Supplementary Material

*for*

# Investigation of the Thiva 2020–2021 Earthquake Sequence Using Seismological Data and Space Techniques

**George Kaviris [1]*, Vasilis Kapetanidis [1], Ioannis Spingos [1], Nikolaos Sakellariou [1], Andreas Karakonstantis [1], Vasiliki Kouskouna [1], Panagiotis Elias [2], Andreas Karavias [3], Vassilis Sakkas [1], Theodoros Gatsios [1,3], Ioannis Kassaras [1], John D. Alexopoulos [1], Panayotis Papadimitriou [1], Nicholas Voulgaris [1] and Isaak Parcharidis [3]**

[1] Section of Geophysics-Geothermics, Department of Geology and Geoenvironment, National and Kapodistrian University of Athens, 15784, Panepistimiopolis Zografou, Greece; gkaviris@geol.uoa.gr (G.K.), vkapetan@geol.uoa.gr (V.K), ispingos@geol.uoa.gr (I.S.), nsakel@geol.uoa.gr (N.S.), akarakon@geol.uoa.gr (A.K.), vkouskouna@geol.uoa.gr (V.K.), vsakkas@geol.uoa.gr (V.S.), theogat@geol.uoa.gr (T.G.), kassaras@geol.uoa.gr (I.K.), jalexopoulos@geol.uoa.gr (J.D.A.), ppapadim@geol.uoa.gr (P.P.), voulgaris@geol.uoa.gr (N.V.)

[2] Institute of Astronomy, Astrophysics, Space Applications and Remote Sensing, National Observatory of Athens, 15236, Penteli, Greece; pelias@noa.gr (P.E.)

[3] Department of Geography, Harokopio University of Athens, 17676, Kallithea, Greece; gp219309@hua.gr (A.K.), parchar@hua.gr (I.P.)

* Correspondence: gkaviris@geol.uoa.gr

## Table of Contents

Excel File S1: Relocated catalogue of the 2020-2021 earthquake sequence at Thiva ..... 2

Excel File S2: Focal mechanisms determined by first motion polarities (FMP) ..... 3

Interactive Matlab Figure S1: 3D model of the 2020-2021 earthquake sequence at Thiva ..... 4

References ..... 5

## Excel File S1: Relocated catalogue of the 2020-2021 earthquake sequence at Thiva

The relocated catalogue is available in the Excel file "S**1_thiva_relocated_catalogue.xlsx**". Rows of events with M≥4.0 are highlighted in yellow.

Column description:
1) event-code: identification code for each event, based on the origin time in yyyy-mm-dd-HH-MM-SS format, to facilitate temporal sorting.
2-7) Year, Month, Day, Hour, Minute, Second of origin time.
8) Latitude (°N).
9) Longitude (°E).
10) Focal Depth (km).
11) Magnitude.
12) Cluster ID: spatial group number (CLID).
13) MinDist: Epicentral distance (km) of the closest station with available data.
Uncertainties of initial locations, as reported by the HypoInverse location code:
14) RMS: Root mean square of the travel-time residual (sec)
15-17) ERX, ERY, ERZ: absolute location uncertainties (km) on each of the three dimensions.
18) Gap: azimuthal gap.
19) Nsta: number of stations with available data.

## Excel File S2: Focal mechanisms determined by first motion polarities (FMP)

Focal mechanisms solutions determined by first motion polarities (FMP) for 20 significant events of the 2020-2021 earthquake sequence at Thiva, with magnitude $2.8 \leq M_L \leq 3.6$, is available in the Excel file "S**2_thiva_focal_mechanisms_FMP.xlsx**".

"RMS" is the root mean square angular difference (Kagan angle) between the average and valid individual solutions, "Pol" is the number of FMP measurements and CLID is the spatial group number

Column description:
1-6) Year, Month, Day, Hour, Minute, Second of origin time.
7) Latitude (°N).
8) Longitude (°E).
9) Focal Depth (km).
10) Magnitude ($M_L$).
11-13) Strike, Dip and Rake values for one of the nodal planes.
14) RMS: root mean square angular difference (Kagan angle) between the average and valid individual solutions.
15) Pol: number of first motion polarity measurements.
16) CLID: spatial group number (see Figure 4).

## Interactive Matlab Figure S1: 3D model of the 2020-2021 earthquake sequence at Thiva

Matlab .fig file "S**1_interactive_3D_model_Thiva.fig**"
Interactive 3D visualization of the 2020-2021 earthquake sequence at Thiva, Central Greece.

The figure is compatible with MATLAB version 2009b and above. It contains layers which can be turned on or off, such as topography (DEM), fault traces, hypocenters per spatial group and inferred planes related to groups of hypocenters or specific faults on the surface.
A selection of preset viewing angles are available in the "3D View" menu at the top, as well as the option to modify the vertical exaggeration and the opacity of the digital elevation model.
Certain planes have been fit to selected groups of hypocenters by least squares. The north-dipping plane of groups #4 was drawn as a visual estimate. The major earthquakes of the sequence (M≥3.5) are marked with stars.

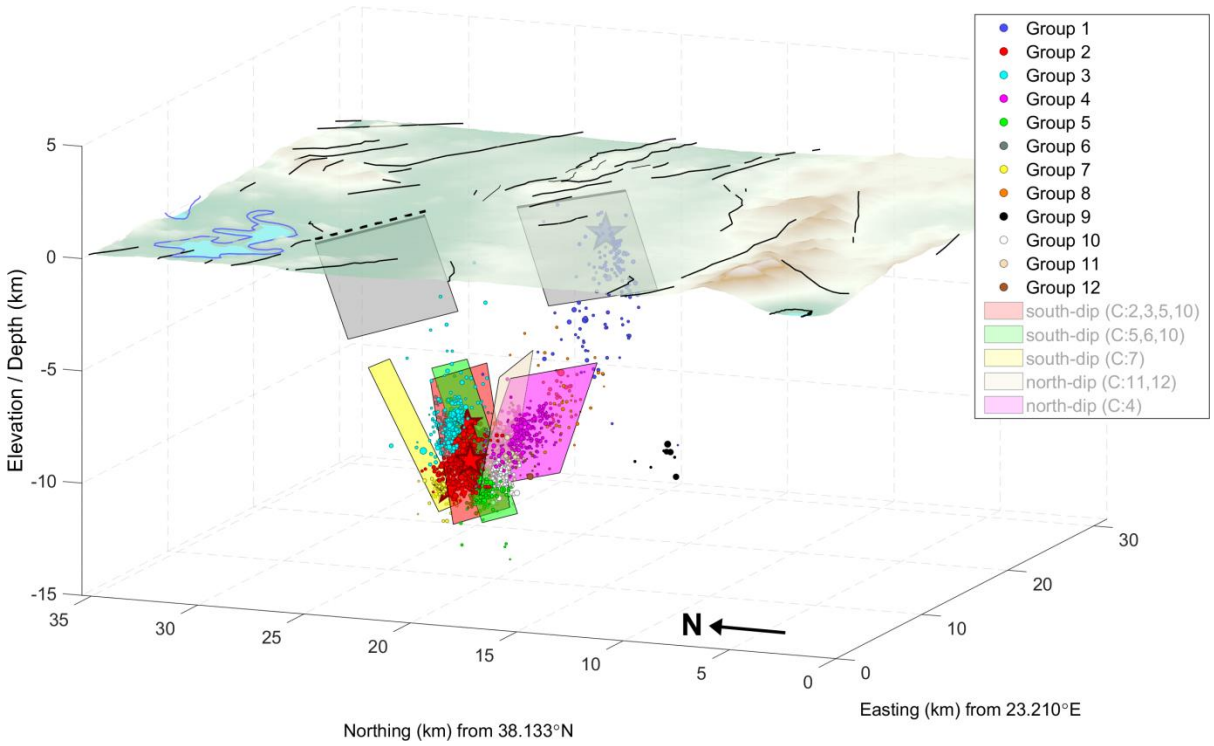



**Figure S1.** 3D view (towards ENE) of the 2020-2021 earthquake sequence at Thiva, Central Greece. Colours and numbers in the legend correspond to the different spatial groups. Fault lines are from the NOAfaults database [15,16] and [35].

## References


15. Ganas, A.; Oikonomou, I.A.; Tsimi, C. NOAfaults: a digital database for active faults in Greece. Bull. Geol. Soc. Greece 2017, 47, 518, doi:10.12681/bgsg.11079.
16. Ganas, A. NOAFAULTS KMZ layer Version 3.0 (2020 update) (V3.0) [Data set], Zenodo 2020. https://doi.org/10.5281/zenodo.4304613
35. 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, doi:10.1016/j.tecto.2007.06.015.