geosciences

MDPI

Essay

Constraints and Uncertainties in Recognizing Active Faults for Database Compilation: Insights from Greece

Riccardo Caputo [1,*], Ioannis Koukouvelas [2] and Athanassios Ganas [3]

[1] Department of Physics and Earth Sciences, Ferrara University, 44122 Ferrara, Italy
[2] Department of Geology, University of Patras, 26504 Patras, Greece; iannis@upatras.gr
[3] Institute of Geodynamics, National Observatory of Athens, 11810 Athens, Greece; aganas@noa.gr
* Correspondence: rcaputo@unife.it

Abstract

In this contribution, we analyze and discuss the recently published Active Faults Greece (AFG) database highlighting how poorly constrained and inaccurate practices could impact the overall results. The analysis of the 3814 fault traces and the 892 individual faults proposed in the AFG emphasizes several critical aspects (such as lacking major geomorphological evidence, fault length exaggeration, improper reporting of blind faults, mapping of fault traces without precision, tracing and characterization of faults without field control, proposal of fault traces differing from well-mapped historical earthquake ruptures, omission and misjudgment of the literature, etc.). All these issues effectively invalidate the AFG, discredit the results presented to the public, and introduce a strong bias in any possible estimate of seismic hazard. Furthermore, we outline the criticalities caused by misleading, uncertain, or disputed data transmitted to administrators, professionals, and the public in general, who do not have the capacity or sufficient knowledge and expertise for carefully verifying the applicability of the product for seismic hazard assessment analyses. For secure fault data definition, the remote sensing/geomorphological approach at the base of the AFG could certainly be useful, but definitely not sufficient. Indeed, for the compilation of internationally recognized databases of seismogenic sources and active fault traces, the systematic and critical analysis of historical and/or instrumental seismicity, palaeoseismological, morphotectonic, geodetic, remote sensing, shallow geophysical techniques, and structural investigations would be required.

Keywords: earthquake geology; seismogenic sources; faults databases; fault geometric parameters; seismic hazard

Check for updates

Received: 15 April 2026
Revised: 3 June 2026
Accepted: 17 June 2026
Published: 26 June 2026

Copyright: © 2026 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license.

1. Introduction

The present note is mainly, but not exclusively, devoted to publicly discuss a recently published paper ([1]) and its associated database of Active Faults of Greece (AFG) also in comparison with other two repositories of seismocgenic sources ([2]) and active fault traces ([3]) well established in the literature for the broader Aegean Region. Indeed, Greece and its neighboring areas, including the Aegean Sea, were recognized long ago as a region of ongoing strong crustal deformation associated with significant seismic activity (e.g., [4–37]; among many others). On many occasions, moderate to strong earthquakes have caused fatalities and significant damage to infrastructure and buildings, also generating economic disturbance and cascading crises (e.g., [38,39]). In addition, environmental effects

commonly occurred, like surface ruptures, subsidence, soil liquefaction, tsunamis, and landslides (e.g., [4,5,13,25,36,40–44]; among many others).

Accordingly, the importance of a complete and reliable repository of active faults, and especially of the causative sources of earthquakes, that have affected the broader Aegean Region, has become clear since the late 1990s. In the beginning, this effort focused on tectonic structures clearly associated with pre-instrumental and instrumental seismicity (e.g., [13,45]), and thus was based almost entirely on historical and seismological data. This approach was certainly useful for studying recently activated seismogenic sources, but it is intrinsically inappropriate for sources without any seismological record (neither pre-instrumental nor instrumental) and/or characterized by a long reactivation period ([46]). The 13 May 1995 Grevena–Kozani Ms = 6.5 earthquake (e.g., [47–56]) and the 7 September 1999 Athens Mw = 6.0 earthquake (e.g., [23,57–59]) are paradigmatic examples of fault reactivations that occurred in areas that had been considered until then to be basically aseismic or associated with (very) low seismic activity. Following these events, the subsequent scientific research around the basic input information for seismic hazard assessment also started to consider the geological records in the source identification process. Nevertheless, most of the consequent preliminary products were just graphical ones, resulting in being too descriptive and lacking quantitative parameter information (e.g., [60–62]).

The design, construction, and population of active fault databases are considered a tool of critical importance for seismic hazard assessment. There are several approaches in many earthquake-prone countries that converge towards identifying the main structural features where seismic ruptures may be localized, at least inside the shallow part of the Earth's crust. The main issues of interest in those approaches and databases are as follows: (a) the inclusivity (i.e., which faults need to be included/selected) in terms of dimensions and fault data completeness, (b) the reliability (i.e., are the included faults real or photo-interpreted lineaments, are they active or inactive, and do they extend in accordance with field data or are they simply inferred?), and (c) the verifiability (i.e., have both historical and instrumental earthquakes occurred on the proposed faults; will future earthquakes occur on those faults). Therefore, these databases should clearly state the adopted procedure for distinguishing objective features from subjective opinions, poorly constrained suggestions, or even unsupported claims.

It is beyond the goals of this note to present an exhaustive treatise on how to produce new data, search published literature, analyze the available records, select the relevant information, and quantify the principal seismotectonic parameters in order to properly compile a database in line with the above-mentioned issues of interest. In the present work, our effort was devoted to analyzing and revising the criteria, followed by B25 for compiling the AFG database. Placing emphasis on the shortcomings, limitations, and overexploitation of the collected information, the practical value of this article could instead be considered as what should be avoided when facing a similar task.

1.1. Nation-Wide Fault Databases for Greece

Research focusing on the earthquake geology of Greece, encompassing neotectonics, seismotectonics, seismology, and palaeoseismology, began systematically in the 1970s. However, though sporadic, even earlier publications providing data and information on the topic do exist (e.g., [4–6,63–68], and many others). Notably, a substantial number of publications have emerged since the 1990s, marking a period of growth in the study of earthquake geology and active fault characteristics in Greece, and a natural evolution of this huge production was the compilation of databases, which soon became a crucial and modern tool provided by earth sciences to improve our analytical strategies and operational

effectiveness in civil protection and construction. Since the beginning of this effort, the Scientific Community realized that consolidating a database is a complex task due to the various methods of storing, processing, and analysing a vast amount of data, particularly regarding the methodology or mapping precision.

In the track of the European FAUST Project ([69]) and the Italian DISS ([70,71]), the Greek Database of Seismogenic Sources (GreDaSS) Project was launched in the late 1990s, whose principal aims were as follows: (i) to overcome the previously mentioned critical issues of existing 'fault collections'; (ii) to provide a complete and accurate repository of fully parametrized seismogenic sources and not simply, for example, a 2D map of (active) fault traces ([45,72,73]); (iii) to perform better and more realistic Seismic Hazard Assessment (SHA) analyses; (iv) to make available to the scientific community an effective web–GIS interface. GreDaSS was first published in 2012 [74], while the most recent version (3.0), which appeared in 2025 ([2]; Figure 1a), was always available through the web portal https://gredass.unife.it/ (accessed on 15 June 2026).

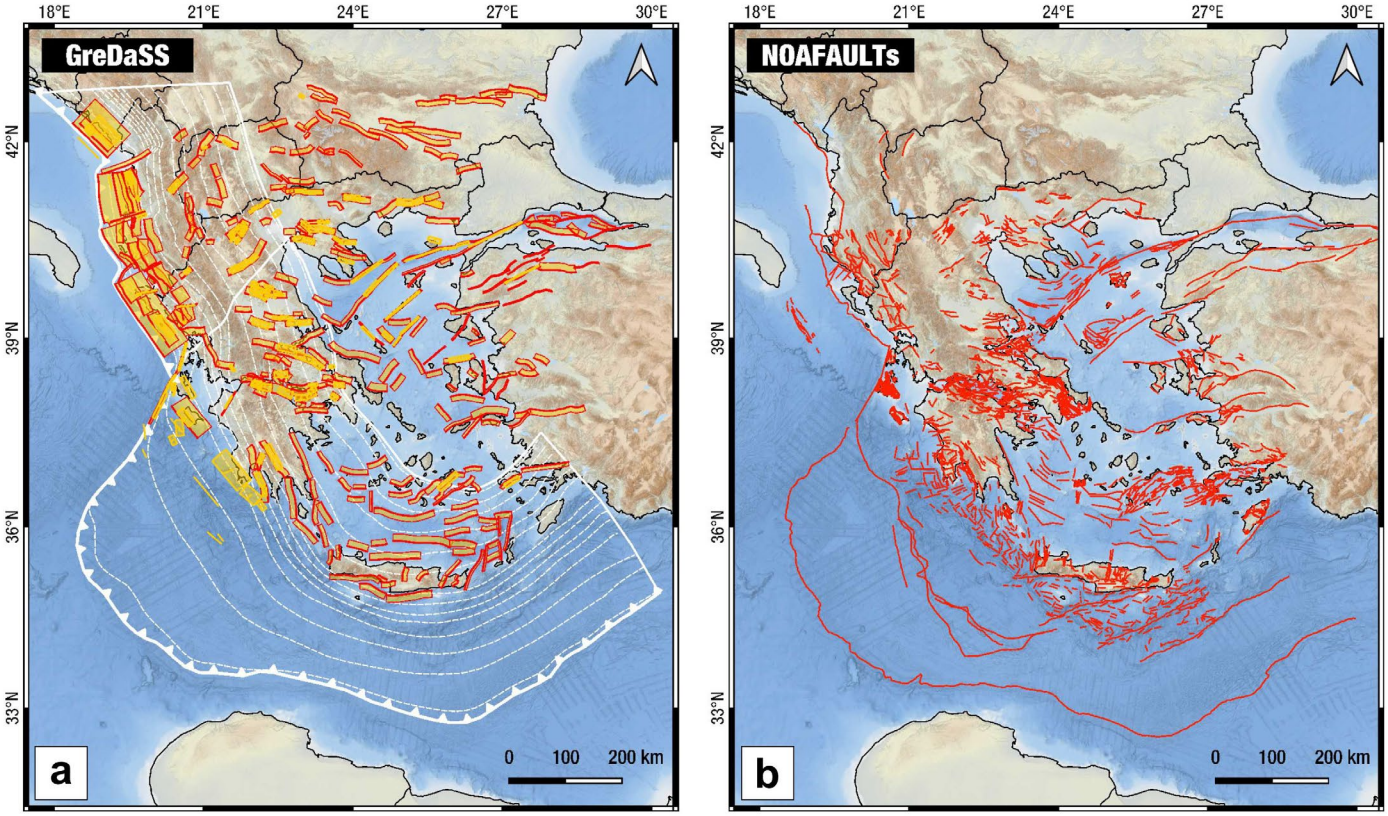


Figure 1. Simplified map of GreDaSS (**a**) and NOAFAULTs (**b**). Modified from [2] and [3], respectively.

Almost in parallel, another important initiative was developed in the frame of the NOAFAULTs Project ([75]) devoted to building a digital database for active fault traces in Greece, whose last version (7.0) was also published in 2025 ([3]; Figure 1b). NOAFAULTs used the standard commercial software ArcMap (version Pro 3.4) to design and populate the database. The fault layer was produced at NOA by on-screen digitization of fault traces at the original map-scale (as drawn by the reference paper it was taken from) and is available through the web portal application https://arcg.is/04Haer (accessed on 15 June 2026), supported by ESRI. The web content of the database also incorporates 27 thematic layers, such as historical seismicity, seismic and geodetic networks, isodepths of the subducted African slab, geodetic velocities ([76]), and many others. The capability

to overlay geospatial data with near-real-time earthquake epicentres achieves an optimal monitoring of areas of high interest.

Both databases adhere to an open-file philosophy and consist of multiple information layers, including graphical, parametric, informative, and metadata layers, which are continuously updatable and GIS-based. However, although they appear similar, the two products are clearly different and complementary in purpose. Indeed, GreDaSS is a repository of geological, tectonic, and active-fault data for the Greek territory and part of its surrounding countries (southern Balkans and western Anatolia) devoted to reconstructing and modelling 3D seismogenic sources capable of generating earthquakes with magnitudes greater than 5.5 (a commonly accepted threshold for damaging seismic events). Therefore, the principal outputs are directly suitable and exploitable for SHA analyses, like the European Seismic Hazard Model (ESHM13; [77]) and, more recently, the ESHM20 ([78]) or the European Fault-Source Model 2020 (EFSM20; [79]).

On the other hand, NOAFAULTs is a repository of peer-reviewed fault traces, geometry, and additional attributes (kinematics, slip rate, associated seismicity, etc.) primarily focusing on supporting seismicity monitoring at the National Observatory of Athens (NOA). As it is constructed, it could represent a fundamental tool for surface fault displacement in seismic hazard analyses and, in general, for urban and infrastructure planning, for avoiding any possible intersections with potential co-seismic surface ruptures.

Following the slightly different targets of the two projects (GreDaSS and NOAFAULTs), they also slightly differ in terms of methodological approach, which was applied for populating the two databases. Indeed, the seismogenic sources included in GreDaSS represent the result of an expert judgement and critical analysis of all available published data (either from the literature or purposely collected by the research group). In this regard, any information, like geological, structural, morphotectonic, geodetic, palaeoseismological, historical, archaeoseismological, geophysical, etc., potentially useful for synthesizing and quantifying the most important geometric, kinematic, dynamic, and chronological seismotectonic parameters of 3D crustal-scale tectonic structures that could generate at least moderate earthquakes (M > 5.5), has been used by the Working Group. Instead, following a systematic search in the peer-review literature data, NOAFAULTs primarily includes all surface fault expressions represented in published maps (either self-standing or included in papers and reports as figures) or originally produced by the Working Group, which are considered as geologically active (i.e., historical, Holocene and Late Pleistocene) by the original authors and supplementing the digitized fault traces with additional geometric and kinematic information to facilitate the end-users.

It is also worth noting that a new database project, HeDBAF (Hellenic Database of Active Faults), including some parametric information about the active faults in the broader Aegean Region, has been recently launched ([80]) under the auspices of EPPO (Earthquake Planning & Protection Organisation of Greece). The responsibility of implementation, management, and hosting is held by the Hellenic Survey of Geology and Mineral Exploration. As a very young effort, the HeDBAF is still in a very preliminary phase, missing many active fault occurrences and parametric information. In summary, and though we are among the founders and leaders of the GreDass and NOAFaults projects, the present note does not imply any conflict of interest with AFG, as far as the above-mentioned databases are extensively utilized by the scientific community.

1.2. The New Active Faults Greece (AFG) Database

Even more recently and notwithstanding the existing available products, [1] (in the following also referred to B25) have published another entirely new database, the Active Faults Greece (AFG), defined by the authors as "*a comprehensive geomorphology-based 1:25,000*

fault database". Based on the analysis of the 3814 fault traces and the 892 individual faults included in the AFG database and the companion paper (B25), in the present note, we pinpoint several critical aspects intrinsic in the product, its initial assumptions, and collection procedure, which could introduce strong biases if the results were used for SHA analyses. We also outline several criticalities caused by misleading, uncertain, or disputed data.

First of all, in the very beginning, B25 authors state that "*accurate mapping of fault traces is a prerequisite for estimating credible earthquake magnitudes on individual faults and developing a national seismic hazard model*." The B25 authors do not explain how most of the data included in the AFG database (classified as 'fault traces', 'individual faults', or 'fault systems') would allow any end-user to estimate an earthquake magnitude properly, and certainly not a "*credible*" one for a seismic hazard model. Above all, no experienced seismologist or engineer would (and could be able to) use the provided data for attempting a seismic hazard model (i.e., [81]). The principal reasons are the following.

(a) Even if the provided data could be of some use for SHA analyses, no reliable "*seismic hazard model*" could be performed for most of the national territory of Greece due to a major, though declared, scope limitation. Indeed, due to the source of information used by B25 (i.e., the cadastral DEM of Greece), at least half of the active faults and seismogenic sources affecting the Aegean Region are completely missing (e.g., [2,3]) simply because they are located offshore. In principle, only limited continental areas could be analysed by incomprehensibly assuming that these continental areas would not be seismically affected by any of the many offshore seismogenic sources. In this regard, considering the well-known geodynamic and seismotectonic setting of the broader Aegean Region, the offshore areas are indeed among the most hazardous ones.

(b) The above-mentioned statement of B25 is also intrinsically inadequate as concerns the use of the adjective "*national*" relative to any hypothetical seismic hazard model potentially obtained from the AFG database. This is because several major faults, which indeed do exist at short distances from the long borders of Greece, are not included at all in AFG, and hence their contribution to properly assessing the seismic hazard would be null. Both reasons would therefore produce a diffuse underestimate of the real seismic hazard, for example, close to the national borders, even for the areas investigated by B25.

(c) It is also curious that (and how) B25 specifically designed a strategy "*to address ambiguities and inconsistencies between existing Greek fault databases, which often differ in scope, purpose, and inclusion criteria*". The question is, based on which criteria do they decide that distinct databases that explicitly declare to have different scopes and purposes are inconsistent for a specific seismotectonic area or even for a single fault? As already mentioned, GreDaSS ([2,19]) includes 'seismogenic sources', while NOAFAULTs ([3,75]) includes 'active fault traces', and for scientists, the use of one kind of 'geological objects' obviously differs from the use of the other kind.

(d) They state that AFG "*offers a resource for understanding and managing Greece's earthquake risk*"; however, they do not address vulnerability at all, which is a cardinal ingredient of any risk analysis.

(e) They conclude their "Background and Summary" introductory chapter by stating that AFG "*offers a reproducible model for other nations seeking to systematize active fault data collection and presentation*". However, for more than a decade, for the entire European territory, a database of seismogenic sources is available, consisting of completely open-access data, like the European Database of Seismogenic Faults (EDSF13; [82]) and the more recent European Fault-Source Model 2020 EFSM20; [79]). Interestingly, most of the regional subdatasets of the EDSF13 and EFSM20 databases have been originally provided and are

continuously updated by numerous national (or international) research groups that made (and make) an effort to standardize and homogenize these products, including Greece.

In brief, the AFG database and the B25 paper have major drawbacks, fundamental misunderstandings, crucial scientific omissions, and biased information. In the attempt to limit ourselves to the major points, in the following pages, we analyse in more detail some relevant statements of B25, and selected elements included in the AFG. The aim is to inform potential stakeholders and interested geoscientists that using the AFG database in SHA analyses would generate incorrect results due to a long list of problematic issues.

2. Methodological Issues for Mapping and Characterizing Active Faults

2.1. Fault Trace Mapping

B25 proposes a list of criteria to argue for the tectonic origin of their observed lineaments, not definitively proven to be faults. They also state that "*to assess the tectonic origin of these lineaments we tested them against the following geomorphic criteria, with the requirement that at least one is honoured*". Firstly, several among the listed criteria do not assure at all that the observed lineament is of "*tectonic origin*" because remote sensing inferred lineaments could also be of stratigraphic or erosional origin (e.g., [83]). In this regard, the tectonic origin of a lineament is verified by field evidence and geophysical data (e.g., [84–86]). Secondly, in order to safely attribute a "*tectonic origin*" to a lineament, more than one (and not only one) of the listed criteria could realistically provide more concordant results. Thirdly, even in case the "*tectonic origin*" of the mapped lineament is proved, (again) only field work could distinguish among, for example, old inherited structures and likely inactive ones from neotectonic features that could be possibly still active (see also the following Sections devoted to the 'classification' and 'timing' of the faults). Fourthly, remote sensing alone cannot definitely conclude that a morphological feature corresponds to an active fault without additional data (geological, structural, and geomorphological mapping, seismicity patterns, geodetic evidence for strain accumulation, etc.). At most, lineaments could eventually correspond to potentially active faults, and it would be appropriate to pair the annotation of "fault confidence rankings" (e.g., [87]).

2.2. Classification of Fault Type

It is well known that most of the currently active faults affecting the Greek territory have a prevailing dip-slip normal kinematics (although in local settings, an oblique-slip component could not be neglected). However, for recognizing and characterising strike–slip faults, it is not simply "*more difficult*", as stated by B25, unless very high slip-rates, which is not the case for onshore faults in Greece. In this regard, it is certainly not sufficient to have a "*careful examination of the landscape*" using remote sensing techniques, but a careful and systematic structural field work (Figure 2). Obviously, the lack of ground truthing in the process of populating the AFG database could cause inaccurate fault type attributions. Only a few examples could be represented by the "*Kerkyra*" individual fault (#833) mapped as normal, which is in reality strike-slip ([88]; Figure 2a) or the "*Athani-Lefkada*" individual fault (#238) also mapped as normal, but again characterized by a transcurrent behaviour (e.g., [42,89]; Figure 2b,c). Note that in the present contribution, we will systematically refer to the "*individual faults*" included in the AFG database by recalling the name and the number as attributed bythe authors.

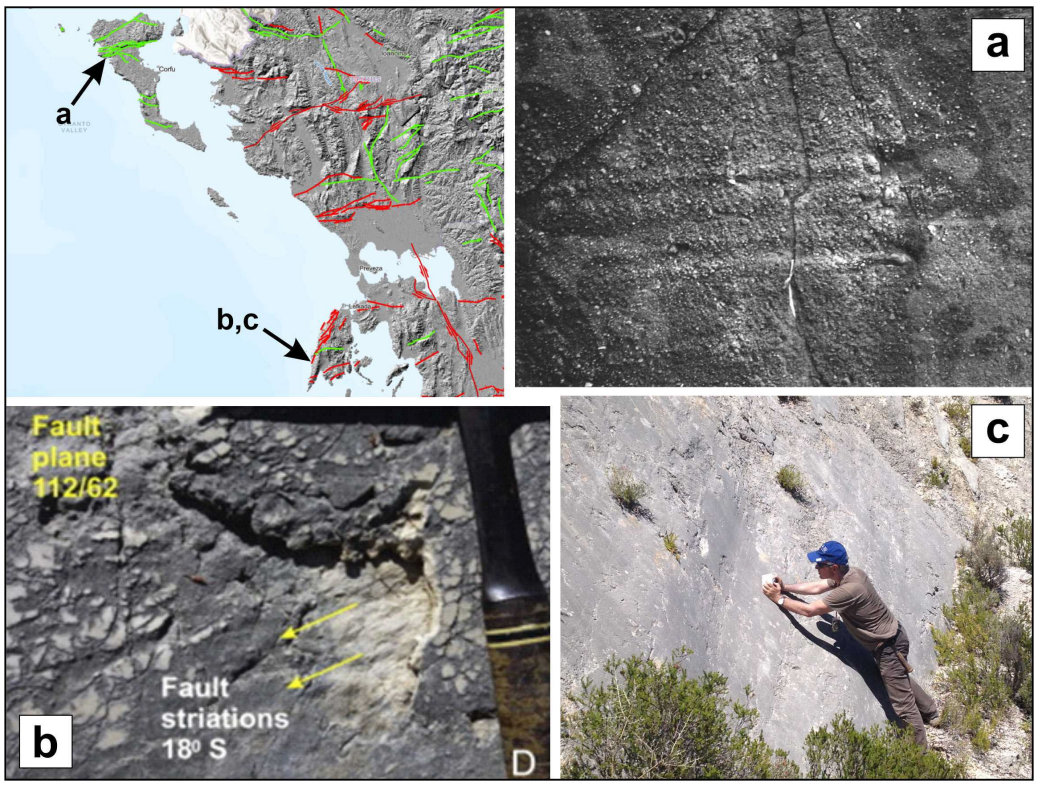


Figure 2. Kinematic indicators from devoted field work clearly documenting the prevailing transcurrent behaviour of the (**a**) "*Kerkyra*" (photo from R. Caputo, summer 1983) and (**b**,**c**) "*Athani-Lefkada*" (photo from A. Ganas, 16 July 2016; location as in Figure 12 of [42]), individual faults, contrary to what is reported in the AFG database. The map shows the location of the sites.

2.3. Earthquake Versus Topographic Fault-Scarps

Beyond the confusion in introducing the term of "*topographic fault scarp*" (indeed all scarps must have a topographic signature to exist and especially in order to be recognized by remote sensing techniques) instead of using a more correct 'cumulative fault scarp', which is probably what they mean, one of the problems of AGF is that scarps associated with dip-slip kinematics having vertical offsets between 4 and 100 m are inexplicably ignored and/or left as unidentified in B25 nomenclature. They indeed discuss the ranges 0.1–4 m and 100–1000 m. This missing 'class' of cumulative scarps is likely the most common within the Aegean Region. Moreover, as far as the 'observed' scarps used by B25 for drawing lineaments are exclusively based on a remote sensing approach through the analysis of cadastral DEMs, it appears methodologically inconsistent to map "*earthquake fault scarps*" in the height range 0.1–4 m when the vertical error of the used DEMs may reach several metres (e.g., [90–92]).

2.4. Fault Hierarchy

A crucial 'philosophical' issue in B25, with the obvious consequences in the AFG database, is represented by the choice of coalescing single lines (i.e., fault traces) in order to upscale the tectonic structure. To support this choice and associated procedure, B25 declare that "*although fault traces may or may not be linked in map-view, they usually merge at depth to form a common slip surface that represent a single coherent active fault*", therefore suggesting that these tectonic structures could 'coherently' rupture the entire 'common slip surface,' thus producing a major earthquake. Although this statement could be reasonable for subparallel, slightly misaligned normal faults with closely spaced tips, it is both geometrically and kinematically impossible in the case of antithetic normal faults that diverge (i.e., forming

a horst) or converge (i.e., forming a full graben) at depth. Notwithstanding our trivial observation, in the AFG database, there are several such unrealistic cases (Figure 3), such as the following: the "*Iliokastro*" (#388) individual fault in Argolida (Figure 3c), where either N- and S-dipping fault traces, both defined active by B25, have been coalesced; the "*Vlachokerasia*" (# 502) individual fault south of Tripolis (Figure 3a), where NE-, SW-, N-, and S-dipping fault traces have been coalesced; the "*Leventis*" (#120) individual fault east of Kozani (Figure 3b), where either SE- and NW-dipping diverging at depth fault traces were also merged to form a "*single coherent active fault*". These three cases are a few examples among many other cases.

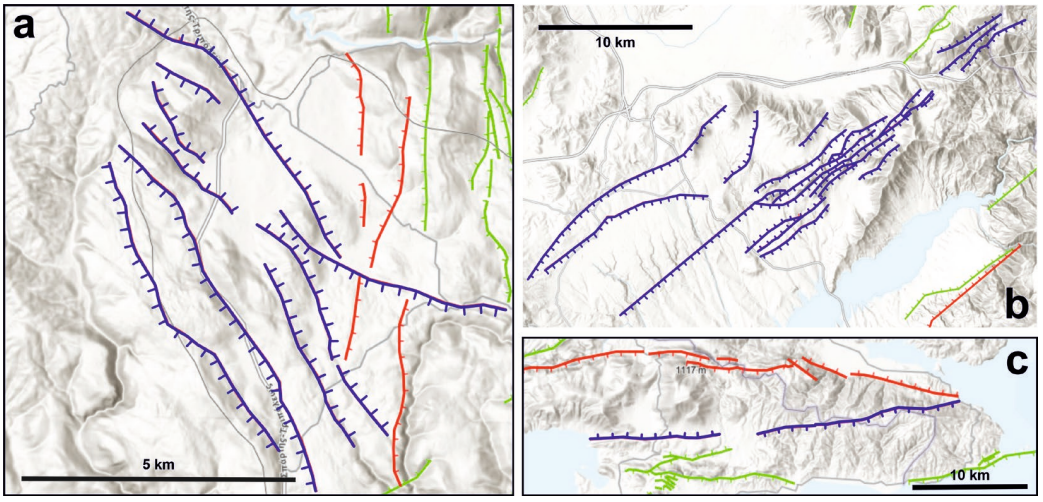


Figure 3. Relief maps adapted from the Active Faults of Greece (AFG) web viewer licensed under Creative Commons Attribution 4.0 International (CC BY 4.0) (https://experience.arcgis.com/experience/a6c85b1edf9d4d17a3f01a70cef6d2b2; accessed 15 June 2026) showing examples of fault traces that have been 'coalesced', allegedly forming "*single coherent active faults*" (thick blue lines with barbs on downthrown block). In each map, the set of thick blue lines clearly shows unrealistic geometric and kinematic relations. (**a**) southern sector of "*Vlachokerasia*" individual fault (# 502) south of Tripolis; (**b**) "*Leventis*" individual fault (#120) east of Kozani; (**c**) "*Iliokastro*" individual fault (#388) in Argolida.

However, our perplexities and doubts in the 'merging' procedure of distinct traces and the upscaling approach applied by B25 are reinforced by the fact that none of the "*individual faults*" which hosted historical earthquakes and ruptured the topographic surface have reactivated all of the traces that have been speculatively merged by B25. Accordingly, the criteria used for merging lineaments, like "*fault traces are approximately co-linear with a common dip direction*", or "*fault traces are formed along a single continuous range-front*", or simply that the "*fault traces are closely spaced*", do not hold in all available real cases, nor are they sufficient to assume the seismogenic continuity of a tectonic structure.

Therefore, the 'upscale' mechanism proposed by B25 could not be justified in Greece with any reasonable confidence. Maybe it is more suitable in transcurrent tectonic regimes, but certainly not in the Aegean Region, which is mostly dominated by crustal stretching ([8,93–99]; among many others), a schizosphere with a limited thickness ([100,101] and references therein) and distributed normal faulting. Once more, systematic fieldwork and additional investigations are needed to define the occurrence of segments and especially to characterize the presence of hard or soft segment boundaries, persistent or temporary boundaries. Furthermore, according to the model of B25 and the assumption these structures represent "*single coherent active faults*", the AFG database includes several very long individual faults, like the "*Lamia-Stilida*" (#280; 102.4 km), the "*Gerakarou-Liti-Mygdonia*" (#53; 104 km), the "*Drama*" (#18, 111.9 km), the "*Kavala-Xanthi-Komotini*" (#1, 125.7 km) or the "*Komotini-Nea Santa*" (#16), which is up to 161.5 km-long (Figure 4; Table 1).

These long faults could have catastrophic consequences in terms of potential magnitudes (see the following Section 3). Based on decades of research applying and following Historical Seismology ([28,102–106]) and Earthquake Geology methods and approaches ([46,107]), such structures, huge in length, have no seismotectonic meaning, certainly not for seismic hazard modelling of the broader Aegean Region.

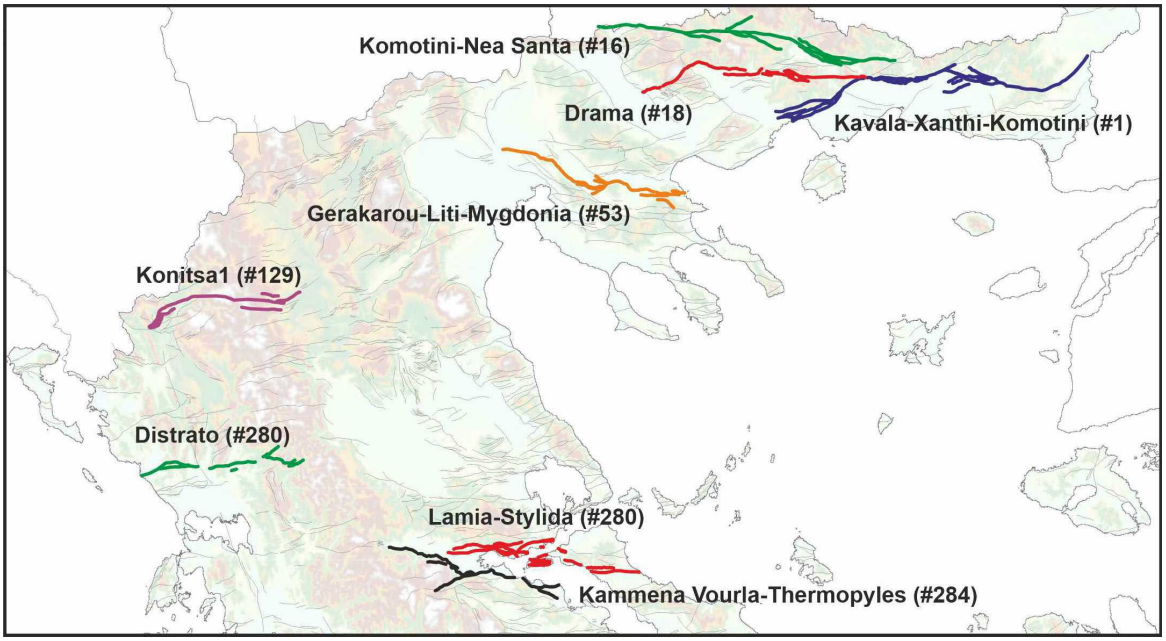


Figure 4. Map showing the "*single coherent active faults*" longer than ca. 100 km as proposed by B25 and redrawn from AFG. Some/most of the suggested connections between distinct fault traces are quite disputable, while their strong segmentation is well-documented in the literature (e.g., [2] and references therein). See also Table 1.

Table 1. Selected "*individual faults*" from the AFG database and their length (in km). Hypothetical magnitudes are calculated based on empirical relationships ([108,109]) and compared with the maximum credible magnitude of the corresponding or nearby seismogenic sources in GreDaSS [2] and the historical events recorded within a buffer zone of 15 km from the AFG lineaments. See Figure 4 for the location.

Individual Fault	Declared Length	WC94	Th17	GreDaSS	Historical Events
Komotini–Nea Santa, #16	161.5	7.8	8.1	6.4	<6.0
Kavala–Xanthi–Komotini, #1	125.7	7.6	7.9	6.5	6.6
Drama, #18	111.9	7.6	7.8	6.5	7.0
Gerakarou–Liti–Mygdonia, #53	104.0	7.6	7.7	6.4–6.5	6.6
Lamia–Stylida, #280	102.4	7.5	7.7	6.6	6.7
Kammena Vourla–Thermopyles, #284	98.1	7.5	7.7	6.5–6.6	6.9
Distrato, #224	89.5	7.4	7.6	6.6	<6.0
Konitsa 1, #129	86.9	7.4	7.6	6.4	6.2

Even more elusive for SHA analyses is the 'definition' of "*fault system*" based on the appearance that individual faults "*accommodate displacements interdependently*". For example, it is not mechanically appropriate to 'upscale' two antithetic individual faults spaced apart 10 km ("*Gyrtoni*", #163, and "*Ligaria*", #203) or even 15 km (e.g., "*Karla*", #174, and "*Kileler*", #181) (Figure 5a); nor suggesting that the "*Roupel*" (#41) individual fault and

the "*Loutra–Almopia Basin–Notia*" (#93) individual fault, whose closest tips are ca. 40 km apart, form a fault system (Figure 5b). On the other hand, and in contrast with the above criteria proposed by B25, east of Asprovalta, northern Greece, two fault traces merged into the individual fault "*Kerdilia–Podochori*" (#26) have been artificially attributed to two distinct fault systems, the "*Kavala-Xanthi–Komotini*" and the "*Assiros–Analipsi-Scholari*", which in principle have a higher rank in their proposed seismotectonic hierarchy.

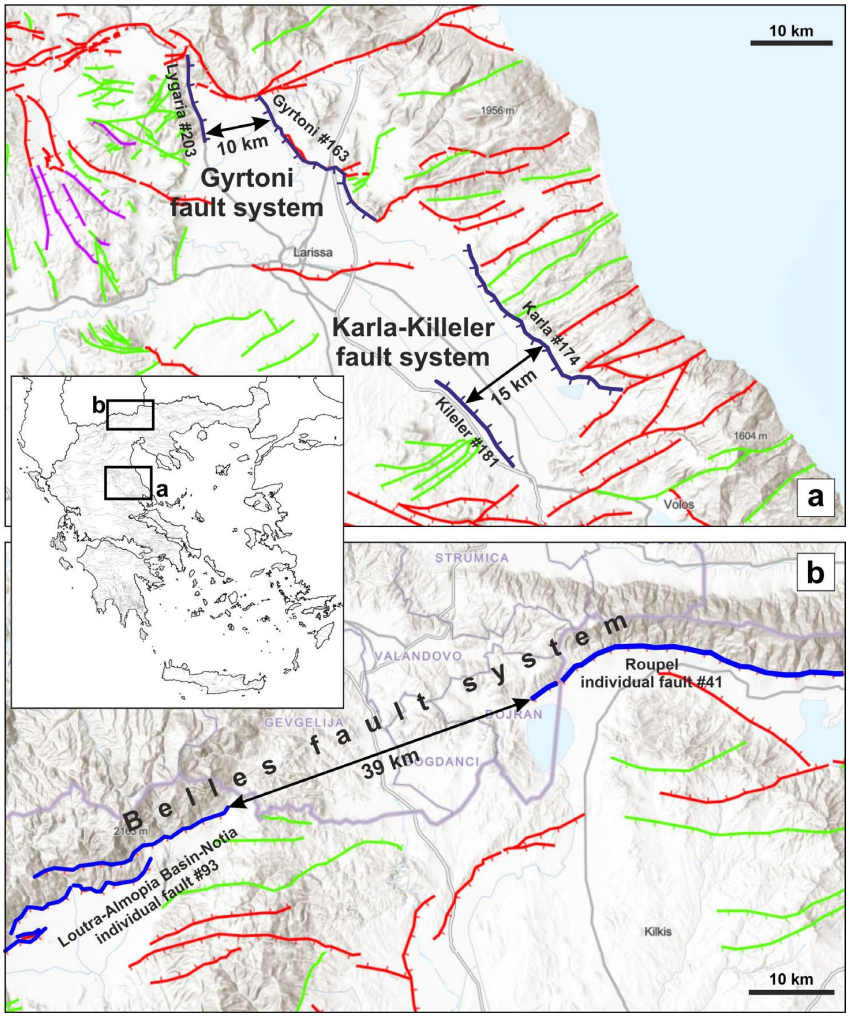


Figure 5. Relief maps adapted from the Active Faults of Greece (AFG) web viewer licensed under Creative Commons Attribution 4.0 International (CC BY 4.0) (https://experience.arcgis.com/experience/a6c85b1edf9d4d17a3f01a70cef6d2b2; accessed 15 June 2026) showing examples of "*individual faults*" (blue thick lines) which unrealistically form a "*fault system*" which could "*accommodate displacements interdependently*". The cases of the "*Gyrtoni*", "*Karla-Killeler*" (**a**) and "*Belles*" (**b**) fault systems. See inset map for location of the areas.

This rather simplistic approach, followed by B25, leads to superficial conclusions and does not provide any factual contribution to a better definition of the seismogenic potential of an active region, nor to improve our hazard estimates. At the end, the question should be as follows: based on which criterion can remotely sensed interpretations provide robust conclusions on the "*displacement interdependence*" between faults?

2.5. Adopting a Definition of "Active Faulting" for Greece

Even considering the *à la page* approach of B25 ("*to be inclusive*"), which assumes the "*time-window of 'active faulting' to include the Quaternary (i.e., since 2.58 Ma)*", it is objectively and intrinsically wrong when this definition is applied to Greece and the

broader Aegean Region. Indeed, for about half a century, it has been clearly recognized that the regional geodynamics has abruptly changed over the last million years and locally even less ([19,32,93,94,97,110–114]; and many others). Accordingly, many of the mapped fault traces could be associated with, and formed under, a different (i.e., older) tectonic regime that is no longer active in the present-day stress field (e.g., [96,98,99,115]). For example, most of the roughly N–S to NNW–SSE trending (normal) fault traces drawn in central–eastern Macedonia or in Thessaly are definitely inactive (based on geologic, structural, geomorphological, geodetic, and seismological observations) and should not be included in a database claiming to collect 'active faults'.

Moreover, to apply the above "*inclusive*" approach and classification, we need field data on fault-controlled sedimentary basins, or scree deposits and colluvial wedges, all included in and associated with basins bordered by synsedimentary fault(s).

In Greece, there are normal faults from the Early Pleistocene that are typically inactive in the current geodynamic setting, despite their inconsistent inclusion in the AFG database (with the "A" of the label denoting 'active'). Accordingly, a more proper (though not exclusive) classification of faults activity useful for the Aegean Region could be as follows (e.g., [116,117]): (i) seismic faults that have directly caused a known moderate-to-strong earthquake; (ii) faults with documented displacement during the Holocene (ca. 10 ka) and moderate to high slip-rate (say, >0.5 mm/a); (iii) faults with documented cumulative displacement over the last 40–45 ka (latest Pleistocene); (iv) faults with documented cumulative displacement since the onset of the Present-day stress field (i.e., less than one million years for most of the Aegean Region) and generally characterized by a very small slip-rate. For class (i), historical and/or instrumental seismicity is generally required for recognizing and discriminating against classes (ii) and (iii), and palaeoseismological data are typically necessary, along with the morphotectonic and/or morphometric analyses, which could provide important contributions. In contrast, attributing a fault to the last class in terms of activity (iv) is more complex, and consequently, multiple diverse approaches should be applied. Certainly, geomorphological and remote sensing methods could be useful, but when studying normal faults (as it is the case for most presumed active structures in Greece), shallow geophysical surveys across the fault trace and/or stratigraphic information from the nearby induced sedimentary basin would also be strictly necessary (e.g., [118–120]).

In summary, considering that most of the time window assumed by B25 (0–2.58 Ma) falls outside the period during which the present-day stress field has been established, since then pervading the Aegean Region, a large percentage of the lineaments represented in AFG should not be considered as active faults or faults capable of being reactivated. As a consequence, the concluding statement by B25 on this argument ("*For the purpose of seismic hazard assessment, in the interests of inclusivity, named faults that have active fault traces should be regarded as active unless otherwise proven*") has very limited scientific or technical applicability.

2.6. Geomorphic Classification

The statement that the geomorphic classification "*was only undertaken for faults attributed 'active' or 'historically active'*" raises further doubts about which features are really included in AFG. The perception is that the "*probably active*" and the "*uncertain*" faults have been excluded by the geomorphological classification simply because they do not have a sufficient geomorphic expression that could be observed from the analysis of remotely sensed cadastral maps. If so, for a database claiming to be useful for SHA analyses, the meaning of about 40% of the traces included in AFG would be at least questionable. In other terms, the statement that the "*probably active faults*" (>40% of the drawn lineaments)

have no geomorphic expression on the cadastral DEMs sounds quite contradictory as far as active faults in AFG have been detected solely based on a remote sensing approach.

In addition, simply using the geometry of the scarps, by distinguishing between "*sharp, moderate, rounded or poor*" ones, for classifying the faults in terms of activity as declared by B25 would be at the very least not sufficient and in many cases even misleading. Indeed, fault scarps with the same or similar geomorphic expression could have different ages, or scarps with similar ages could have undergone quite different morphological evolution, leading to different final geometries. Indeed, since several decades (e.g., [121–125], and many others), it is well known that the 'roundness' (or conversely the 'sharpness' as referred to by B25) of a fault-related scarp depends on several factors among which the involved material and particularly the presence at the surface of loose deposits, a regolith or a bedrock, its degree of erodibility and its capacity to produce small *versus* large clasts, the orientation of the slope, the dependence of transport efficiency on the slope aspect, etc. (e.g., [121–125]).

Thirdly, even for remaining 50% of geomorphologically classified lineaments (the "*active*" and "*historically active*" ones), in case a scarp is defined as "*poor*", it seems contradicting the fact that these features could be recognised based on a remote sensing technique, and equally questionable would be the meaning of mapping a lineament with a trace uncertainty of 1000 m relative to the hypothetical fault location along a smoothly degrading scarp.

Fourthly, the "*depositional control criterion*" could not be unequivocally used for determining the presence of an active fault along, for example, "*a range-front between hill/mountain and Quaternary depocenters*" because such geometrical relationships (in map view) could be due to the occurrence of inherited structures and a purely on-lap sedimentary mechanism. This is clearly the case of the "*Karla*" (#174; [126,127]), "*Lygaria*" (#203; [128,129] *cum bibl.*), "*Central Hills*" (#184; [19,126,130]), "*Pagasitikos Gulf*" (#259; [131–133]), "*Veroia*" (#119; [134]) individual faults and many other features included in the AFG database. Also, using "*a range-front between hill/mountain and Quaternary depocenters*" solely based on a remote sensing approach could even lead to confusing an inactive east-dipping reverse (blind) fault like the Mitsikeli thrust east of Ioannina (e.g., [135]) with an 'active' west-dipping normal fault ("*Mitsikeli*", #148). Again, it is evident that fieldwork data is critical for discriminating against the origin of a similar lineament.

2.7. Lacking Major Faults

Some major and well-documented faults in the literature, as active structures, are missing from the AFG database but are largely included in the literature. For example, the north-dipping Psathopyrgos Fault in NW Achaia (Figure 6; [136–142]) represents an important seismogenic source potentially affecting Patras, one of the major towns of Greece, in case of reactivation. In the same area, the Rion–Patras fault has also been 'recently' documented to be active (e.g., [143]).

2.8. Including Blind Faults

B25 state that they built a "*homogeneous database of continental active faults in Greece*" and insist on this issue by adding that "*the value of this approach derives from its* [...] *uniformity of compilation methods and a consistent philosophy of geomorphic attribution*", but also that their "*mapping philosophy emphasizes a unified* [...] *methodology*". On the other hand, since the title of the paper, it is declared that AFG includes only "*geomorphology-based*" faults as far as the pillar of the database is represented by a remote sensing analysis of cadastral DEMs. Surprisingly and disrupting any assessed rule of data homogeneity, AFG also includes the "*Movri*" (#453) individual fault, which is a clearly blind seismogenic source ([24,144–148]).

Although remote sensing and topographic/DEM analyses are valuable tools for detecting surface expressions of active tectonics, such as fault scarps, offset drainage features, and geomorphic discontinuities are fundamentally insufficient for the reliable identification and characterization of blind faults since these do not rupture or modify the Earth's surface enough. Instead, blind faults remain buried beneath younger sediments, lacking direct geomorphic expression. Consequently, satellite imagery and related outcomes, i.e., shaded-relief models, or DEMs and the derived lineaments may at best reveal ambiguous features that can equally reflect lithological boundaries, erosional processes, drainage patterns, anthropogenic modifications, or non-tectonic topography.

In addition, the identification of buried structures requires integration with independent geological and geophysical evidence, including field-based structural mapping, stratigraphic observations, seismic reflection profiles, geodetic measurements, microseismicity distributions, focal mechanisms, or other subsurface datasets. Without such validation, interpretations derived solely from DEMs or remotely sensed lineaments remain speculative and may lead to substantial overestimation or misclassification of tectonic structures.

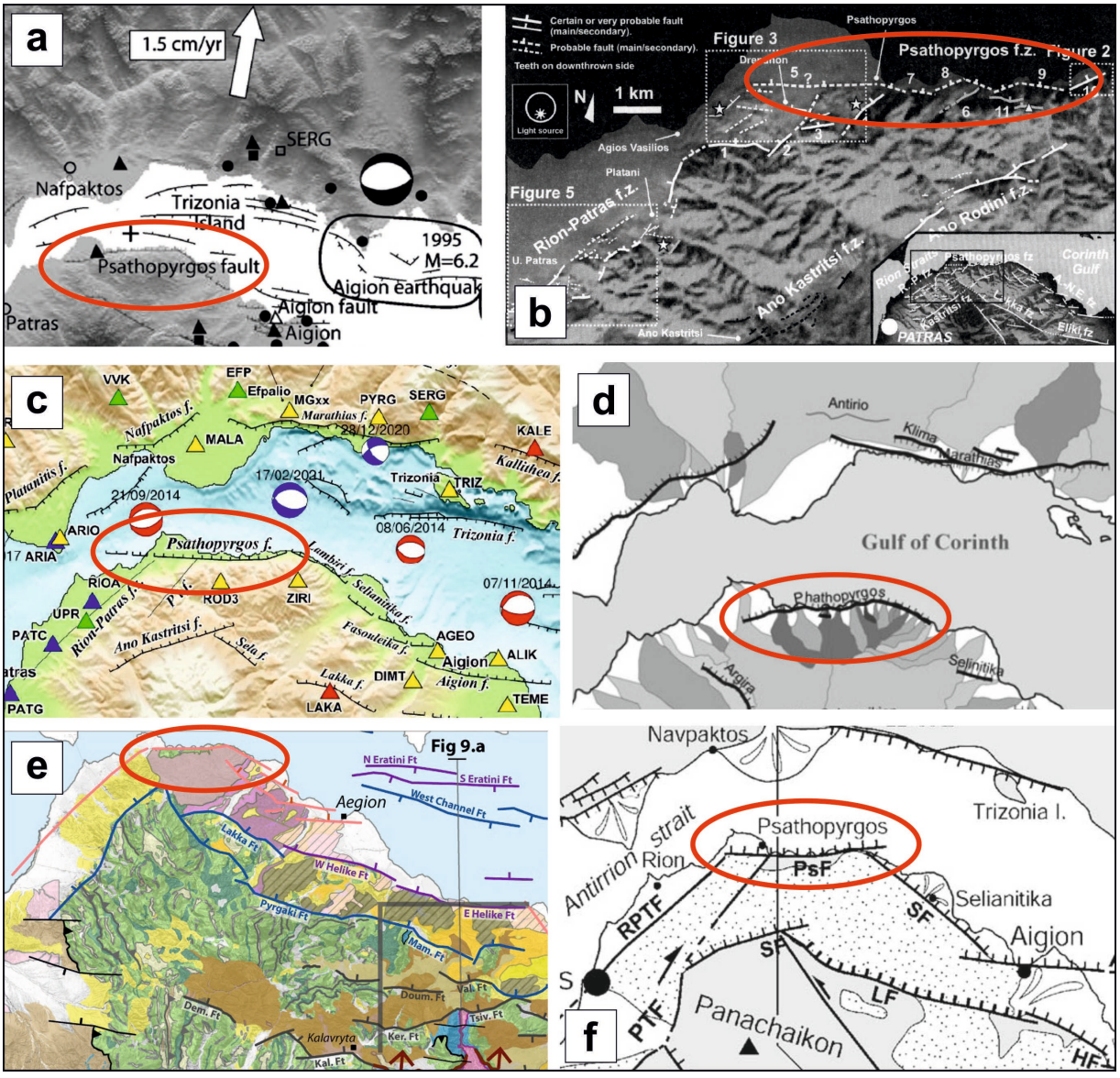


Figure 6. The Psathopyrgos Fault is well-documented in the literature as an active fault, representing an example of an important tectonic structure omitted by B25, in contradiction with the statement

that AFG "*includes all previously known active faults with appropriate referencing*". Selected maps extracted and modified from (**a**) [149] (© 2005 Elsevier B.V.); (**b**) [138] (licensed under CC BY 4.0); (**c**) [150] (© 2021 by the authors licensed under CC BY); (**d**) [140] (licensed under CC BY 4.0); (**e**) [151] (© Wiley Periodicals LLC licensed under CC BY); (**f**) [137] (© 2005 Elsevier B.V.). In all maps the Psathopyrgos Fault is emphasized by a red ellipse.

Although the "*Movri*" (#453) individual fault is indeed declared in the text (but not explained) to be a unique alien feature in the database, other blind faults have been instead included in Thessaly, where, based on the DinSAR method, seismological data and especially field surveys, all research groups that investigated the March 2021 Damasi sequence converge in documenting that the mainshock and the major aftershocks clearly activated blind sources ([25,152–156]; among others). The few ground ruptures that were observed have been associated with secondary or sympathetic minor structures ([30,31]).

In this regard, it is also curious that the same authors ([157]) after describing a list of surficial evidences conclude that "*because these displacements are small and localized along shallow depths only, and also because they form at an angle to the main displacement gradient, we do not attribute them to the earthquake rupture process itself but to syn-seismic (or sympathetic) rupture in response to ground shaking (e.g., gravitational collapse)*". That is to say that these faults/traces included in the AFG database do not have a primary, active, seismogenic role, but a passive, triggered one; above all, the lineaments traced in AFG are certainly not capable of generating M > 6 events as assumed by B25 for the construction of the database.

3. Discussion

3.1. Kinematically and Geometrically Unrealistic Faults

A strange case of two individual faults was reported in the NE Aegean Island of Lesbos (Figure 7a). Although they have been drawn with almost orthogonal strikes, they are interpreted by B25 as both dextral strike-slip and probably active, which is dynamically impossible for two 'conjugate' faults. Whatever the stress field affecting the island, since [158], the coupled geometry and kinematics proposed in AFG are obviously mechanically unfeasible.

Another incorrect geometry is observed at the boundary between Thessaly and Macedonia, where the so-called "*Lithochoro*" (#748) individual fault 'turns around' the massif of the Olympus Mount from an almost N–S and W-dipping setting on the western side, to an almost N-S, but E-dipping, setting on the eastern side of the relief, encircling the massif on the northern side with a northern dip-direction. Similar is also the curved fault trace from NW to NE, called the "*Rodia*" (#161) fault. The only memory of such unrealistic faults is in some early geological maps of the 1950s, where the focus of mapping was directed towards mineral exploration and ore deposits and certainly not active faults.

Dynamically strange for contemporaneously active dip-slip structures are also the several fault traces drawn in southwestern Peloponnese showing roughly orthogonal cross-cutting geometries, like the "*Methoni*" (# 489) N–S trending individual fault and the "*Platanovrysi*" (#488) and "*Lykissa*" (#490) individual faults, both E–W trending (Figure 7b). It is worth noting that the latter two individual faults have been grouped into the "*Pylos*" fault system, while the former as a distinct "*Methoni*" fault system. Beyond the doubts about the suggested coeval activity, also this choice is rather difficult to understand.

Within the 'category' of unrealistic faults, we could also include several cases, one of which is the "*Kalamata*" (#515) individual fault. It includes either "*active*" or "*historically active*" traces that all dip eastwards in the AFG database. In contrast, field surveys following the 1986 Kalamata event as well as morphotectonic and seismological investigations all document the opposite fault dip ([35,159–161]). Similar mistakes also exist in more recent events, like the 2020 M7.0 Samos event, where the causative seismogenic source

unanimously dips to the north ([44,162–167]; among many others). However, in the AFG database, the entire 'detected' fault traces in the northern sector of the island dip south.

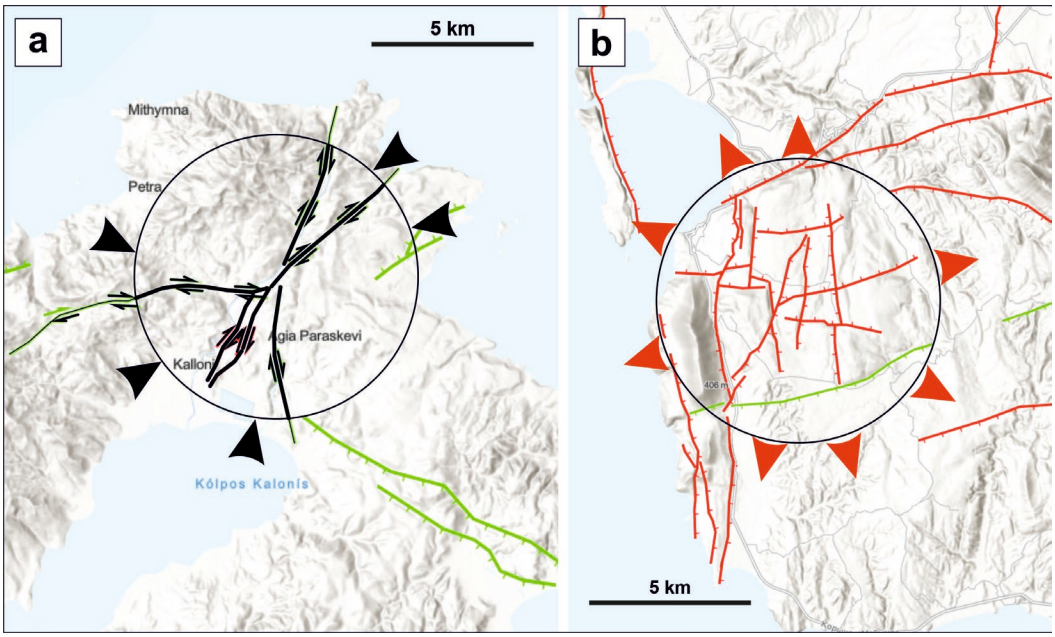


Figure 7. (**a**) The 'case' of the Lesvos Island crossed by two high-angle-to-orthogonal active faults (black lines within the circle), which have both a dextral strike-slip kinematics. Two subvertical, roughly perpendicular fault sets cannot both accommodate dextral strike-slip motion under a single regional stress field because the resolved shear stress directions would be incompatible with the geometry of the faults. In general, strike-slip motion occurs when the maximum horizontal compressive stress (σ_1) lies at about 30° to the fault strike (see black arrows for each fault). In an orthogonally oriented fault, the same stress trajectory can no longer resolve the same kinematics (i.e., dextral shear). (**b**) The 'case' of multiple crossing normal fault sets in southwestern Peloponnese (red lines within the circle). The illustration indicates two almost orthogonal fault systems as active, in contrast to the common notion that networks of orthogonal faults can only arise from a stress field that varies in time ([168]). Assuming they are all contemporaneously active (B25) would imply the presence of as many σ_3 stress axes (red arrows) affecting this crustal volume. On the other hand, the extensional direction in this area is roughly E–W ([32,35,97]; among others). Adapted from the Active Faults Greece (AFG) web viewer licensed under CC BY 4.0.

3.2. Misused/Wrong Fault Names

For the labelling of faults, a process commonly based on literature data or local toponyms, we have some concerns. For instance, while the name of a fault along with its geometric and kinematic details is in general well-established from previous publication(s), any new naming, or the use of a known name in a different geographical location leads to confusion within the scientific community. This inappropriate use of names also appears inside the AFG database thus causing confusion to the community.

For example, (a) the "*Saranda*" (#144) individual fault is traced by B25 near the Greek Albanian border, while the town of Saranda is 30 km north in Albania. (b) The "*Petousi-Souli*" (#142) fault name is attributed to a "*probably active*" fault trace more than 30 km to the north of the village Petoussi in Epirus. (c) On the other hand, the real Petoussi–Souli Fault (e.g., [169]), which indeed crosses the above-mentioned village, is referred to as "*Pertouli-Souli*" (#146). Instead, Pertouli is a well-known village in Western Thessaly ca. 74 km to the east. (d) The closest tip of the "*Almyros*" (#257) individual fault is 25 km west of the Almyros town and in any case outside the whole Almyros Basin ([19,170]). (e) The "*Kastri*" (#190) individual fault in eastern Thessaly, which instead is referred to

as the Larissa Fault in the literature ([171]). (f) While the Rodia Fault is a well-defined, mainly (W)NW-(E)SE trending, tectonic structure bounding the Tyrnavos Basin to the north (e.g., [19]) and mapped in detail ([129]), the name of the "*Rodia*" (#161) individual fault is instead applied by B25 to a 90° angular fault trending NW–SE in the western sector and turning eastwards in a NE–SW oriented trace.

According to B25, the "*Stumica-Komotini-Nea Santa*" is a ca. 165 km-long fault system basically composed of the "*Komotini-Nea Santa*" (#16) individual fault, which in turn is 161.5 km-long. This set of lineaments is paradigmatic of the inappropriate naming issue. In particular, (a) the 'major' Nea Santa village is located more than 60 km away from any of the traced lineament; (b) the fault trace closest to the Komotini town is at 20+ km distance; while (c) "*Stumica*" (the name is 'Strumica' town in the Republic of Northern Macedonia) is located almost 50 km from the western tip of the mapped lineament.

Using inappropriate names for labelling tectonic structures is certainly not a simple formal matter, but it introduces unnecessary confusion in the literature that could last for decades.

3.3. Non-Existent Faults

As mentioned above, an individual fault ("*Rodia*", #161) has been traced with a NE–SW direction for more than 47 km all along the Tempi Valley, continuing across the deltaic plain of the Pinios River up to the mouth of the river. B25 consider this lineament as an "*active fault*" due to the "*depositional control*", but neither the intramountain sector (which follows for several kilometers the Tembi Valley, a gorge deeply entrenched in the Mesozoic bedrock) nor the part traced within the flat Holocene fluvial-deltaic plain shows any sort of dislocation or control on the Quaternary sediments ([172]).

Moreover, all four traces drawn across the south shore of Hydra Island (NE Peloponnese) are offsetting Permian rocks, and especially they have been defined by B25 as north-dipping, that is to say antithetic with the topographic slope.

On Ikaria Island, the so-called "*Kampos*" (#801) individual fault is an intrusive contact and not a tectonic one ([173]).

Considering the critical issue previously discussed in Section 2.6, the list of non-existent faults or at least not active faults, which are instead included in the AFG database, is probably much longer.

3.4. Possibility of Including Inactive Faults

As discussed above, based on decades of scientific research within the Aegean Region, 2.6 Ma-old geomorphic features (i.e., "*scarps in Quaternary sediments*") do not necessarily represent "*active faults*" in Greece. A similar conclusion is also reached when considering "*facets in bedrock spurs*". Maybe even less scientifically supported is the definition of "*probably active faults*" as those "*fault traces that do not displace young sediments, do not meet the above criteria or whose extent is limited to land underlain by bedrock*". If these data were used for SHA analyses, this category of faults, accounting for over 40% of the AFG database, would have a significant impact. Possibly, except for a few "*historical*" (51) and "*uncertain*" (65) faults, the entire classification is meaningless, also due to the lack in B25 of any discussion and/or any reference to the slip-rate of each mapped structure.

An additional criticism to this point arises from the intrinsically imprecise approach followed by B25 in constructing the database; indeed, although they declare to have "*no intention to include inactive faults in the AFG, it remains possible that the dataset contains some of these older faults*". This statement suggests that inactive faults are included in the published database, and perhaps in the future, their removal from the database will be performed gradually. However, it would be critical that, in the meantime, someone could, in principle,

use this dataset for SHA analyses. Certainly, mistakes can happen, but the correct scientific approach to creating such efforts of repositories moves in the opposite direction, gradually incorporating only thoroughly verified data.

3.5. Internal Inconsistencies

Although implicitly, and only in Section 2, B25 declare that "*fault ruptures during large-magnitude (>M6) earthquakes often, however, propagate to the ground-surface and displace topography* [...]. *It is these fault traces that comprise the core of the AFG in onshore Greece*". A major inconsistency is then, how is it possible in most sectors of the Aegean Region (which are affected by an extensional tectonic regime) that earthquakes with a magnitude greater than six (as they declare) could be hosted on and produce "*fault traces*" as short as 0.5–1 km, like many features included in the AFG database? Indeed, all available empirical relationships between magnitude and surface rupture length for normal faulting worldwide (e.g., [108,109,174]; among others) and specifically those obtained for the Aegean Region ([41]) clearly suggest that coseismic rupture lengths at the surface for such strong earthquakes (M > 6) would be broadly/nearly in the range 10–15 km, which would automatically exclude 82–91% of the "*fault traces*" included in AFG, but also the 27–42% of the coalesced "*individual faults*".

In our opinion, this represents a major internal inconsistency in the AFG dataset, especially between the declared scope of mapping fault traces generated by events with M > 6, on one hand, and the features really mapped and included in the database, on the other hand.

3.6. Problematic Fault Dimensions and Kinematic Uncertainty

Empirical relationships between length and width for normal faults are typically in the range 1.5–2.0 (e.g., [174]). This range of values is similar to slightly smaller for strike–slip faults up to ca. 40 km in length, but the aspect ratio (L vs. W) is potentially larger for longer faults ([174]). In terms of kinematics (rake), the AFG database includes only three strike-slip individual faults longer than 40 km (four faults if we consider also the "*Movri*" #453). In reality, none of these structures ("*Katouna–Amvrakikos*", #241; "*Strymon*", #37; "*Pertouli–Souli*", #146) is a purely strike–slip fault, as far as structural, seismological and geodetic data indicate important dip-slip components of motion ([99,175–180]). For example, the only field data along the so-called "*Pertouli–Souli*" individual fault also documents a clear dip-slip kinematic component ([181]).

On the other hand, based on thermo-rheological modelling, the brittle–ductile transition (BDT) has been reconstructed for the broader Aegean Region ([100,101] *cum bibl.*) and its laterally variable depth was well constrained by seismological data ([182] and references therein). Analysing this 3D surface (Figure 8; [100]) in correspondence to the onshore areas investigated by B25, the depth of the modelled BDT ranges between 8–10 km along the border with Bulgaria and 17–19 km in western Macedonia (where it is locally up to ca. 20 km), northern Thessaly, Central Greece and Crete (locally increasing eastwards up to ca. 22 km).

Considering that 95% of the events and 99% of the seismic energy is released above the BDT ([182]) and applying the above-mentioned aspect ratio for normal faults (1.5–2.0), the results of the 3D thermo-rheological modelling of the broader Aegean Region ([100,101]) allow the constraining of the maximum rupture dimension of the seismogenic sources in continental and insular Greece assuming as a worst-case scenario a seismic rupture crossing the entire schizosphere (i.e., from the BDT up to the topographic surface). We performed this exercise for all (major) individual faults included in the AFG database, making clear that for all the structures longer than 30–40 km (depending on the assumed

aspect ratio), assuming a coseismic rupture all along the length reported in the database is strongly unlikely, necessarily implying fault segmentation characterized by hard segment boundaries. In this regard, a map with the "*individual faults*" longer than 30 (pink lines) and 50 km (red lines) has been extracted from the database (Figure 9).

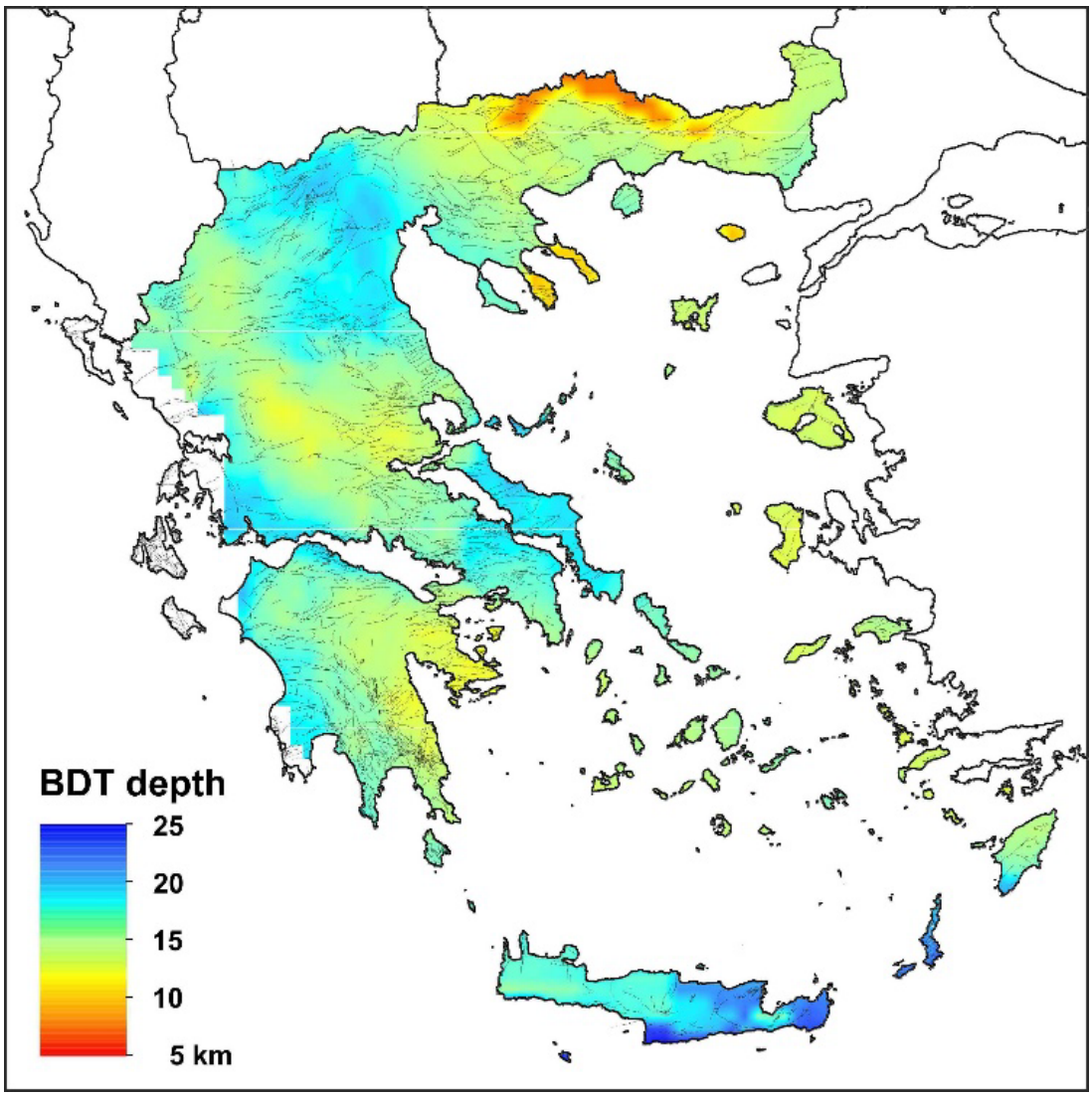


Figure 8. Depth of the brittle-ductile transition zone extracted from [101] showing that the thickness of the schizosphere mainly ranges between 10 and 20 km, with local peaks up to ca. 22 km, therefore impeding very long co-seismic ruptures, say greater than 35–40 km.

Alternatively, the rheological constrain and the straightforward consequences likely dictate the need to systematically revise this parameter (i.e., length) in the AFG database, especially given that "individual faults" are the result of a subjective "*upscaling procedure*" performed by B25 as discussed in a previous Section. In any case, most values attributed to this parameter could not be of direct use for SHA analyses. Examples of unrealistically long "*individual faults*" are listed in Table 1 together with the estimated magnitude calculated from empirical relations ([108,109]). For comparison, the maximum credible magnitude of the corresponding or nearby seismogenic sources in GreDaSS [2] and the historical events recorded within a buffer zone of 20 km from the AFG lineaments are also reported.

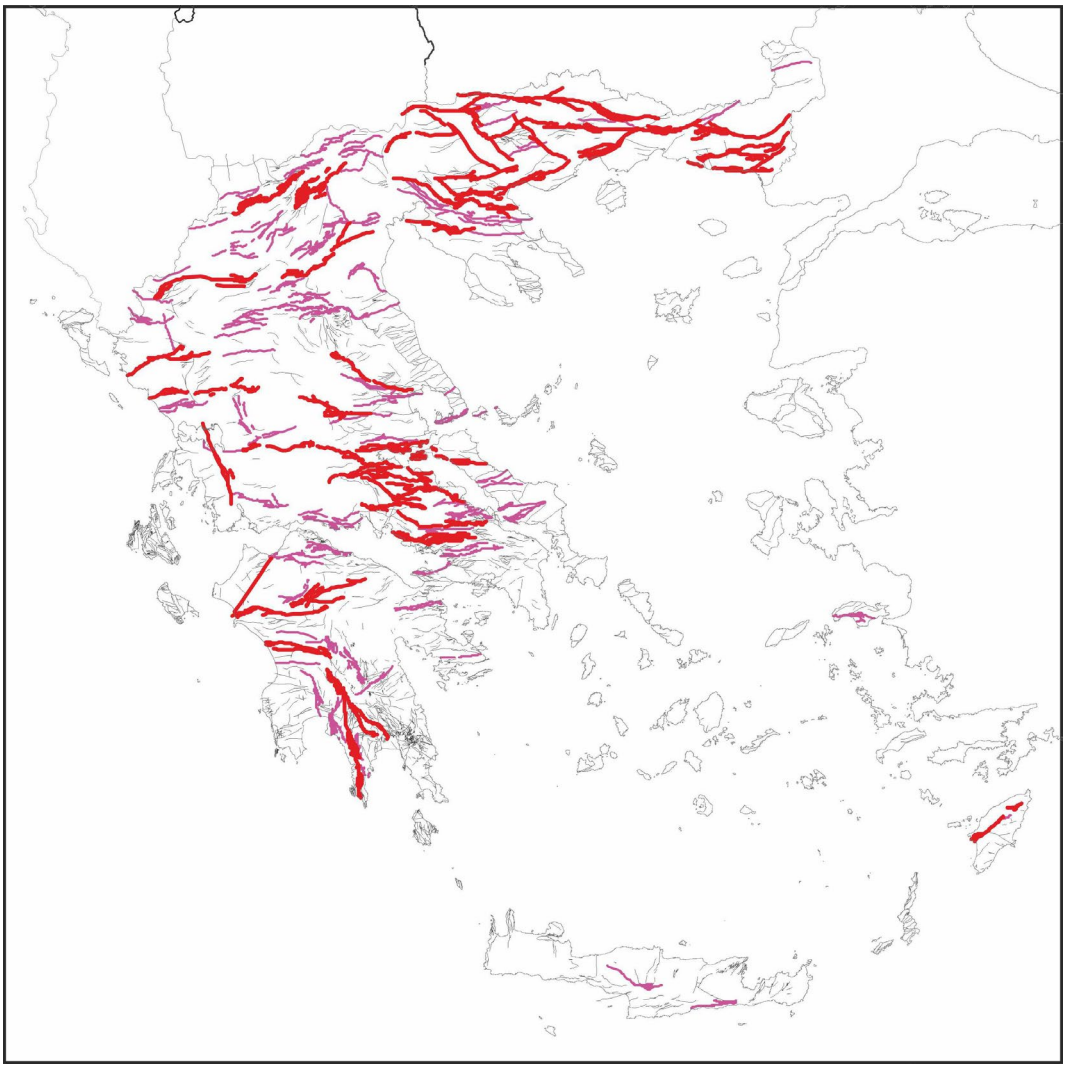


Figure 9. The "individual faults" included in the AFG database which are longer than 50 (thick red lines) and 30 (thin pink lines) km.

3.7. Problematic Fault Magnitudes

Limited to the continental areas investigated by B25, the instrumentally recorded magnitudes provided by any national or international network (see for example any of the seismic catalogues provided by NOA, AUTH or EMSC) are systematically lower than or at most equal to M7, and this threshold was likely never exceeded, even if we take into account the entire historical record back to Classical times ([22,40,102–104,183–186]). As shown above, the 3D thermo-rheological modelling results ([101]) and the commonly accepted aspect ratios ([174,187]) noticeably constrain the possible maximum dimensions of fault ruptures. Applying these geometric constraints (rupture area or reasonably reduced length) and using well-known empirical relationships (e.g., [41,108,109]), it is thus possible to estimate the associated maximum credible magnitudes, which indeed are systematically in perfect agreement with the recorded seismicity (i.e., $\leq$M7).

Remarkably, within the AFG database, a significant number of "*individual faults*" and "*fault systems*" attain lengths largely exceeding the above-mentioned ca. 30–40 km. Following the hypotheses of B25 that these long tectonic structures are entirely active and potentially seismogenic (i.e., they could rupture for the entire reported length), the associated magnitudes calculated based on empirical relationships (e.g., [41,108,109]) could reach values greater than M7.5 and possibly up to M8.

Accordingly, assuming the calculated magnitudes for the "*individual faults*" longer than 50 km (Figure 9) and taking into account commonly applied European GMPEs (e.g., [188,189]), it is also possible to estimate the induced PGA values for a soil type A (i.e., bedrock) as a function of distance from the source. Without entering the details of the calculations, which are beyond the goals of the present note, the PGA induced by such earthquakes would be lower than 1 g only at distances greater than 22–48 km from the faults (for events respectively in the magnitude range 7.0–8.0; Figure 10). Please note that in the calculations we assumed the stiffest soil type (A), while amplification effects would certainly occur for the other soil types, therefore worsening the overall distribution of the expected acceleration (PGA). As clearly observed in Figure 10, the results based on the length of the "*individual faults*" reported in the AFG database provide a shocking picture, suggesting that almost nowhere in Greece would there be suitable building conditions unless a very binding anti-seismic design is imposed.

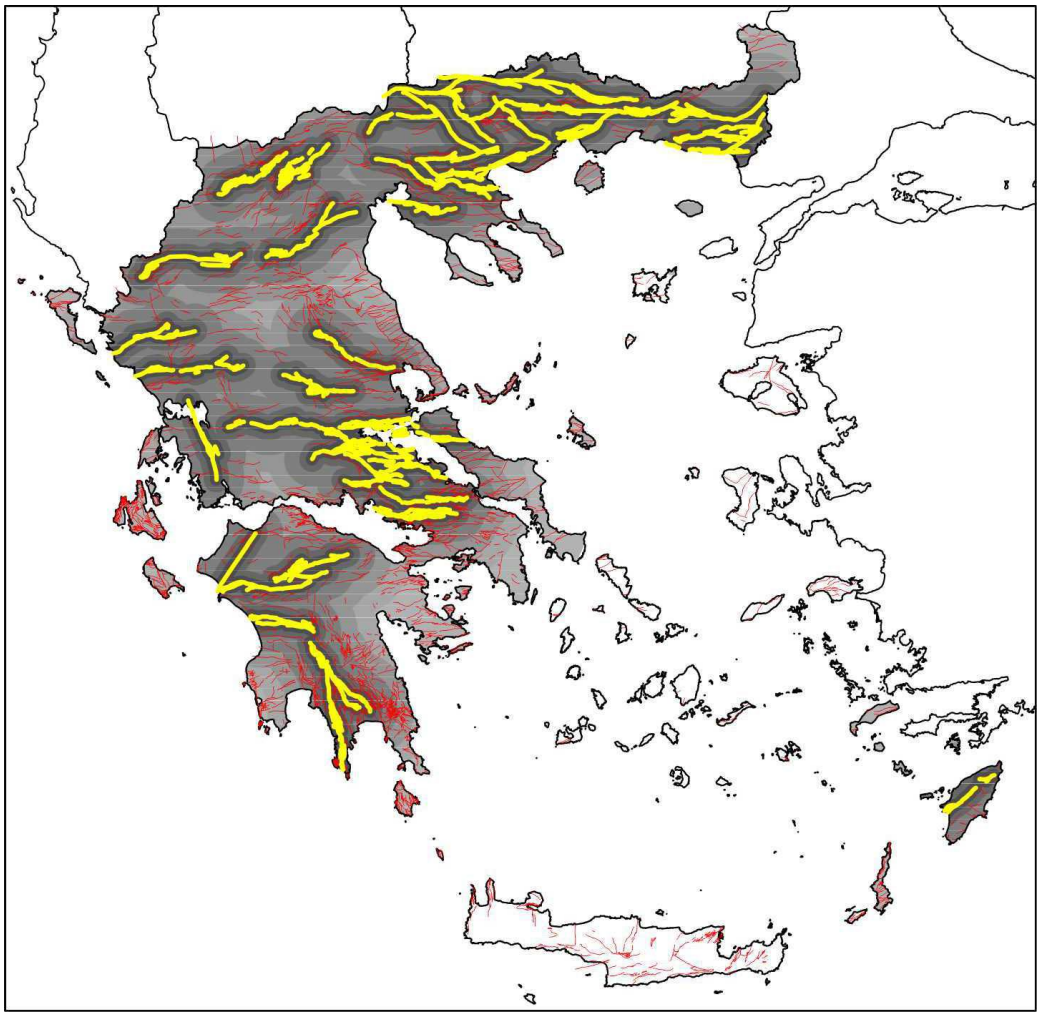


Figure 10. Calculated maximum PGA values assuming the reactivation of the "*individual faults*" longer than 50 km (thick yellow lines) included in the AFG database, potentially releasing magnitudes between M7 and M8. Red lines represent fault traces shorter than 50 km. Gray areas indicate calculated PGA values > 1 g (the darker the color, the higher the acceleration) in soil type A. PGAs have been calculated on the basis of GMPEs (e.g., [189]) and the magnitudes estimated from empirical relationships ([41,108,109]) associated with the fault lengths proposed by B25.

Considering that such catastrophic events were never recorded for the Aegean Region as documented by a huge literature, the above assumptions of B25 (i.e., potentially

seismogenic "*individual faults*" longer than 30–50 km) should be taken as a null, not verified, hypothesis, and consequently most of the AFG database should be considered as not verified. In summary, these crude length values provided in the attribute table of the AFG database have poor scientific meaning and are certainly of no practical use for SHA purposes.

4. Ethical Issues in the Attribute Table

4.1. Original Authorships

We have some concerns about the correct acknowledgement of the previous and original authorships. Indeed, though B25 declare that "*central to this active-fault compilation was to redraft all previously described faults*" and that AFG "*includes all previously known active faults with appropriate referencing*", when carefully examining the pop-up windows containing the attribute tables associated with numerous faults, it becomes evident that the aforementioned declarations are misleading. We also found a very long list of missing or incorrect references; however, based on many decades of research activity on active tectonics, earthquake geology, seismotectonics, palaeoseismology, morphotectonics, remote sensing, etc., and specifically of the Aegean Region, we recall just a few examples in the following.

Collectively, we could not find any reference to the official geological maps of Greece produced by the Greek Geological Survey (IGME). Although some of the published sheets (mainly at the 1:50,000 scale) could be relatively old, many are instead recent and represent excellent cartographic products. Moreover, none of the AFG fault traces included in the Chalkida area (central Greece) refer to the corresponding Neotectonic Map of Greece, Chalkida Sheet ([190]). Also, we could not find references to the official neotectonic maps produced by the Greek Earthquakes and Earthquake Planning and Protection Organization (EPPO) for those traces coincident with the Filiatra Sheet ([191]), or the Gytheio Sheet ([192]), or the Korinthos Sheet ([193]), the Rhodos Sheet ([194]), and again the Langadhas Sheet ([195]). In contrast, for the vast majority of traces included in AFG, the sole citation provided is "*Begg* et al., *2025*" [1], thereby creating the misleading impression that these fault traces were identified and mapped for the first time by this research group.

A similar omission of literature appears with faults in Kerkyra (Corfu), where some major E-W trending faults are attributed again and solely to "*Begg* et al., *2025*" [1], while they are known since the 1960s ([196]) and the 1980s ([88]), etc.

4.2. About the "Relevant Publication" Statement

At this regard and notwithstanding the fact that they declare in the attributes definitions that the listed literature is reported as "*relevant publications*", it is quite curious that for 3813 out of the 3814 fault traces included in the database (corresponding to the 99.95% of the entire dataset) they claim themselves an authorship or at least a co-authorship, while for up to the 50% (1897 out of 3814) of the traced graphical elements the very only reference listed in the "*relevant publications*" attribute is "*Begg* et al., *2025*" [1]. This may suggest that our seismotectonic knowledge of Greece has been "tremendously" improved after the AFG database publication. However, even in cases where they introduced only minor changes across many fault traces, these numbers and percentages strongly suggest a systematic reliance on self-citation and a consistent lack of proper attribution to earlier publications and original contributions by other researchers. As members of the scientific community, having contributed for decades and with dozens of papers collecting numerous citations, we consider this an ethical issue of concern.

4.3. Misuse of Literature Data

Another paradoxical issue is represented by the misuse of the scientific literature. An example is the "*Karla–Killeler*" (a misspelling of the 'Kileler' village) fault system (#174 and #181; Figure 5), which is shown as active, while in the original work of [19] (listed in the attribute table of the database), it is clearly stated that these tectonic structures are now inactive.

As concerns the "*Stumica–Komotini–Nea Santa*" fault system, the fault traces 3704, 3406, 3405, 2741, 2703 coalesced to form the "*Komotini–Nea Santa*" (#16) individual fault, in the attribute table of the AFG database, refer to "*Basili et al., 2013*" [82], the paper associated with the EDSF13 database (https://edsf13.ingv.it/SHARE_WP3.2_Database.html) accessed on 15 June 2026. However, if someone searches this database, none of these fault segments exist.

Similarly, both the almost 30 km-long fault trace #763 attributed to the "*Agios Isidoros*" individual fault in Rhodes Island, and the "*Achaia*" (#631) individual fault in NW Peloponnese, report in the attribute table the references of "*Basili et al. (2013)*" [82]. Nevertheless, none of these structures exists in the public EDSF13 database. A more systematic check may discover many more examples of literature misuse.

Other similar examples are from Boeotia, where the fault trace #3208 is attributed to "*Tsodoulos et al. (2008)*" [197], though in no figure of the original paper is such a fault drawn, nor is it recalled in the text. Or from the epicentral area of the 1894 Atalanti earthquake, where B25 refer to "*Cundy et al. (2000)*" [198] for supporting their >12 km-long fault trace #1371 belonging to the "*Atalanti*" (#291) individual fault, though in Figure 2 of the original paper (the only picture with a reasonable scale for the purpose), only a small segment, less than 1 km-long, is drawn. Or the fault trace #3812 belonging to the "*Klenia–Dervenakia*" (#368) individual fault, which is even outside any map included in the original paper by "*Ghisetti and Vezzari (2005)*" [note: should instead read Ghisetti and Vezzani ([199])] listed in the reference literature by B25. Or the fault traces #3120 and #2447 both belonging to the "*Pamisos*" (#471) individual fault, which B25 has drawn as E-dipping, while in both citations listed in the attribute table of the AFG database (e.g., [35,200]) the corresponding tectonic structures clearly indicate a W-dipping setting. Or the "*Kougeika*" (#449) individual fault referring to "*Basili et al. (2013)*" [82], but not existing in the corresponding EDSF13. Or, as previously mentioned, the fault traces #260 and #2102 both belong to the "*Kalamata*" (#515) individual fault, which clearly refers to "*Lyon-Caen et al., 1988*" [159] though in the original paper, all represented faults dip towards the West (and not to the East as in B25). Or the "*Aigiali*" (#788) individual fault in Amorgos Island, which is drawn in B25 as S-dipping, while in the original paper ([201]), the symbol of the barbs is on the northern side. Or the case of the "*Leontion*" (#437) and "*Demestiha*" (#438) individual faults in NW Peloponnese, for which the paper of [140] is referred to in the attribute table, though the original research in reality focuses on the Psathopyrgos Fault 20–25 km away. In addition, the fact that the traced lineaments that do exist in an introductory map of [140] cross an area characterized by low hypsometric integral values, thus suggesting their inactivity. Or the "*Petri*" (#421) individual fault in central Peloponnese, which has been drawn for 28.8 km as an active S-dipping structure in the AFG database, while in the original paper of [151], the fault has a length of ca. 7 km and it is N-dipping (also it has been labelled by the Authors as 'Galatas Fault', unexplicably modified by B25). Or the nearby "*Feneos*" (#426) individual fault, which has been mapped by [151] as an N-dipping 'low-angle normal fault,' becoming, for about 30 km (trace lineament #2421), a S-dipping fault. The AFG database contains numerous additional examples of similar inconsistencies, which are not reported here in order to avoid overburdening the discussion.

5. Discussion and Conclusions

In this article, we focused our discussion and commentary on the AFG database, highlighting various pitfalls, drawbacks, errors, and uncertainties. We are confident that the Scientific Community could independently make similar observations to ours.

Moreover, in terms of societal impact, the most critical issue is the fact that the AFG database and the B25 article have been popularized on news websites, newspapers, and social media right after the paper was published online. Sharing scientific findings with the public is, in general, a good practice because it connects geological research with ordinary people, helping them learn, understand, trust, and think critically about science. In these press releases and social media posts, the database is presented as "the result of a cohesive new methodology" (https://www.ekathimerini.com/news/environment/1288318/hidden-quake-faults-mapped/; last accessed 1 June 2026) or as "Greece Publishes First Complete Seismic Map of Active Faults" (https://greekreporter.com/2025/11/29/greece-complete-seismic-map-active-faults/, accessed on 15 June 2026). See also the Facebook posts in the Kefalonia press on 30 November 2025 (https://www.kefaloniapress.gr/topika/koinonika/article/822802/o-chartis-me-ta-energa-seismika-rigmata-stin/, accessed on 15 June 2026), at the Lakonikos.gr site on 20 December 2025, in Patrisnews.com on 2 January 2026, and other groups (https://www.facebook.com/groups/840068593841735/, accessed on 15 June 2026). In these communications, authors are reported to state that the AFG database will help stakeholders understand the complex way dense active fault lines work in Greece, allowing also for estimating credible earthquake magnitudes for the development of a national seismic hazard model.

However, as clearly documented in this article, the published AFG database has drawbacks, contains many shortcomings, and includes misleading information. Consequently, the stakeholders involved in construction or civil protection planning might take wrong decisions, and society could be living under a kind of "potential risks". Indeed, it is interesting to note that in every administrative region (Periferia) of Greece, the AFG database contains at least one "*individual fault*" or "*fault system*" largely exceeding 30–50 km, that is to say, capable of generating earthquakes greater than M7.

Beyond the low likelihood of occurrence of magnitudes greater than M7 on mainland Greece due to either the BDT depth and aspect ratio constraints as previously discussed, such magnitudes would make it increasingly expensive to build, over most of the Greek territory, because of impelling administrative rules and the need for ensuring compliance of constructions with consequently very strict safety, quality, and budgetary regulations. Therefore, the result of popularizing an insufficiently validated database of active faults exerts pressure on engineers, geologists and managers working in the construction industry and considered as end-users of the product, upsets the investors and society in general.

Active faults represent the source of strong and destructive earthquakes. Studies and investigations of active faults are necessary for anti-seismic protection and planning and for disaster prevention (e.g., [82,202,203]). During the last 15+ years, we have presented updated nation-scale databases of active faults in Greece and its adjacent regions, either represented as seismogenic sources and active fault traces (GReDaSS and NOAFAULTs). The information included in these repositories encompasses field mapping, geophysical profiles, measurements of offset horizons and landforms, 14C and cosmogenic isotope dating, as well as geometric and kinematic parameters of both exposed and blind faults, earthquake sequences and their characteristics, among other information [46]. These data have been acquired and analyzed utilizing uniform technical standard frameworks adopting the European FAIR policy. Both databases are accessible through a Web Geographic Information System (GIS) application, enabling browsing, querying, and downloading

functionalities via a web browser. Users can also incorporate map layers and obtain fault data in any OGC-compliant GIS software for further analysis through these services.

We emphasize the continuous need for open data policy and sharing good practices, and for constructing databases hosting multidisciplinary data that are verifiable by other community members and properly listing all data sources.

Author Contributions: Conceptualization, Methodology, Validation, Investigation, Writing—Original Draft Preparation, Review & Editing, R.C., I.K. and A.G. All authors have read and agreed to the published version of the manuscript.

Funding: We acknowledge numerous funding sources during the last ca. 30 years. In particular, the activities of the GreDaSS Working Group were mainly funded by the Italian Ministry of University and Research, the University of Basilicata, the University of Ferrara, the Istituto Nazionale di Geofisica e Vulcanologia, the Aristotle University of Thessaloniki as well as in the frame of international projects, like FAUST, SHARE, TAP, EPOS, etc. Similarly, NOAFAULTs was funded by the project "HELPOS-Hellenic Plate Observing System-MIS 5002697", the GSRT-funded project KRIPIS-ASPIDA "Infrastructure Upgrade for Seismic Protection of the Country and Strengthen Service Excellence through Action", the National industry-academia project 'Platform of multidimensional monitoring with micro sensors of Enceladus of Hellenic Supersite-PROION' (grant number: MIS-5070928) and the HORIZON Geo-Inquire project (EU-project number 101058518).

Data Availability Statement: The data analyzed and discussed in the present note are those provided by Begg et al. (2025) [1], which have been declared by the authors to be freely available at https://doi.org/10.5880/fidgeo.2025.047 under a Creative Commons Licence in ESRI shapefile, kml and Excel formats.

Acknowledgments: We acknowledge discussions with members of the Seismotectonics Committee of Greece and, over the last few decades, the continuous scientific exchanges with many colleagues of the European community working on seismogenic sources and active faults of the broader Aegean Region. We also want to express our gratitude to all the students and colleagues of the GreDaSS Working Group and NOAFAULTS Working Group for their efforts in the construction and population of the databases.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Begg, J.G.; Mouslopoulou, V.; Heron, D.; Nicol, A. AFG-Active Faults Greece: A comprehensive geomorphology based 1:25,000 fault database. *Sci. Data* **2025**, *12*, 1853. [CrossRef]
2. GreDaSS Working Group. The Greek Database of Seismogenic Sources (GreDaSS), Version 3.0.0: A Compilation of Potential Seismogenic Sources (Mw > 5.5) in the Broader Aegean Region. 2025. Available online: https://gredass.unife.it (accessed on 16 June 2026). [CrossRef]
3. Ganas, A. 2025. Available online: https://zenodo.org/records/16728922 (accessed on 15 June 2026).
4. Schmidt, J. *Monographien von Orient Erdbeben 1837–1873*; Alwin Georgi: Leipzig, Germany, 1879; pp. 34–136.
5. Skouphos, T. Die zwei grossen Erdbeben in Lokris am 8/20 und 15/27 April 1894. *Z. Ges. Erdkd. Zu Berl.* **1894**, *29*, 1–409.
6. Maravellakis, M.I. Contribution to the knowledge of the history of the earthquakes of Greece and neighbouring countries from recollection. In *Epistimoniki Epetiris*; Faculty of Sciences, Aristotle University of Thessaloniki: Thessaloniki, Greece, 1939; Volume 5, pp. 69–148.
7. Papazachos, B.C.; Delibasis, N.D. Tectonic stress field and seismic faulting in the area of Greece. *Tectonophysics* **1969**, *7*, 231–255. [CrossRef]
8. McKenzie, D. Active tectonics of the Alpine-Himalayan belt: The Aegean Sea and surrounding regions. *Geophys. J. Int.* **1978**, *55*, 217–254. [CrossRef]
9. Delibassis, N.; Drakopoulos, J.; Fytrolakis, N.; Katsikatsos, G.; Makropoulos, K.; Zamani, A. Seismotectonic investigation of Crete Island and the adjacent areas. In *Symposium on the Hellenic arc and the Trench (HEAT)*; National Technical University of Athens: Athens, Greece, 1982; Volume 1.

10. Mercier, J.-L.; Carey-Gailhardis, E.; Mouyaris, K.; Simeakis, K.; Roundoyannis, T.; Anghelidis, C. Structural analysis of recent and active faults and regional state of stress in the epicentral area of the 1978 Thessaloniki earthquakes (Northern Greece). *Tectonics* **1983**, *2*, 577–600. [CrossRef]
11. Pavlides, S.B.; Mountrakis, D.M. Extensional tectonics of northwestern Macedonia, Greece, since the late Miocene. *J. Struct. Geol.* **1987**, *9*, 385–392. [CrossRef]
12. Mariolakos, I.; Fountoulis, I.; Logos, E.; Lozios, S. Surface faulting caused by the Kalamata (Greece) earthquakes (13.9.86). *Tectonophysics* **1989**, *163*, 197–203. [CrossRef]
13. Ambraseys, N.N.; Jackson, J.A. Seismicity and associated strain of central Greece between 1890 and 1988. *Geophys. J. Int.* **1990**, *101*, 663–708. [CrossRef]
14. Roberts, S.; Jackson, J. *Active Normal Faulting in Central Greece: An Overview*; Roberts, A.M., Yielding, G., Freeman, B., Eds.; Special Publication; Geological Society of London: London, UK, 1991; Volume 56, pp. 125–142.
15. Taymaz, T.; Jackson, J.; McKenzie, D.P. Active tectonics of the north and central Aegean Sea. *Geophys. J. Int.* **1991**, *106*, 433–490. [CrossRef]
16. Armijo, R.; Lyon-Caen, H.; Papanastassiou, D. A possible normal-fault rupture for the 464 BC Sparta earthquake. *Nature* **1991**, *351*, 137–139. [CrossRef]
17. Armijo, R.; Lyon-Caen, H.; Papanastassiou, D. East-west extension and Holocene normal-faults scarps in the Hellenic arc. *Geology* **1992**, *20*, 491–494. [CrossRef]
18. Doutsos, T.; Poulimenos, G. Geometry and kinematics of active faults and their seismotectonic significance in the western Corinth-Patras rift (Greece). *J. Struct. Geol.* **1992**, *14*, 689–699. [CrossRef]
19. Caputo, R.; Pavlides, S. Late Cainozoic geodynamic evolution of Thessaly and surroundings (Central-Northern Greece). *Tectonophysics* **1993**, *223*, 339–362. [CrossRef]
20. Jackson, J. Active tectonics of the Aegean region. *Annu. Rev. Earth Planet. Sci.* **1994**, *22*, 239–271. [CrossRef]
21. Roberts, G.P.; Ganas, A. Fault-slip directions in central and southern Greece measured from striated and corrugated fault planes' Comparison with focal mechanism and geodetic data. *J. Geophys. Res.* **2000**, *105*, 443–562. [CrossRef]
22. Papazachos, B.; Papazachou, C. *The Earthquakes of Greece*, 3rd ed.; Editions ZITI: Thessaloniki, Greece, 2003; 288p.
23. Ganas, A.; Pavlides, S.B.; Valkaniotis, S.; Sboras, S.; Papaioannou, S.; Alexandris, G.A.; Plessa, A.; Papadopoulos, G.A. Active fault geometry and kinematics in Parnitha Mountain, Attica, Greece. *J. Struct. Geol.* **2004**, *26*, 2103–2118. [CrossRef]
24. Ganas, A.; Serpelloni, E.; Drakatos, G.; Kolligri, M.; Adamis, I.; Tsimi, C.; Batsi, E. The Mw 6.4 SW-Achaia (Western Greece) earthquake of 8 June 2008: Seismological, field, GPS observations, and stress modeling. *J. Earthq. Eng.* **2009**, *13*, 1101–1124. [CrossRef]
25. Ganas, A.; Valkaniotis, S.; Briole, P.; Serpetsidaki, A.; Kapetanidis, V.; Karasante, I.; Kassaras, I.; Papathanassiou, G.; Karamitros, I.; Tsironi, V.; et al. Domino-style earthquakes along blind normal faults in Northern Thessaly (Greece): Kinematic evidence from field observations, seismology, SAR iInterferometry and GNSS. *Bull. Geol. Soc. Greece* **2021**, *58*, 37–86. [CrossRef]
26. Kiratzi, A. Stress tensor inversions along the westernmost North Anatolian Fault Zone and its continuation into the North Aegean Sea. *Geophys. J. Int.* **2002**, *151*, 360–376. [CrossRef]
27. Goldsworthy, M.; Jackson, J.; Haines, J. The continuity of active fault systems in Greece. *Geophys. J. Int.* **2002**, *148*, 596–618. [CrossRef]
28. Kouskouna, V.; Makropoulos, K.C. Historical earthquake investigations in Greece. *Ann. Geophys.* **2004**, *47*, 723–731. [CrossRef]
29. Caputo, R.; Catalano, S.; Monaco, C.; Romagnoli, G.; Tortorici, G.; Tortorici, L. Active faulting on the island of Crete (Greece). *Geophys. J. Int.* **2010**, *183*, 111–126. [CrossRef]
30. Koukouvelas, I.K.; Nikolakopoulos, K.G.; Kyriou, A.; Caputo, R.; Belesis, A.; Zygouri, V.; Verroios, S.; Apostolopoulos, D.; Tsentzos, I. The March 2021 Damasi earthquake sequence, Central Greece: Reactivation evidence across the westward propagating Tyrnavos Graben. *Geosciences* **2021**, *11*, 328. [CrossRef]
31. Koukouvelas, I.; Caputo, R.; Nikolakopoulos, K.; Kyriou, A.; Famiglietti, N.A. Is the Mesochori Fault a key structure for understanding the earthquake activity during the 2021 Damasi earthquake in the northern Thessaly, Greece? *Geosciences* **2023**, *13*, 331. [CrossRef]
32. Kokkalas, S.; Xypolias, P.; Koukouvelas, I.; Doutsos, T. Postcollisional contractional and extensional deformation in the Aegean region. In *Postcollisional Tectonics and Magmatism in the Mediterranean Region and Asia*; Dilek, Y., Pavlides, S., Eds.; Special Paper; Geological Society of America: Boulder, CO, USA, 2006; Volume 409, pp. 97–123. [CrossRef]
33. Kiratzi, A.; Dimakis, E. Focal mechanisms and slip models of moderate size earthquakes in Albania and adjacent countries. *Ital. J. Geosci.* **2013**, *132*, 186–193. [CrossRef]
34. Triantafyllou, I.; Karavias, A.; Koukouvelas, I.; Papadopoulos, G.A.; Parcharidis, I. The Crete Isl. (Greece) Mw6.0 Earthquake of 27 September 2021: Expecting the unexpected. *GeoHazards* **2022**, *3*, 106–124. [CrossRef]

35. Zygouri, V.; Koukouvelas, I.; Ganas, A.; Tsimi, C. Clustering of earthquakes along the Pidima-Anthia normal fault: New data from palaeoseismology and tectonic geomorphology and their significance on the earthquake's regularity and recurrence across southern Greece. *J. Struct. Geol.* **2023**, *176*, 104974. [CrossRef]
36. Katsonopoulou, D.; Koukouvelas, I. Earthquake Environmental Effects: The Case of Late Classical-Hellenistic Helike, Gulf of Corinth, Greece. *Geosciences* **2024**, *14*, 311. [CrossRef]
37. Katsonopoulou, D.; Koukouvelas, I.; Kormann, M. Earthquake Destruction and Resilience in Ancient Helike, Gulf of Corinth, Greece: A Case Study of Past Human–Environment Relationship. *Land* **2025**, *14*, 1392. [CrossRef]
38. Kouskouna, V.; Ganas, A.; Kleanthi, M.; Kassaras, I.; Sakellariou, N.; Sakkas, G.; Valkaniotis, S.; Manousou, E.; Bozionelos, G.; Tsironi, V.; et al. Evaluation of macroseismic intensity, strong ground motion pattern and fault model of the 19 July 2019 Mw5.1 earthquake west of Athens. *J. Seismol.* **2021**, *25*, 747–769. [CrossRef]
39. Sarhosis, V.; Giarlelis, C.; Karakostas, C.; Smyrou, E.; Bal, I.E.; Valkaniotis, S.; Ganas, A. Observations from the March 2021 Thessaly Earthquakes: An earthquake engineering perspective for masonry structures. *Bull. Earthq. Eng.* **2022**, *20*, 5483–5515. [CrossRef]
40. Papadopoulos, G.A. *Historical Earthquakes and Tsunamis in the Corinth Rift, Central Greece*; National Observatory of Athens: Athens, Greece, 2000; pp. 1–128.
41. Pavlides, S.B.; Caputo, R. Magnitude versus faults' surface parameters: Quantitative relationships from the Aegean. *Tectonophysics* **2004**, *380*, 159–188. [CrossRef]
42. Papathanassiou, G.; Valkaniotis, S.; Ganas, A.; Grendas, N.; Kollia, E. The November 17th, 2015 Lefkada (Greece) strike-slip earthquake: Field mapping of generated failures and assessment of macroseismic intensity ESI-07. *Eng. Geol.* **2017**, *220*, 13–30. [CrossRef]
43. Papathanassiou, G.; Valkaniotis, S.; Ganas, A.; Stampolidis, A.; Rapti, D.; Caputo, R. Floodplain evolution and its influence on liquefaction clustering: The case study of March 2021 Thessaly, Greece, seismic sequence. *Eng. Geol.* **2022**, *298*, 106542. [CrossRef]
44. Ganas, A.; Elias, P.; Briole, P.; Valkaniotis, S.; Escartin, J.; Tsironi, V.; Karasante, I.; Kosma, C. Co-seismic and post-seismic deformation, field observations and fault model of the 30 October 2020 Mw = 7.0 Samos earthquake, Aegean Sea. *Acta Geophys.* **2021**, *69*, 999–1024. [CrossRef]
45. Papazachos, B.C.; Papaioannou, C.A.; Papazachos, C.B.; Savvaidis, A.S. Rupture zones in the Aegean region. *Tectonophysics* **1999**, *308*, 205–221. [CrossRef]
46. Caputo, R.; Sboras, S.; Pavlides, S.; Chatzipetros, A. Comparison between single-event effects and cumulative effects for the purpose of seismic hazard assessment. A review from Greece. *Earth-Sci. Rev.* **2015**, *148*, 94–120. [CrossRef]
47. Pavlides, S.B.; Zouros, N.C.; Chatzipetros, A.A.; Kostopoulos, D.S.; Mountrakis, D.M. The 13 May 1995 western Macedonia, Greece (Kozani Grevena) earthquake; preliminary results. *Terra Nova* **1995**, *7*, 544–549. [CrossRef]
48. Meyer, B.; Armijo, R.; De Chabalier, J.; Delacourt, C.; Ruegg, J.; Acache, J.; Brioke, P.; Papanastassiou, D. The 1995 Grevena (Northern Greece) earthquake: Fault model constrained with tectonic observations and SAR interferometry. *Geophys. Res. Lett.* **1996**, *23*, 2677–2680. [CrossRef]
49. Meyer, B.; Armijo, R.; Massonnet, D.; de Chabalier, J.B.; Delacourt, C.; Ruegg, J.C.; Achache, J.; Papanastassiou, D. Results from combining tectonic observations and SAR interferometry for the 1995 Grevena earthquake: A summary. *J. Geodyn.* **1998**, *26*, 255–259. [CrossRef]
50. Meyer, B.; Armijo, R.; Massonnet, D.; de Chabalier, J.B.; Delacourt, C.; Ruegg, J.C.; Achache, J.; Papanastassiou, D. Comment on "Geodetic investigation of the 13 May Kozani-Grevena (Greece) earthquake" by Clarke et al. *Geophys. Res. Lett.* **1998**, *25*, 129–130.
51. Chiarabba, C.; Selvaggi, G. Structural central on fault geometry: Example of the Grevena Ms 6.6, normal faulting earthquake. *J. Geophys. Res.* **1997**, *102*, 22445–22457.
52. Clarke, P.J.; Paradisis, D.; Briole, P.; England, P.C.; Parson, B.E.; Billiris, H.; Veis, G.; Ruegg, J.-C. Geodetic investigation of the 13 May 1995 Kozani-Grevena (Greece) earthquake. *Geophys. Res. Letts.* **1997**, *24*, 707–710. [CrossRef]
53. Clarke, P.J.; Davies, R.R.; England, P.C.; Parsons, B.; Billiris, H.; Paradissis, D.; Veis, G.; Cross, P.A.; Denys, P.H.; Ashkenazi, V.; et al. Crustal strain in central Greece from repeated GPS measurements in the interval 1989-1997. *Geophys. J. Int.* **1998**, *135*, 195–214. [CrossRef]
54. Hatzfeld, D.; Karakostas, V.; Ziazia, M.; Selvaggi, G.; Leborgne, S.; Berge, C.; Guiguet, R.; Paul, A.; Voidomatis, P.; Diagourtas, D.; et al. The Kozani-Grevena (Greece) earthquake of 13 May 1995 revisited from a detailed seismological study. *Bull. Seism. Soc. Am.* **1997**, *87*, 463–473. [CrossRef]
55. Hatzfeld, D.; Karakostas, V.; Ziazia, M.; Selvaggi, G.; Lebogne, S.; Berge, C.; Makropoulos, K. The Kozani-Grevena (Greece) earthquake of May 13, 1995, a seismological study. *J. Geodyn.* **1998**, *26*, 245–254. [CrossRef]
56. Doutsos, T.; Koukouvelas, I. Fractal analysis of normal faults in northwestern Aegean area. *Greece. J. Geodyn.* **1998**, *26*, 197–216. [CrossRef]

57. Kontoes, C.; Elias, P.; Sykioti, O.; Briole, P.; Remy, D.; Sachpazi, M.; Veis, G.; Kotsis, I. Displacement field and fault modelling for the September 7, 1999 Athens earthquake inferred from Ers-2 Satellite Radar Interferometry. *Geophys. Res. Lett.* **2000**, *27*, 3989–3992.
58. Voulgaris, N.; Pirli, M.; Papadimitriou, P.; Kassaras, J.; Makropoulos, K. Seismotectonic characteristics of the area of western Attica derived from the study of the September 7, 1999 Athens earthquake aftershock sequence. *Bull. Geol. Soc. Greece* **2001**, *34*, 1645–1651. [CrossRef]
59. Foumelis, M.; Parcharidis, I.; Lagios, E.; Voulgaris, N. Evolution of post-seismic ground deformation of the Athens 1999 earthquake observed by SAR interferometry. *J. Appl. Geophys.* **2009**, *69*, 16–23. [CrossRef]
60. Mountrakis, D.; Tranos, M.; Papazachos, C.; Thomaidou, E.; Karagianni, E.; Vamvakaris, D. Neotectonic and seismological data concerning major active faults, and the stress regimes of Northern Greece. In *Tectonic Development of the Eastern Mediterranean Region*; Robertson, A.H.F., Mountrakis, D., Eds.; Special Publication; Geological Society of London: London, UK, 2006; Volume 260, pp. 649–670.
61. Pavlides, S.B.; Valkaniotis, S.; Chatzipetros, A. Seismically capable faults in Greece and their use in seismic hazard assessment. In Proceedings of the 4th International Conference on Earthquake Geotechnical Engineering, Thessaloniki, Greece, 25–28 June 2007; p. 1609.
62. Karakaisis, G.F.; Papazachos, C.B.; Scordilis, E.M. Seismic sources and main seismic faults in the Aegean and surrounding area. *Bull. Geol. Soc. Greece* **2010**, *43*, 2026–2042.
63. Mitsopoulos, K. *The great earthquake of Lokris of April 1894*; National Typography: Athens, Greece, 1895; pp. 1–40. (In Greek)
64. Floras, D. Damages and disasters of Chalkidiki earthquakes. *Tech. Chron.* **1933**, *25*, 21–28.
65. Maravelakis, M.I. Etude geologique et macroseismique des seismes de Larisa du 1 mars 1941. Epistimoniki Triakontapetiris A Krit. *Epistimonikes Pragmateiai* **1944**, *XVII*, 176–193. (In Greek with French abstract)
66. Galanopoulos, A.G. Die beiden schadenbringenden Beben von Larissa aus den Jahren 1892 und 1941. *Sonderdr. Gerlands Beitr. Geophys.* **1950**, *62*, 27–38.
67. Kreatsa, K.G. *The Earthquakes of Chois of May 21st and July 23 1949, Preliminary Report*; National Typography: Athens, Greece, 1952; pp. 329–340. (In Greek)
68. Georgalas, G.; Galanopoulos, A. Das grosse Erdbeben der Chalkidike vom 26 September 1932. *Bull. Geol. Soc. Greece* **1953**, *1*, 11–63.
69. Mucciarelli, M.; FAUST Working Group. Faults as a seismologists' tool: Current advancement of the EC project "FAU.S.T". In Proceedings of the XXVII General Assembly of the European Seismological Commission (ESC), Lisbon, Portugal, 10–15 September 2000; Lisbon University: Lisbon, Portugal, 2000; pp. 319–324.
70. Valensise, G.; Pantosti, D. (Eds.) Database of Italy's Seismogenic Sources, v. 1.0. INGV internal file distributed on CD-ROM. 2000. Available online: https://diss.ingv.it/data (accessed on 16 June 2026).
71. Valensise, G.; Pantosti, D. (Eds.) Database of Potential Sources for Earthquakes Larger than M 5.5 in Italy. *Ann. Geofis.* **2001**, *44*, 797–964.
72. Papazachos, B.C.; Mountrakis, D.M.; Papazachos, C.B.; Tranos, M.D.; Karakaisis, G.F.; Savvaidis, A.S. The faults which have caused the known major earthquakes in Greece and surrounding region between the 5th century BC and today. In Proceedings of the 2nd National Conference Anti-Seismic Engineering and Technical Seismology, Thessaloniki, Greece, 28–30 September 2001; Volume 1, pp. 17–26.
73. Pavlides, S.; Chatzipetros, A.; Valkaniotis, S. Active faults of Greece and surroundings. In Proceedings of the 33rd International Geological Congress, Oslo, Norway, 6–14 August 2008.
74. Caputo, R.; Pavlides, S. The Greek Database of Seismogenic Sources (GreDaSS), Version 2.0.0: A Compilation of Potential Seismogenic Sources (Mw > 5.5) in the Aegean Region. 2013. Available online: http://gredass.unife.it (accessed on 15 June 2026). [CrossRef]
75. Ganas, A.; Oikonomou, I.A.; Tsimi, C. NOAfaults: A digital database for active faults in Greece. *Bull. Geol. Soc. Greece* **2013**, *47*, 518–530. [CrossRef]
76. Briole, P.; Ganas, A.; Elias, P.; Dimitrov, D. The GPS velocity field of the Aegean. New observations, contribution of the earthquakes, crustal blocks model. *Geophys. J. Int.* **2021**, *226*, 468–492. [CrossRef]
77. Woessner, J.; Laurentiu, D.; Giardini, D.; Crowley, H.; Cotton, F.; Grünthal, G.; Valensise, G.; Arvidsson, R.; Basili, R.; Demircioglu, M.B.; et al. The 2013 European Seismic Hazard Model: Key components and results. *Bull. Earthq. Eng.* **2015**, *13*, 3553–3596. [CrossRef]
78. Danciu, L.; Giardini, D.; Weatherill, G.; Basili, R.; Nandan, S.; Rovida, A.; Beauval, C.; Bard, P.-Y.; Pagani, M.; Reyes, C.G.; et al. The 2020 European Seismic Hazard Model: Overview and results. *Nat. Hazards Earth Syst. Sci.* **2024**, *24*, 3049–3073. [CrossRef]
79. Basili, R.; Danciu, L.; Beauval, C.; Sesetyan, K.; Vilanova, S.P.; Adamia, S.; Arroucau, P.; Atanackov, J.; Baize, S.; Canora, C.; et al. The European Fault-Source Model 2020 (EFSM20): Geologic input data for the European Seismic Hazard Model 2020. *Nat. Hazards Earth Syst. Sci.* **2024**, *24*, 3945–3976. [CrossRef]

80. Galanakis, D.; Sboras, S.; Sakellariou, D.; Pavlides, S.; Iordanidou, K.; Georgiou, C.; Ganas, A.; Koukouvelas, I.; Kranis, C.; Lalechos, S.; et al. The Hellenic DataBase of Active Faults (HeDBAF): A new, national geodatabase of active faults for the broader Greek territory. In Proceedings of the EGU General Assembly 2025, Vienna, Austria, 27 April–2 May 2025; p. EGU25-9230. [CrossRef]
81. Field, E.H.; Jordan, T.H.; Cornell, C.A. OpenSH–a developing community-modeling environment for seismic hazard analysis. *Seismol. Res. Lett.* **2003**, *74*, 406–419.
82. Basili, R.; Kastelic, V.; Demircioglu, M.B.; Garcia Moreno, D.; Nemser, E.S.; Petricca, P.; Sboras, S.P.; Besana-Ostman, G.M.; Cabral, J.; Camelbeeck, T.; et al. The European Database of Seismogenic Faults (EDSF) compiled in the framework of the Project SHARE. 2013. [CrossRef]
83. Ganas, A. Fault Segmentation and Seismic Hazard Assessment in the Gulf of Evia Rift, Central Greece. Ph.D. Thesis, University of Reading, Reading, UK, 1997; Unpublished.
84. Ganas, A. Mapping of active normal faults in the Lokris region (central Greece) using SPOT DEM data. In Proceedings of the 8th International Congress of the Geological Society of Greece, Patras, Greece, 27–29 May 1998; pp. 173–179.
85. Ganas, A.; Pavlides, S.; Karastathis, V. DEM-based morphometry of range-front escarpments in Attica, central Greece, and its relation to fault slip rates. *Geomorphology* **2005**, *65*, 301–319. [CrossRef]
86. Gabrielsen, R.H.; Olesen, O. The Concept of Lineaments in Geological Structural Analysis; Principles and Methods: A Review Based on Examples from Norway. *Geomatics* **2024**, *4*, 189–212. [CrossRef]
87. Adam, R.N.; Scott, C.; Arrowsmith, J.R.; Reano, D.; Madugo, C.; Koehler, R.D.; Zuckerman, M.G.; Gray, B.; Kozaci, O.; González, T.; et al. A systematic approach to mapping tectonic faults and documenting supporting geomorphology. *Geosphere* **2025**, *21*, 227–244. [CrossRef]
88. Caputo, R. The Neogenic Dextral Transcurrent System of Corfu (Central Mediterranean). *Ann. Géol. Pays Hellén.* **1988**, *33*, 327–335.
89. Rondoyanni, T.; Sakellariou, M.; Baskoutas, J.; Christodoulou, N. Evaluation of active faulting and earthquake secondary effects in Lefkada Island, Ionian Sea, Greece: An overview. *Nat. Hazards* **2012**, *61*, 843–860. [CrossRef]
90. Nikolakopoulos, K.G.; Soura, K.; Koukouvelas, I.K.; Argyropoulos, N.G. UAV vs classical aerial photogrammetry for archaeological studies. *J. Archaeol. Sci. Rep.* **2017**, *14*, 758–773. [CrossRef]
91. Koukouvelas, I.K.; Zygouri, V.; Nikolakopoulos, K.; Verroios, S. Treatise on the tectonic geomorphology of active faults: The significance of using a universal digital elevation model. *J. Struct. Geol.* **2018**, *116*, 241–252. [CrossRef]
92. Michalopoulou, M.; Depountis, N.; Nikolakopoulos, K.; Boumpoulis, V. The Significance of Digital Elevation Models in the Calculation of LS Factor and Soil Erosion. *Land* **2022**, *11*, 1592. [CrossRef]
93. Mercier, J.-L. La néotectonique. Ses méthodes et ses buts. Un exemple: L'Arc Egéen (Méditerranée orientale). *Rev. Géol. Dyn. Géogr. Phys.* **1976**, *XVIII*, 323–346.
94. Mercier, J.-L.; Sorel, D.; Vergely, P.; Simeakis, K. Extensional tectonic regimes in the Aegean basins during the Cenozoic. *Basin Res.* **1989**, *2*, 49–71. [CrossRef]
95. Angelier, J. Néotectonique de l'Arc Égéen. *Soc. Géol. Nord. Spéc. Publ.* **1979**, *3*, 1–418.
96. Kahle, H.-G.; Straub, C.; Reilinger, R.; McClusky, S.; King, R.W.; Hurst, K.; Veis, G.; Kastens, K.; Cross, P. The strain rate field in the eastern Mediterranean region, estimated by repeated GPS measurements. *Tectonophys.* **1998**, *294*, 237–252. [CrossRef]
97. Doutsos, T.; Kokkalas, S. Stress and deformation patterns in the Aegean region. *J. Struct. Geol.* **2001**, *23*, 455–472. [CrossRef]
98. Jenny, S.; Goes, S.; Giardini, D.; Kahle, H.G. Earthquake recurrence parameters from seismic and geodetic strain rates in the eastern Mediterranean. *Geophys. J. Int.* **2004**, *157*, 1331–1347. [CrossRef]
99. Pérouse, E.; Chamot-Rooke, N.; Rabaute, A.; Briole, P.; Jouanne, F.; Georgiev, I.; Dimitrov, D. Bridging onshore and offshore present-day kinematics of central and eastern Mediterranean: Implications for crustal dynamics and mantle flow. *Geochem. Geophy. Geosyst.* **2012**, *13*, Q09013. [CrossRef]
100. Maggini, M. 3D Rheological Modelling in the Aegean Region and Its Importance for the Seismotectonics of the Area. Ph.D. Thesis, University of Ferrara, Ferrara, Italy, 2020; pp. 1–268.
101. Maggini, M.; Russo, D.; Caputo, R. A 3D rheological model for the Aegean Region: Mechanical layering and seismotectonic implications. *J. Struct. Geol.* **2023**, *175*, 104956. [CrossRef]
102. Guidoboni, E.; Comastri, A.; Traina, G. *Catalogue of Ancient Earthquakes in the Mediterranean Area up to the 10th Century*; ING-SGA, Editrice Compositori srl: Bologna, Italy, 1994; pp. 1–503.
103. Guidoboni, E.; Ferrari, G.; Tarabusi, G.; Sgattoni, G.; Comastri, A.; Mariotti, D.; Ciuccarelli, C.; Bianchi, M.G.; Valensise, G. CFTI5Med, the new release of the catalogue of strong earthquakes in Italy and in the Mediterranean area. *Sci. Data* **2019**, *6*, 80. [CrossRef] [PubMed]
104. Ambraseys, N. *Earthquakes in the Mediterranean and Middle East: A Multidisciplinary Study of Seismicity up to 1900*; Cambridge University Press: Cambridge, UK, 2009; pp. 1–947. [CrossRef]
105. Stiros, S. The 373 B.C. Helike (Gulf of Corinth, Greece) earthquake and tsunami, revisited. *Seismol. Res. Lett.* **2021**, *93*, 444–457. [CrossRef]

106. Triantafyllou, I. Revision of the allegedly deadly and tsunamigenic 1843 earthquake at Chalke Island, South Aegean Sea, Greece. *Seismol. Res. Lett.* **2026**, *20*, 1–10. [CrossRef]
107. Caputo, R.; Helly, B. The use of distinct disciplines to investigate past earthquakes. *Tectonophysics* **2008**, *453*, 7–19. [CrossRef]
108. Wells, D.L.; Coppersmith, J.K. New empirical relationships among magnitude, rupture length, rupture width, rupture area, and surface displacement. *Bull. Seismol. Soc. Am.* **1994**, *84*, 974–1002. [CrossRef]
109. Thingbaijam, K.K.S.; Mai, M.P.; Goda, K. New empirical earthquake source scaling laws. *Bull. Seismol. Soc. Am.* **2017**, *107*, 2225–2246. [CrossRef]
110. Angelier, J. Sur l'évolution tectonique depuis le Miocène supérieur d'un arc insulaire méditerranéen: L'arc Égéen. *Rev. Géogr. Phys. Géol. Dyn.* **1977**, *19*, 271–294.
111. Dewey, J.F.; Şengor, A.M.C. Aegean and surrounding regions: Complex multiplate and continuum tectonics in a convergent zone. *Bull. Geol. Soc. Am.* **1979**, *90*, 84–92. [CrossRef]
112. Barrier, E.; Angelier, J. Structure et neotectonique de l'arc hellenique oriental: Les iles de Kassos et Karpathos (Dodecanese, Grece). *Rev. Geol. Dyn. Geogr. Phys.* **1982**, *23*, 257–276.
113. Fassoulas, C. The tectonic development of a Neogene basin at the leading edge of the active European margin: The Heraklion basin, Crete, Greece. *J. Geodyn.* **2001**, *31*, 49–70. [CrossRef]
114. Mantovani, E.; Babbucci, D.; Tamburelli, C.; Viti, M. Late Cenozoic evolution and present tectonic setting of the Aegean–Hellenic Arc. *Geosciences* **2022**, *12*, 104. [CrossRef]
115. D'Agostino, N.; Métois, M.; Kocic, R.; Dunic, L.; Kukac, N.; Ganas, A.; Georgiev, I.; Jouanne, F.; Kaludjerovic, N.; Kandic, R. Active crustal deformation and rotations in the southwestern Balkans from continuous GPS measurements. *Earth Planet. Sci. Lett.* **2020**, *539*, 116246. [CrossRef]
116. Machette, M.N. Active, capable, and potentially active faults-a paleoseismic perspective. *J. Geodyn.* **2000**, *29*, 387–392. [CrossRef]
117. Wu, Z.; Hu, M. Definitions, classification schemes for active faults, and their application. *Geosciences* **2024**, *14*, 68. [CrossRef]
118. Caputo, R.; Piscitelli, S.; Oliveto, A.; Rizzo, E.; Lapenna, V. The use of electrical resistivity tomographies in active tectonics: Examples from the Tyrnavos Basin, Greece. *J. Geodyn.* **2003**, *36*, 19–35. [CrossRef]
119. Oliveto, A.N.; Mucciarelli, M.; Caputo, R. HVSR prospections in multi-layered environments: An example from the Tyrnavos Basin (Greece). *J. Seismol.* **2004**, *8*, 395–406. [CrossRef]
120. Karastathis, V.K.; Ganas, A.; Makris, J.; Papoulia, J.; Dafnis, P.; Gerolymatou, E.; Drakatos, G. The application of shallow seismic techniques in the study of active faults: The Atalanti normal fault, central Greece. *J. Appl. Geophys.* **2007**, *62*, 215–233. [CrossRef]
121. Nash, D.B. Morphologic dating and modelling degradation of fault scarps. In *Active Tectonics*; Wallace, R.E., Ed.; National Academy Press: Washington, DC, USA, 1986; pp. 181–194.
122. Pierce, K.L.; Colman, S.M. Effect of height and orientation (microclimate)on geomorphic degradation rates and processes. Late-glacial terrace scarps in central Idaho. *Geol. Soc. Am. Bull.* **1986**, *97*, 869–885.
123. Avouac, J.-P.; Tapponnier, P.; Bai, M.; You, H.; Wang, G. Active thrusting and folding along the northern Tien Shan and late Cenozoic rotation of the Tarim relative to Dzungaria and Kazakhstan. *J. Geophys. Res.* **1993**, *98*, 6755–6804. [CrossRef]
124. Merritts, D.; Ellis, M. Introduction to special session on tectonics and topography. *J. Geophys. Res.* **1994**, *99*, 12135–12141. [CrossRef]
125. Pinter, N.; Brandon, M.T. How erosion builds mountains. *Scientif. Am.* **1997**, *276*, 74–79. [CrossRef]
126. Katsikatsos, G.; Vidakis, M.; Migiros, G. Geological Map of Greece. In *Platycampos Sheet, Scale 1:50,000*; Institute of Geology and Mineral Exploration: Athens, Greece, 1981.
127. Migiros, G.; Vidakis, M. Geological Map of Greece. In *Ayia-Panayia Ayias Sheet, Scale 1:50,000*; Institute of Geology and Mineral Exploration: Athens, Greece, 1984.
128. Migiros, G. *Geological Map of Greece. Larissa Sheet, Scale 1:50,000*; Institute of Geology and Mineral Exploration: Athens, Greece, 1985.
129. Caputo, R.; Helly, B. The Holocene activity of the Rodia Fault, Central Greece. *J. Geodyn.* **2005**, *40*, 153–169. [CrossRef]
130. Katsikatsos, G.; Mylonakis, J.; Triantaphyllis, E.; Papadheas, G.; Psonis, C. Geological Map of Greece. In *Velestino Sheet, Scale 1:50,000*; Institute of Geology and Mineral Exploration: Athens, Greece, 1983.
131. Katsikatsos, G.; Mylonakis, J.; Vidakis, M.; Hecht, J.; Papadeas, G. Geological Map of Greece. In *Volos Sheet, Scale 1:50,000*; Institute of Geology and Mineral Exploration: Athens, Greece, 1986.
132. Katsikatsos, G.; Papadeas, G.; Mylonakis, J.; Triantaphyllis, E. Geological Map of Greece. In *Zagora-Syki Sheet, Scale 1:50,000*; Institute of Geology and Mineral Exploration: Athens, Greece, 1987.
133. Caputo, R. The active Nea Anchialos Fault System (Central Greece): Comparison of geological, morphotectonic, archaeological and seismological data. *Ann. Geophys.* **1996**, *39*, 557–574. [CrossRef]
134. Brunn, J.H. *Geological Map of Greece. Veroia Sheet, Scale 1:50,000*; Institute of Geology and Mineral Exploration: Athens, Greece, 1982.
135. Velaj, T. The structural style and hydrocarbon exploration of the subthrust in the Berati Anticlinal Belt, Albania. *J. Petrol. Explor. Prod. Technol.* **2015**, *5*, 123–145. [CrossRef]

136. Doutsos, T.; Kontopoulos, N.; Poulimenos, G. The Corinth-Patras Rift as the initial stage of continental fragmentation behind an active island arc (Greece). *Basin Res.* **1998**, *1*, 177–190.
137. Flotté, N.; Sorel, D.; Müller, C.; Tensi, J. Along strike changes in the structural evolution over a brittle detachment fault: Example of the Pleistocene Corinth-Patras Rift (Greece). *Tectonophysics* **2005**, *403*, 77–94. [CrossRef]
138. Palyvos, N.; Pantosti, D.; Stamatopoulos, L.; De Martini, P.M. Geomorphological reconnaissance of the Psathopyrgos and Rion-Patras fault zones (Achaia, NW Peloponnesus). *Bull. Geol. Soc. Greece* **2007**, *40*, 1586–1598. [CrossRef]
139. Palyvos, N.; Lemeille, F.; Dorel, D.; Pantosti, D.; Pavlopoulos, K. Geomorphic and biological indicators of paleoseismicity and Holocene uplift rate at a coastal normal fault footwall (western Corinth Gulf, Greece). *Geomorphology* **2008**, *96*, 16–38. [CrossRef]
140. Tsimi, C.; Ganas, A.; Soulakellis, N.; Kairis, O.; Valmis, S. Morphotectonics of the Psathopyrgos active fault, western Corinth rift, central Greece. *Bull. Geol. Soc. Greece* **2007**, *40*, 500–511. [CrossRef]
141. Console, R.; Carluccio, R.; Papadimitriou, E.; Karakostas, V. Synthetic earthquake catalogs simulating seismic activity in the Corinth Gulf, Greece, fault system. *J. Geophys. Res.* **2014**, *120*, 326–343. [CrossRef]
142. Kaviris, G.; Elias, P.; Kapetanidis, V.; Serpetsidaki, A.; Karakonstantis, A.; Plicka, V.; De Barros, L.; Sokos, E.; Kassaras, I.; Sakkas, V. The western Gulf of Corinth (Greece) 2020–2021 seismic crisis and cascading events: First results from the Corinth Rift Laboratory Network. *Seism. Rec.* **2021**, *1*, 85–95. [CrossRef]
143. Parcharidis, I.; Kokkalas, S.; Fountoulis, I.; Foumelis, M. Detection and monitoring of active faults in urban environments: Time series interferometry on the cities of Patras and Pyrgos (Peloponnese, Greece). *Rem. Sens.* **2009**, *1*, 676–696. [CrossRef]
144. Koukouvelas, I.K.; Kokkalas, S.; Xypolias, P. Surface deformation during the Mw 6.4 (8 June 2008) Movri Mountain earthquake in the Peloponnese, and its implications for the seismotectonics of western Greece. *Int. Geol. Rev.* **2010**, *52*, 249–268. [CrossRef]
145. Gallovič, F.; Zahradník, J.; Křížová, D.; Plicka, V.; Sokos, E.; Serpetsidaki, A.; Tselentis, G.-A. From earthquake centroid to spatial-temporal rupture evolution: Mw 6.3 Movri Mountain earthquake, June 8, 2008, Greece. *Geophys. Res. Letts.* **2009**, *36*, L21310. [CrossRef]
146. Konstantinou, K.I.; Melis, N.S.; Lee, S.-J.; Evangelidis, C.P.; Boukouras, K. Rupture process and aftershocks relocation of the 8 June 2008 Mw 6.4 earthquake in Northwest Peloponnese, Western Greece. *Bull. Seismol. Soc. Am.* **2009**, *99*, 3374–3389. [CrossRef]
147. Feng, L.; Newman, A.V.; Farmer, G.T.; Psimoulis, P.; Stiros, S. Energetic rupture, coseismic and post-seismic response of the 2008 MW 6.4 Achaia-Elia Earthquake in northwestern Peloponnese, Greece: An indicator of an immature transform fault zone. *Geophys. J. Int.* **2010**, *183*, 103–110. [CrossRef]
148. Papadopoulos, G.A.; Karastathis, V.; Kontoes, C.; Charalampakis, M.; Fokaefs, A.; Papoutsis, I. Crustal deformation associated with east Mediterranean strike–slip earthquakes: The 8 June 2008 Movri (NW Peloponnese), Greece, earthquake (Mw6.4). *Tectonophysics* **2010**, *492*, 201–212. [CrossRef]
149. Bernard, P.; Lyon-Caen, H.; Briole, P.; Deschamps, A.; Boudin, F.; Makropoulos, K.; Papadimitriou, P.; Lemeille, F.; Patau, G.; Billiris, H.; et al. Seismicity, deformation and seismic hazard in the western rift of Corinth: New insights from the Corinth Rift Laboratory (CRL). *Tectonophys.* **2006**, *426*, 7–30. [CrossRef]
150. Kapetanidis, V.; Michas, G.; Kaviris, G.; Vallianatos, F. Spatiotemporal properties of seismicity and variations of shear-wave splitting parameters in the Western Gulf of Corinth (Greece). *Appl. Sci.* **2021**, *11*, 6573. [CrossRef]
151. Wicker, V.; Ford, M.; Gawthorpe, R.L.; Skourtsos, E.; Kranis, H.; Kerouedan, L.; Muravchik, M. Transition from Late-Miocene syn-orogenic extension to Plio-Pleistocene Corinth rifting in the southern Hellenides, northern Peloponnese, Greece. *Tectonics* **2024**, *43*, e2023TC007964. [CrossRef]
152. Papadopoulos, G.A.; Agalos, A.; Karavias, A.; Triantafyllou, I.; Parcharidis, I.; Lekkas, E. Seismic and geodetic imaging (DInSAR) investigation of the March 2021 strong earthquake sequence in Thessaly, Central Greece. *Geosciences* **2021**, *11*, 311. [CrossRef]
153. Chatzipetros, A.; Pavlides, S.; Foumelis, M.; Sboras, S.; Galanakis, D.; Pikridas, C.; Bitharis, S.; Kremastas, E.; Chatziioannoi, A.; Papaioannou, I. The Northern Thessaly strong earthquakes of March 3 and 4, 2021 and their neotectonic setting. *Bull. Geol. Soc. Greece* **2021**, *55*, 222–255. [CrossRef]
154. Michas, G.; Pavlou, K.; Avgerinou, S.-E.; Anyfadi, E.-A.; Vallianatos, F. Aftershock patterns of the 2021 Mw 6.3 Northern Thessaly (Greece) earthquake. *J. Seismol.* **2022**, *26*, 201–225. [CrossRef]
155. Kontoes, C.; Alatza, S.; Chousianitis, K.; Svigkas, N.; Loupasakis, C.; Atzori, S.; Apostolakis, A. Coseismic surface deformation, fault modeling, and Coulomb stress changes of the March 2021 Thessaly, Greece, earthquake sequence based on InSAR and GPS Data. *Seismol. Res. Lett.* **2022**, *93*, 2584–2598. [CrossRef]
156. Papadimitriou, E.; Karakostas, V.; Papazachos, C.; Foumelis, M.; Kiratzi, A.; Pikridas, C.; Bonatis, P.; Kostoglou, A.; Kourouklas, C.; Scordilis, E.; et al. The seismogenic structure of March 2021 Tyrnavos (central Greece) doublet (Mw 6.3 and Mw 6.0), constrained by aftershock locations and geodetic data. *Geophys. J. Int.* **2023**, *235*, 644–689. [CrossRef]
157. Mouslopoulou, V.; Sudhaus, H.; Konstantinou, K.I.; Begg, J.; Saltogianni, V.; Männel, B.; Andinisari, R.; Oncken, O. *A deeper look into the* 2021 Tyrnavos earthquake sequence (TES) reveals coseismic breaching of an unrecognized large-scale fault relay zone in continental Greece. *Tectonics* **2022**, *41*, e2022TC007453. [CrossRef]

158. Anderson, E.M. *The Dynamics of Faulting and Dyke Formation with Applications to Britain*; Oliver and Boyd: Edinburgh, UK, 1942; pp. 1–191.
159. Lyon-Caen, H.; Armijo, R.; Drakopoulos, J.; Baskoutass, J.; Delibassis, N.; Gaulon, R.; Kouskouna, V.; Latoussakis, J.; Makropoulos, K.; Papadimitriou, P.; et al. The 1986 Kalamata (South Peloponnesus) earthquake: Detailed study of a normal fault, evidences for east-west extension in the Hellenic arc. *J. Geophys. Res.* **1988**, *93*, 14967–15000. [CrossRef]
160. Papazachos, B.; Kiratzi, A.; Karacostas, B.; Panagiotopoulos, D.; Scordilis, E.; Mountrakis, D. Surface fault traces, fault plane solution and spatial distribution of the aftershocks of the September 13, 1986 earthquake of Kalamata (south Greece). *Pure Appl. Geophys.* **1988**, *126*, 55–68. [CrossRef]
161. Fountoulis, I.; Mariolakos, I.; Ladas, I. Quaternary basin sedimentation and geodynamics in SW Peloponnese (Greece) and late stage uplift of Taygetos Mt. *Boll. Geof. Teor. Appl.* **2014**, *55*, 303–324. [CrossRef]
162. Akinci, A.; Cheloni, D.; Dindar, A.A. The 30 October 2020, M7.0 Samos Island (Eastern Aegean Sea) earthquake: Effects of source rupture, path and local-site conditions on the observed and simulated ground motions. *Bull. Earthq. Eng.* **2021**, *19*, 4745–4771. [CrossRef]
163. Altunel, E.; Pinar, A. Tectonic implications of the Mw 6.8, 30 October 2020 Kuşadası Gulf earthquake in the frame of active faults of Western Turkey. *Turk. J. Earth Sci.* **2021**, *30*, 436–448. [CrossRef]
164. Chousianitis, K.; Konca, A.O. Rupture process of the 2020 Mw7.0 Samos earthquake and its effect on surrounding active faults. *Geophys. Res. Letts.* **2021**, *48*, e2021GL094162. [CrossRef]
165. Mavroulis, S.; Triantafyllou, I.; Karavias, A.; Gogou, M.; Katsetsiadou, K.-N.; Lekkas, E.; Papadopoulos, G.A.; Parcharidis, I. Primary and secondary environmental effects triggered by the 30 October 2020, Mw = 7.0, Samos (Eastern Aegean Sea, Greece) earthquake based on post-event field surveys and InSAR analysis. *Appl. Sci.* **2021**, *11*, 3281. [CrossRef]
166. Kiratzi, A.; Papazachos, C.; Özacar, A.; Pinar, A.; Kkallas, C.; Sopaci, E. Characteristics of the 2020 Samos earthquake (Aegean Sea) using seismic data. *Bull. Earthq. Eng.* **2022**, *20*, 7713–7735. [CrossRef]
167. Plicka, V.; Gallovic, F.; Zahrandnik, J.; Serpetsidaki, A.; Sokos, E.; Vavlas, N.; Kiratzi, A. The 2020 Samos Mw7 earthquake: Source model depicting complexity and rupture directivity. *Tectonophysics* **2022**, *843*, 229591. [CrossRef]
168. Peacock, D.C.P.; Nixon, C.W.; Rotevatn, A.; Sanderson, D.J.; Zuluaga, L.F. Interacting faults. *J. Struct. Geol.* **2017**, *97*, 1–22. [CrossRef]
169. Caputo, R.; Zouros, N. Examples of Alpide deformation from Epirus: Local anomalies or need to re-evaluate the amount of shortening in the Western Hellenides? *Bull. Geol. Soc. Greece* **1993**, *28*, 315–326.
170. Galanakis, D. Brittle tectonic and morphological alteration of Almyros Basin. *Bull. Geol. Soc. Greece* **2001**, *34*, 371–379. [CrossRef]
171. Caputo, R.; Bravard, J.-P.; Helly, B. The Pliocene-Quaternary tecto-sedimentary evolution of the Larissa Plain (Eastern Thessaly, Greece). *Geodin. Acta* **1994**, *7*, 219–231. [CrossRef]
172. Dilalos, S.; Alexopoulos, J.D.; Vassilakis, E.; Poulos, S.E. Investigation of the structural control of a deltaic valley with geophysical methods. The case study of Pineios river delta (Thessaly, Greece). *J. Appl. Geophys.* **2022**, *202*, 104652. [CrossRef]
173. Laurent, V.; Beaudoin, A.; Jolivet, L.; Arbaret, L.; Augier, R.; Rabillard, A.; Menant, A. Interrelations between extensional shear zones and synkinematic intrusions: The example of Ikaria Island (NE Cyclades, Greece). *Tectonophys.* **2015**, *651–652*, 152–171. [CrossRef]
174. Leonard, M. Earthquake fault scaling: Self-consistent relating of rupture length, width, Average displacement, and moment release. *Bull. Seismol. Soc. Am.* **2010**, *100*, 1971–1988. [CrossRef]
175. Hatzfeld, D.; Kassaras, I.; Panagiotopoulos, D.; Amorese, D.; Makropoulos, K.; Karakaisis, G.; Coutant, O. Microseismicity and strain pattern in northwestern Greece. *Tectonics* **1995**, *14*, 773–785. [CrossRef]
176. Tranos, M.D.; Papadimitriou, E.E.; Kilias, A.A. Thessaloniki-Gerakarou fault zone (TGFZ): The western extension of the 1978 Thessaloniki earthquake fault (Northern Greece) and seismic hazard assessment. *J. Struct. Geol.* **2003**, *25*, 2109–2123. [CrossRef]
177. Vamvakaris, D.A.; Papazachos, C.B.; Karagianni, E.E.; Scordilis, E.M.; Hatzidimitriou, P.M. Small-scale spatial variation of the stress field in the back-arc Aegean area: Results from the seismotectonic study of the broader area of Mygdonia basin (N. Greece). *Tectonophysics* **2006**, *417*, 249–267. [CrossRef]
178. Hollenstein, C.; Muller, M.D.; Geiger, A.; Kahle, H.G. Crustal motion and deformation in Greece from a decade of GPS measurements, 1993-2003. *Tectonophysics* **2008**, *449*, 17–40. [CrossRef]
179. Pérouse, E.; Sébrier, M.; Braucher, R.; Chamot-Rooke, N.; Bourlès, D.; Briole, P.; Sorel, D.; Dimitrov, D.; Arsenikos, S. Transition from collision to subduction in western Greece: The Katouna–Stamna active fault system and regional kinematics. *Int. J. Earth Sci.* **2017**, *106*, 967–989. [CrossRef]
180. Lazos, I.; Papanikolaou, I.; Sboras, S.; Foumelis, M.; Pikridis, C. Geodetic Upper Crust Deformation based on primary GNSS and INSAR data in the Strymon Basin, Northern Greece—Correlation with active faults. *Appl. Sci.* **2022**, *12*, 9391. [CrossRef]
181. Boccaletti, M.; Caputo, R.; Mountrakis, D.; Pavlides, S.; Zouros, N. Palaeoseismicity of the Souli Fault, Epirus, Western Greece. *J. Geodyn.* **1997**, *24*, 117–127. [CrossRef]

182. Maggini, M.; Caputo, R. Seismological data versus rheological modelling: Comparisons across the Aegean Region for improving the seismic hazard assessment. *J. Struct. Geol.* **2021**, *145*, 104312. [CrossRef]
183. Papazachos, B.; Papazachou, C. *The Earthquakes of Greece*, 2nd ed.; Editions ZITI: Thessaloniki, Greece, 1997; pp. 1–304.
184. Papadopoulos, G.A. *A seismic History of Crete. The Hellenic Arc and Trench*; Ocelotos Publ.: Athens, Greece, 2011; pp. 1–415.
185. Guidoboni, E.; Comastri, A. *Catalogue of Earthquakes Andtsunamis in the Mediterranean Area from the 11th to the 15th Century*; INGV-SGA: Rome/Bologna, Italy, 2005; pp. 1–1037.
186. Stiros, S.; Antoniou, D.; Kontogianni, V. Palaeoseismological information from church repairs dated by inscriptions: Evidence from eighteenth century Greece. *Seismol. Res. Lett.* **2025**, *96*, 3253–3264. [CrossRef]
187. Leonard, M. Self-consistent earthquake fault-scaling relations: Update and extension to stable continental strike-slip faults. *Bull. Seismol. Soc. Am.* **2014**, *104*, 2953–2965. [CrossRef]
188. Ambraseys, N.N.; Douglas, J.; Sarma, S.K.; Smit, P.M. Equations for the estimation of strong ground motions from shallow crustal earthquakes using data from Europe and the Middle East: Vertical peak ground acceleration and spectral acceleration. *Bull. Earthq. Eng.* **2005**, *3*, 55–73. [CrossRef]
189. Bindi, D.; Pacor, F.; Luzi, L.; Puglia, R.; Massa, M.; Ameri, G.; Paolucci, R. Ground motion prediction equations derived from the Italian strong motion database. *Bull. Earthq. Eng.* **2011**, *9*, 1899–1920. [CrossRef]
190. Mettos, A.; Rondoyanni, T.; Georgiou, C.; Ioakim, C. *Neotectonic Map of Greece, 1:100,000, Chalkida Sheet*; European Center on Prevention and Forecasting of Earthquakes and Earthquake Planning and Protection Organization: Athens, Greece, 2011.
191. Mariolakos, I.; Sabot, V.; Fountoulis, I.; Marcopoulou-Diacantoni, A.; Mirkou, R. *Neotectonic Map of Greece at Scale 1:100000, Filiatra Sheet*; Earthquake Planning & Protection Organization: Athens, Greece, 1998.
192. Lekkas, S.; Alexopoulos, A.; Danamos, G. *Neotectonic Map of Greece, Gythio, Neapolis, Elafonisos Sheets, Scale: 1/100,000*; European Center on Prevention and Forecasting of Earthquakes and Earthquake Planning and Protection Organization: Athens, Greece, 1997.
193. Papanikolaou, D.; Logos, E.; Lozios, S.; Sideris, C. *Neotectonic Map of Greece, Korinthos Sheet, Scale 1/100,000*; European Center on Prevention and Forecasting of Earthquakes and Earthquake Planning and Protection Organization: Athens, Greece, 1996.
194. Lekkas, E.; Papanikolaou, D.; Sakellariou, D. *Neotectonic Map of Greece, Rhodos Sheet, Scale: 1/100,000*; European Center on Prevention and Forecasting of Earthquakes and Earthquake Planning and Protection Organization: Athens, Greece, 1998.
195. Mountrakis, D.; Kilias, A.; Pavlides, S.; Sotiriadis, L.; Psilovikos, A.; Astaras, T.; Vavliakis, E.; Koyfos, G.; Dimopoulos, G.; Soulios, G.; et al. *Neotectonic Map of Greece, Langadhas Sheet, Scale: 1/100,000*; European Center on Prevention and Forecasting of Earthquakes and Earthquake Planning and Protection Organisation: Athens Greece, 1996.
196. IGRS-IFP. *Étude Géologique de l'Épire (Grèce Nord-Occidentale)*; Ed. Technip: Paris, France, 1966; pp. 1–306.
197. Tsodoulos, I.M.; Koukouvelas, I.K.; Pavlides, S. Tectonic geomorphology of the easternmost extension of the Gulf of Corinth (Beotia, Central Greece). *Tectonophysics* **2008**, *453*, 211–232. [CrossRef]
198. Cundy, A.B.; Kortekaas, S.; Dewez, T.; Stewart, I.S.; Collins, P.E.F.; Croudace, I.W.; Maroukian, H.; Papanastassiou, D.; Gaki-Papanastassiou, P.; Pavlopoulos, K.; et al. Coastal wetlands as recorders of earthquake subsidence in the Aegean: A case study of the 1894 Gulf of Atalanti earthquakes, central Greece. *Mar. Geol.* **2000**, *170*, 3–26.
199. Ghisetti, F.; Vezzani, L. Inherited structural controls on normal fault architecture in the Gulf of Corinth (Greece). *Tectonics* **2005**, *24*, TC4016. [CrossRef]
200. Karamitros, I.; Ganas, A.; Chatzipetros, A.; Valkaniotis, S. Non-planarity, scale-dependent roughness and kinematic properties of the Pidima active normal fault scarp (Messinia, Greece) using high-resolution terrestrial LiDAR data. *J. Struct. Geol.* **2020**, *136*, 10406. [CrossRef]
201. Papadopoulos, G.; Pavlides, S. The large 1956 earthquake in the South Aegean: Macroseismic field configuration, faulting, and neotectonics of Amorgos Island. *Earth Planet. Sci. Lett.* **1992**, *113*, 383–396. [CrossRef]
202. Emre, Ö.; Duman, T.Y.; Özalp, S.; Şaroğlu, F.; Olgun, Ş.; Elmacı, H.; Çan, T. Active fault database of Turkey. *Bull. Earthq. Eng.* **2018**, *16*, 3229–3275. [CrossRef]
203. Maldonado, V.; Contreras, M.; Melnick, D. A comprehensive database of active and potentially-active continental faults in Chile at 1:25 000 scale. *Sci. Data* **2021**, *8*, 20. [CrossRef] [PubMed]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.