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Climate Denial and Distrust of Science: An Analysis of Instagram Comments on Portuguese News Media During the 2026 European Heatwave

Ricardo Ramos * and Maria José Rodrigues

Transdisciplinary Research Center in Education and Development (CITeD), Universidade Politécnica de Bragança (UPB), 5300-000 Bragança, Portugal; mrodrigues@ipb.pt
* Correspondence: ricardo.ramos@unipb.pt

Abstract

Social media platforms have become important arenas for public discussion of climate change, facilitating both the dissemination of scientific information and the contestation of climate-related claims. This study examines the discursive patterns through which climate change and extreme weather were contested in Instagram comments associated with news coverage of the June 2026 European heatwave. A qualitative research design based on inductive thematic analysis was employed, complemented by descriptive quantification of the resulting thematic categories. The corpus comprised 1197 top-level comments associated with 13 climate-related posts published by four prominent Portuguese news media outlets on Instagram. Seven thematic categories were identified: denial of human influence on climate change, normalization and trivialization of observed phenomena, discrediting of mass media, discrediting of science and experts, conspiracy narratives, anecdotal evidence and personal experience, and climate-affirming or neutral discourses. The most frequent categories were denial of human influence on climate change (31.4%) and normalization and trivialization of observed phenomena (21.0%), followed by discrediting of mass media (13.8%), climate-affirming or neutral discourses (11.5%), discrediting of science and experts (9.8%), conspiracy narratives (7.2%), and anecdotal evidence and personal experience (5.3%). The findings reveal a substantial presence of climate-dissent discourse within the analyzed corpus, expressed through both explicit rejection of anthropogenic influence and more indirect forms of contestation. However, the results should not be interpreted as representative of Portuguese Instagram users or the Portuguese population as a whole. The study highlights the importance of examining the discursive dynamics of social media comment sections for climate communication, science communication, and climate literacy.

Keywords: climate change; climate denial; Instagram; disinformation; climate literacy; science communication

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1. Introduction

Climate change is one of the major environmental, social, and economic challenges of the twenty-first century (Weaver et al., 2023; NASA, 2024a). The scientific evidence concerning the role of human activities in recent global warming is extensive, and the scientific consensus on anthropogenic climate change is exceptionally strong (Lynas et al., 2021; NASA, 2023). Nevertheless, the existence, causes, severity, and implications of climate change remain contested in public discourse. Understanding these forms of contestation is

particularly important in contemporary media environments, where scientific information is increasingly discussed, challenged, and reframed by users.

Climate change denial can take several forms. Lamb et al. (2020) distinguish between denial of the existence of climate change, denial of its anthropogenic causes, and denial of the seriousness of the problem or the need for action. This conceptualization is important because disagreement with particular scientific findings should not automatically be considered denialism. Questioning scientific results is an essential component of scientific inquiry itself (Farias, 2025). Climate change denial, by contrast, involves the systematic rejection, dismissal, or reinterpretation of established evidence in ways that are inconsistent with the available scientific knowledge. Such rejection may be associated with identity-protective, ideological, and sociopolitical factors rather than with scientific disagreement alone (Lewandowsky & Oberauer, 2016).

Recent research suggests that climate denial has also become increasingly indirect. Rather than explicitly rejecting the existence of climate change, contemporary forms of climate dissent may minimize the significance of observed changes, normalize extreme events, attribute climatic changes primarily to natural processes, challenge the credibility of scientists and scientific institutions, or discredit the media through which climate information is communicated (Lamb et al., 2020; Coan et al., 2021; Fortin et al., 2025; Ramos et al., 2025). These forms of contestation overlap with broader discourses of climate delay and obstruction and may coexist with conspiracy narratives and misinformation (Lamb et al., 2020; Fortin et al., 2025). Consequently, examining climate denial requires attention not only to explicit rejection of climate change but also to the argumentative strategies through which scientific explanations are minimized, reframed, or delegitimized.

In this study, discursive patterns refer to recurring ways in which comments frame, interpret, support, or contest climate-related claims. These patterns are identified through the predominant communicative function of each comment, rather than through isolated words or expressions. Forms of argumentation, in turn, refer to the types of reasoning and rhetorical strategies used to support these positions, such as attributing climate change to natural variability, presenting extreme temperatures as ordinary or recurrent, invoking personal experience as evidence, questioning the credibility of scientific experts, or accusing news media of exaggeration or manipulation. Previous research has identified similar forms of climate contestation, including the rejection of anthropogenic causes, the minimization of climate impacts, and the discrediting of scientific and institutional sources (Lamb et al., 2020; Coan et al., 2021; Fortin et al., 2025; Ramos et al., 2025). These concepts provide the analytical basis for identifying and interpreting the categories developed in the present study.

This issue has become particularly relevant with the expansion of social media. Platforms such as Instagram and Facebook have transformed the production, distribution, and consumption of information by enabling users to comment on and circulate content outside traditional editorial structures (European Commission, 2023; Nicolosi et al., 2025; Ramos et al., 2025). News-related comment sections consequently constitute an important environment for the public discussion of scientific issues. They allow users to express agreement or disagreement with journalistic content, introduce alternative explanations, challenge scientific claims, and question the credibility of journalists, experts, and institutions. Research on online communication indicates that comments can also influence how audiences interpret the content to which they respond, meaning that the discussion surrounding a news item can become part of the broader communicative context in which information is received (Clementson, 2019; Maddern, 2026).

Social-media discussions should nevertheless not be assumed to represent the distribution of opinions within the broader population. Although public acceptance of climate change is widespread, a relatively small proportion of highly active users may account

for a substantial share of online discussion. A European systematic review estimates that between 96% and 98% of Europeans recognize the reality of climate change, with Portugal among the countries displaying particularly high levels of concern (Bourke et al., 2025). Research on online political and social discussion has also shown that a relatively small minority of users can produce a disproportionately large share of publicly visible content (Pew Research Center, 2019). Comment sections may therefore provide a useful window into forms of public contestation while simultaneously producing a potentially distorted impression of the prevalence of particular views.

The characteristics of the Instagram audience are also relevant to the interpretation of these discussions. In Portugal, Instagram has substantial population reach, with recent estimates indicating that the 25–34 age group constitutes the largest segment of users, while the platform is also used extensively by other age groups (NapoleonCat, 2026). Research on news consumption in Portugal indicates that younger audiences are more likely to use Instagram and TikTok to access news, whereas older audiences rely more strongly on Facebook (DataReport, 2025). These characteristics suggest that discussions occurring around news content on Instagram should not automatically be considered representative of Portuguese public opinion as a whole. Importantly, there is insufficient evidence to characterize Portuguese Instagram users according to a particular political orientation, and demographic or political characteristics cannot be inferred from the comments analyzed in the present study.

A study based on the European Social Survey found that 77.9% of Portuguese respondents stated that climate change definitely exists, constituting the highest proportion among the European countries analyzed. Only 2.3% of Europeans, in the entire sample, denied the existence of climate change (Fraembs & Drobnič, 2024). Furthermore, recent Eurobarometer data shows that 91% of Portuguese respondents considered natural disasters aggravated by climate change a concern, compared to 66% in the European Union (European Parliament, 2026).

The relevance of these dynamics is heightened during major climatic events, when scientific information and journalistic coverage receive substantial public attention. In June 2026, much of Europe experienced an intense heatwave, with several countries recording exceptional temperatures and meteorological records (World Meteorological Organization, 2026). Heatwaves are complex climatic events whose definition varies according to the statistical criteria and climatological baseline adopted (Padalino et al., 2024), while evidence indicates that climate change is contributing to changes in the frequency, intensity, and duration of extreme heat events (Copernicus, 2023; Chen, 2026). Portugal has also experienced a marked increase in exceptionally warm conditions, with many of its hottest years occurring since the beginning of the twenty-first century (IPMA, 2023). The health consequences of extreme heat further reinforce the public significance of such events, with the World Health Organization reporting substantial heat-related mortality across Europe in recent years (World Health Organization, 2026). The extensive media attention surrounding the 2026 European heatwave, therefore, provided an information-rich context in which to examine how users responded to climate-related news.

The broader digital information environment is also undergoing changes that may affect the circulation of climate-related information. In January 2025, Meta announced changes to its approach to content moderation and fact-checking in certain regions, placing greater emphasis on freedom of expression and community-based moderation (Kaplan, 2025). Although the consequences of these changes for climate misinformation require further empirical investigation, existing research has raised concerns about the circulation and amplification of misleading climate-related content on digital platforms (Global Witness, 2022; Nicolosi et al., 2025; Essien, 2025). These developments further underscore

the importance of examining how climate-related claims are expressed and contested in social media environments.

Despite the growing literature on climate denial, climate misinformation, and digital science communication, important gaps remain. Existing research has identified a range of climate-dissent narratives across digital platforms, but comparatively less attention has been devoted to Instagram as an environment for responses to climate-related news. Research examining Portuguese social-media discourse has identified forms of climate denial and distrust toward scientific knowledge in comments associated with news content on Facebook (Ramos et al., 2025), but evidence concerning Instagram remains limited. Moreover, less is known about how different forms of climate dissent coexist within news-related comment sections during periods of intense media attention to extreme climatic events. Examining these discussions during a major heatwave provides an opportunity to characterize not only explicit forms of climate denial but also more indirect forms of contestation involving normalization, naturalization, institutional distrust, conspiracy narratives, and appeals to personal experience.

Against this background, the present study adopts a qualitative case-study approach to examine climate-related discourse in Instagram comments associated with news coverage of the June 2026 European heatwave by selected Portuguese news outlets. The study does not seek to provide statistical estimates of the prevalence of climate denial among Portuguese Instagram users or the Portuguese population. Instead, it aims to characterize the discursive patterns present within a defined corpus of publicly accessible comments and to examine the forms of argumentation through which climate-related scientific explanations were contested, supported, or reinterpreted.

Examining the coexistence of climate-dissent, climate-affirming, and neutral comments is also important because comment sections should not be assumed to contain a uniform set of attitudes or rhetorical positions. Identifying these different responses makes it possible to characterize the range of discourse present within the same news-related context, rather than focusing exclusively on contestation. In this study, coexistence refers to the presence of these different types of discourse within the analyzed corpus, not to direct interaction or exchange between users. This distinction is particularly relevant because the analysis focuses on top-level comments and excludes replies to other comments.

Accordingly, the study addresses the following research questions:

RQ1. What are the main discursive patterns through which climate change is contested in Instagram comments associated with climate-related news during a major European heatwave?

RQ2. What forms of argumentation are used by commenters to challenge, minimize, or reinterpret scientific explanations of climate change and extreme weather?

RQ3. How are climate-dissent discourses represented alongside climate-affirming or neutral comments within the analyzed corpus?

By addressing these questions, the study contributes to the literature on climate-change denial, digital science communication, and public responses to climate-related news, providing evidence from the relatively underexamined Portuguese Instagram context. The comments presented in the analysis were selected according to the number of likes received and are used solely as illustrative examples of the discursive categories identified, rather than as indicators of agreement, endorsement, or representativeness.

2. Materials and Methods

This study adopted a qualitative research design based on inductive thematic analysis, complemented by descriptive quantification of the resulting thematic categories. The qualitative analysis was used to identify, characterize, and interpret the main discursive

patterns in the comments, while subsequent frequency and percentage calculations were used to describe the distribution of these categories across the corpus.

2.1. Comment Coding

Data collection took place during the observation period in June 2026, coinciding with an intense heatwave that affected several European countries and generated extensive media coverage. All publications related to climate change, heatwaves, extreme temperatures, and associated meteorological phenomena published by the official Instagram profiles of the four Portuguese news outlets selected for the study were considered. The selection of these outlets was based on their substantial Instagram reach rather than on their political or editorial orientation. At the time of data collection, the four outlets had among the largest Instagram audiences among Portuguese news media and consequently provided a substantial volume of publicly accessible audience comments. The selected outlets represent prominent actors within the Portuguese news media landscape, although they differ in their editorial profiles and positioning. These differences were not used as analytical or sampling criteria, as the purpose of the study was not to compare climate-change discourse across media outlets. Rather, the selection was intended to provide a sufficiently large and visible corpus of public audience reactions to climate-related news.

In total, 13 posts related to the European heatwave were identified, generating a corpus of 1197 user comments. The 13 posts were distributed across the four selected outlets as follows: 4, 4, 3, and 2 posts, respectively. The unit of analysis was the individual top-level comment responding directly to the news publication. The corpus was not intended to represent all climate-related content published on Instagram, but rather to provide an in-depth qualitative examination of public discourse during a single high-impact climatic event.

Comments were collected manually from the original Instagram posts. Screenshots of the comments were stored together with the corresponding links to the original posts, allowing the researchers to return to the original publications when necessary during the analysis. During corpus preparation, duplicate comments were identified as instances in which the same user posted the same comment more than once on the same Instagram post. Repeated instances of the same comment by the same user were treated as duplicates and counted only once in the final corpus. Identical or similar comments posted by different users were not considered duplicates and were retained as separate contributions.

Replies to comments were excluded because the study focused on users' direct responses to the news publications rather than on interactions between commenters. During the initial review of the corpus, replies frequently consisted of interpersonal exchanges involving disagreement, clarification, and discussion between users. These interactions represented a different level of discourse from direct responses to the news publications and were therefore outside the analytical scope of the study.

Because the researchers had access only to publicly visible content on Instagram during the observation period, it was not possible to determine whether individual comments had been removed, hidden, or otherwise affected by account-level or platform-level moderation or curation. The corpus should therefore be understood as a temporal snapshot of publicly accessible comments rather than as a complete record of all comments submitted to the selected posts.

2.2. Coding Procedure

All comments were first read in full by the researchers to familiarize themselves with the corpus and identify recurring discursive patterns. The thematic categories were developed inductively from this exploratory reading. Preliminary categories were subse-

quently discussed, reviewed, and refined among the researchers, resulting in an agreed coding framework.

The final typology comprised seven thematic categories, six representing forms of climate dissent and one comprising climate-affirming or neutral discourse. The categories were defined inductively according to the predominant discursive function identified in each comment. Although some comments could contain elements associated with more than one category, the categories were treated as analytically distinct coding categories, and each comment was assigned to the category corresponding to its predominant discursive function. This approach recognizes that different rhetorical strategies may intersect within individual comments while maintaining a consistent coding framework across the corpus.

The seven categories were:

(a) Denial of human influence on climate change: comments attributing observed climate change primarily or exclusively to natural factors and rejecting or minimizing the role of anthropogenic activity;
(b) Normalization and trivialization of observed phenomena: comments primarily framing heatwaves or other extreme temperatures as normal, recurrent, cyclical, or otherwise unexceptional phenomena, thereby minimizing their significance;
(c) Discrediting of mass media: comments questioning the credibility of news organizations or accusing the media of alarmism, manipulation, sensationalism, or fearmongering in their coverage of climate-related issues;
(d) Discrediting of science and experts: comments challenging the credibility of scientists, scientific institutions, climate studies, or expert knowledge;
(e) Conspiracy narratives: comments attributing climate-related phenomena or climate communication to alleged conspiracies involving governments, elites, organizations, or covert forms of environmental manipulation;
(f) Anecdotal evidence and personal experience: comments primarily invoking individual memories or personal experiences as evidence to challenge, minimize, or contradict scientific explanations of climate change or extreme weather;
(g) Climate-affirming or neutral discourses: comments expressing recognition of the reality or significance of climate change, expressing concern about climate-related phenomena, supporting climate action, or not expressing an identifiable position of climate dissent.

The distinction between normalization and anecdotal evidence was based on the predominant function of the discourse. Comments were coded as normalization when their primary function was to portray extreme weather as ordinary, recurrent, or insignificant, whereas comments were coded as anecdotal evidence when personal experience or individual memory was primarily used as evidence to challenge or reinterpret broader scientific explanations. These strategies could nevertheless overlap within the same rhetorical statement.

Once the coding framework had been established, the agreed coding framework was then independently applied by both researchers to the remaining 1077 comments. Inter-rater agreement was assessed using Cohen's kappa ($\kappa = 0.82$), indicating a high level of inter-rater agreement. Discrepancies were subsequently discussed and resolved by consensus. The agreed coding framework was then applied to the remaining comments in the corpus.

Following the qualitative coding process, the frequency of comments assigned to each thematic category was calculated and expressed as a percentage of the total corpus ($N = 1197$). This quantification was descriptive and was used to characterize the distribution of the identified discursive patterns rather than to perform inferential statistical

analysis. The distribution of comments across the thematic categories is presented in Figure 1.

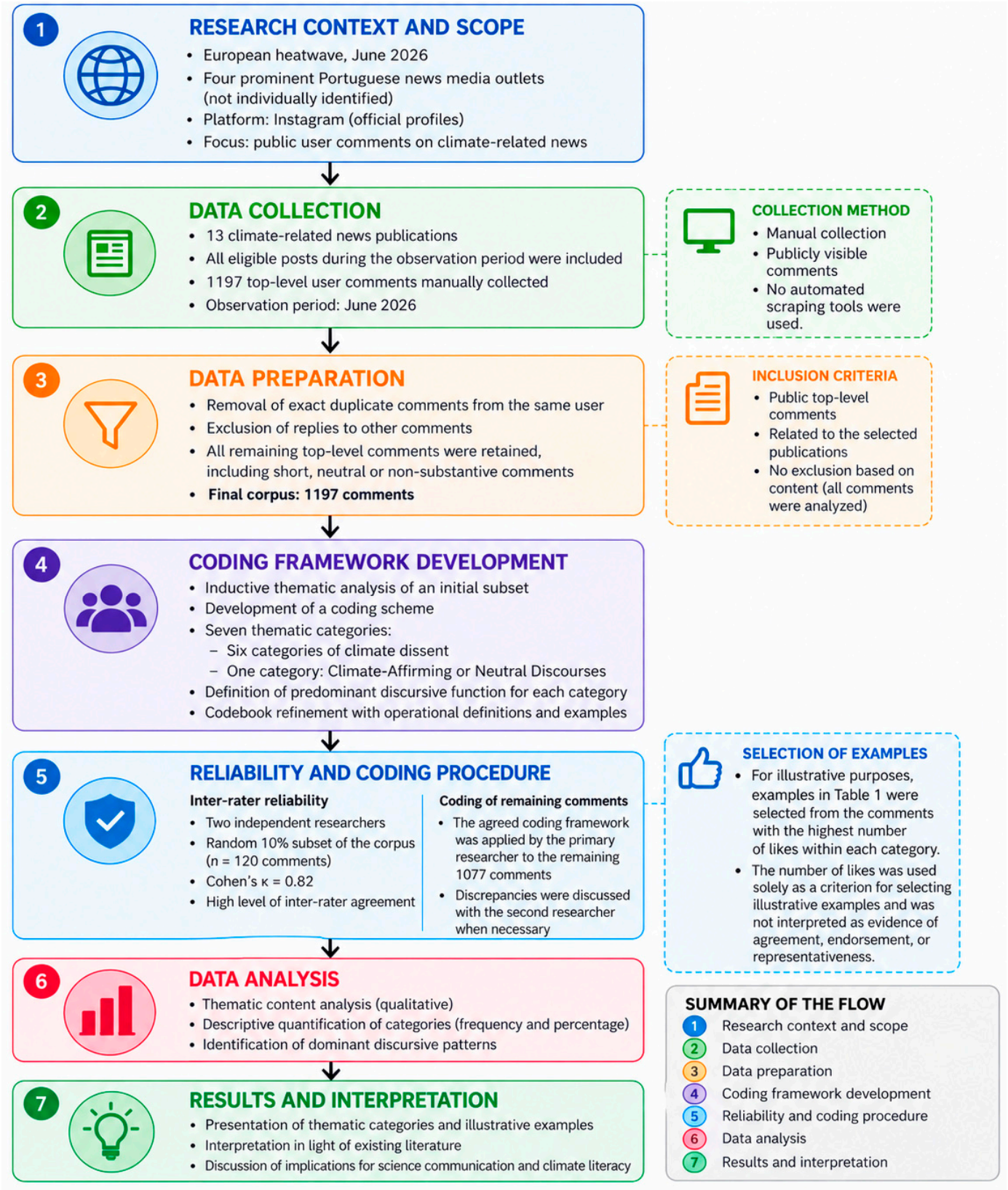


Figure 1. Methodological flowchart of the study.

For illustrative purposes, the comments presented in Table 1 were selected from those receiving the highest number of likes within each category, as they provided clear examples of the discursive patterns identified. The number of likes was used solely as a criterion for selecting illustrative examples and was not interpreted as evidence of agreement, endorsement, or representativeness of users' views.

Table 1. Percentage distribution and typology of discursive patterns identified in the total corpus of comments (N = 1197).

Category	Description	%	Comment Example
Denial of Human Influence on Climate Change	Rejection of anthropogenic responsibility for global warming, attributing climate change primarily or exclusively to natural factors.	31.4	"The Sun is at its 25th cycle, it can change Earth's climate."
Normalization and Trivialization of Observed Phenomena	Comments primarily framing heatwaves or other extreme temperatures as normal, recurrent, cyclical, or otherwise unexceptional phenomena, thereby minimizing their significance.	21.0	"We are in the summer, why all the drama?"
Discrediting of Mass Media	Accusations of alarmism, manipulation, sensationalism, or fear-mongering by the media in their coverage of climate-related issues.	13.8	"The mainstream media loves to spread terror."
Climate-Affirming or Neutral Discourses	Comments expressing recognition of the reality or significance of climate change, expressing concern about climate-related phenomena, supporting climate action, or not expressing an identifiable position of climate dissent.	11.5	"Scary what is happening in Europe. We must change behaviors urgently."
Discrediting of Science and Experts	Comments challenging the credibility of scientists, scientific institutions, climate studies, or expert knowledge.	9.8	"Scientists are paid to maintain the narrative."
Conspiracy Narratives	Comments attributing climate-related phenomena or climate communication to alleged conspiracies involving governments, elites, organizations, or covert forms of environmental manipulation.	7.2	"Start by banning geoengineering and chemtrails."
Anecdotal Evidence and Personal Experience	Comments primarily invoking individual memories or personal experiences as evidence to challenge, minimize, or contradict scientific explanations of climate change or extreme weather.	5.3	"I'm 50 years old and when I was a kid it was this hot or worse."

2.3. Ethical Considerations

This study analyzed publicly available comments posted on the official Instagram profiles of major Portuguese news outlets. The study involved no direct interaction with users, recruitment of participants, access to private information, or attempt to identify individual authors. Data collection followed the Association of Internet Researchers (AoIR) Ethics Guidelines 3.0 for research involving public online content. Comments were anonymized prior to analysis, and no usernames, profile photographs, or other personally identifiable information are reported in the manuscript. Direct identifiers, including usernames and profile photographs, were not recorded in the dataset used for analysis or reported in the manuscript. User comments were translated into English for presentation where applicable, and identifying information was removed to reduce the possibility of direct attribution to individual accounts.

The analysis focused on aggregate discursive patterns rather than individual users. Particular care was taken to minimize potential risks to privacy and identification, given that the comments were publicly accessible but originated from individual users. As the age

of comment authors could not be verified, the possibility that some comments originated from minors cannot be excluded; this is acknowledged as a limitation of the study.

3. Results

Thirteen posts published by the four main Portuguese news media outlets on Instagram during the observation period in June 2026 generated a corpus of 1197 comments. All comments were coded according to the thematic framework developed during the qualitative analysis. The percentage distribution presented below refers to the entire corpus (N = 1197), whereas the quotations shown in Table 1 were selected from the comments that received the highest number of user "likes" as illustrative examples of each thematic category.

As detailed in Table 1, the most prevalent discourse was the denial of human influence on climate change (31.4%), closely followed by the normalization of observed phenomena (21.0%). Together, these two categories accounted for 52.4% of the analyzed comments, indicating that these forms of climate dissent were prominent within the corpus.

The thematic pillars associated with institutional distrust also achieved considerable representation: Discrediting of mass media accounted for 13.8% of the discourse, while the delegitimation of science and its experts accounted for 9.8%. Conspiracy theories, particularly those involving covert atmospheric manipulation such as geoengineering or "chemtrails," accounted for 7.2% of the corpus. Conversely, the use of anecdotal evidence and personal experience to dispute empirical data had the lowest frequency among the dissent typologies, accounting for 5.3% of the corpus.

Finally, climate-affirming or neutral discourses accounted for 11.5% of the total corpus. These comments either expressed concern about the heatwave, recognized the significance of climate change, supported action, or did not express an identifiable climate-dissent position. This indicates that climate-affirming or non-dissenting responses were also present within the analyzed comment sections, although they were less frequent than the combined climate-dissent categories.

It is important to emphasize that the comments presented in Table 1 serve as illustrative examples of the identified categories. For illustrative purposes, comments receiving the highest number of likes within each category were selected because they provided clear examples of the discursive patterns identified. The number of likes was used solely as a criterion for selecting illustrative examples and was not interpreted as evidence of agreement, endorsement, or representativeness.

In a specific publication explaining that Portugal had escaped the core severity of the European heatwave due to an Atlantic depression, the pattern of comments differed from that observed across the corpus. This post contained 16 analyzed comments, most of which expressed concern about the phenomenon or valued the information provided, while only a small number expressed climate dissent or distrust. This isolated observation should not be interpreted as evidence of a causal relationship between journalistic framing and audience response, particularly because the study did not systematically analyze the framing characteristics of the selected publications. Nevertheless, the difference observed across this individual post suggests a potentially relevant direction for future comparative research examining how journalistic framing and contextualization may relate to patterns of audience response.

4. Discussion

The results obtained show a substantial presence of climate-dissent discourses in the comments associated with news about the European heatwave. Although the identified categories present distinct characteristics, several involve forms of contestation that do not

necessarily constitute explicit climate denial, but rather challenge, minimize, or reinterpret scientific explanations and their communicative intermediaries.

This context is particularly relevant to the interpretation of the present study's results. The high proportion of climate-dissent discourse identified in the analyzed comments should not, therefore, be interpreted as representative of the Portuguese population's attitudes towards climate change. This finding can be considered alongside broader evidence of public attitudes towards climate change in Portugal. Previous research indicates high levels of recognition of climate change and concern about its consequences among Portuguese respondents (Fraembs & Drobnič, 2024; European Parliament, 2026). The substantial presence of climate-dissent discourse in the present corpus contrasts with this broader pattern of public concern. However, this contrast should not be interpreted as evidence that Portuguese public opinion is divided in the same proportions as the analyzed comments. Rather, it highlights the importance of distinguishing between population-level attitudes and the discursive patterns visible in specific social media comment sections. The present study cannot determine whether this concentration of dissent reflects the characteristics of users who choose to comment, platform dynamics, the nature of the news coverage, or a combination of these factors.

4.1. Denial of Human Influence on Climate Change

The most frequent category identified in this study corresponded to the denial of human influence on climate change. The comments included in this category attributed the observed changes exclusively to natural factors, such as solar cycles, natural climate variations, or long-term geological processes, rejecting the role of anthropogenic greenhouse gas emissions.

Among the comments analyzed, examples such as:

> "The Sun is in its 25th cycle, meaning more activity, only it can change the climate on Earth. Our planet has always suffered from so-called climate change since it existed."

This type of discourse represents one of the classic forms of climate change denial, rejecting the scientific consensus on the influence of human activities on global warming (Poortinga et al., 2011). Although natural factors, such as solar activity, volcanism, or internal climate variability, effectively influence the Earth's climate system, the literature demonstrates that the warming observed since the Industrial Revolution cannot be explained solely by these mechanisms, with anthropogenic influence currently considered the main cause of observed climate change (Stern & Kaufmann, 2014; NASA, 2024b).

The results obtained are also in line with the recent evolution of climate change denial described by Lamb et al. (2020). According to these authors, the explicit denial of the existence of climate change is progressively giving way to more subtle forms of contestation, in which it is accepted that the climate is changing, but human influence is rejected or the need to implement mitigation measures is minimized. In this context, attributing climate change to exclusively natural causes is currently one of the most frequent discursive strategies for challenging the scientific consensus without directly denying the existence of the phenomenon.

4.2. Normalization and Trivialization of Observed Phenomena

The second most frequent category corresponded to the normalization and trivialization of observed phenomena. Expressions such as "it has always been hot," "we are in summer," or "there is nothing abnormal" appeared repeatedly in the analyzed comments, seeking to present high temperatures as natural, recurring phenomena devoid of any relation to anthropogenic climate change.

Unlike the explicit denial of the existence of climate change, this type of discourse does not necessarily reject that the climate is changing. Instead, it seeks to relativize the importance of observed phenomena, reducing the perception of risk and the need to act. This pattern fits into the concept of climate delay discourse, described by Lamb et al. (2020), according to which climate action is delayed through the minimization of impacts or the normalization of extreme events.

However, scientific evidence shows that heat waves have become more frequent, intense, and prolonged, both in Portugal and in other regions of Europe (Copernicus, 2023; Chen, 2026). Thus, interpreting these phenomena as perfectly normal events does not coincide with the trends observed in the climatological series of recent decades.

The persistence of this type of argument could also be interpreted in light of the Shifting Baseline Syndrome (Soga & Gaston, 2018). According to this concept, individuals tend to use their personal experience as a reference to assess environmental changes, progressively adjusting their perception of what they consider "normal." As a result, gradual changes in climatic conditions may cease to be perceived as exceptional and be incorporated into the climate's natural variability.

In parallel, cognitive psychology demonstrates that human memory is reconstructive and subject to various biases, and does not constitute an objective record of past meteorological conditions. Instead of relying on climatological series or observational data, many individuals base their interpretations on autobiographical memories or isolated experiences, which are often insufficient to characterize long-term climate trends. This behavior could also be explained by the theory of identity-protective cognition (Kahan et al., 2007, 2012; Lewandowsky et al. (2013). From this perspective, individuals tend to interpret new evidence in ways consistent with their previously established beliefs and values. Acceptance of scientific evidence on climate change may imply behavioral changes, acceptance of environmental regulations, or even the revision of previously held political and ideological positions. Thus, minimizing observed phenomena could constitute not only a misinterpretation of climate reality, but also a cognitive mechanism for protecting individual identity and the social group to which the individual belongs.

4.3. Discrediting of Mass Media

The theme of politicization and media/Discrediting of mass media mistrust was a prominent discursive pillar in the analyzed corpus, accounting for 13.8% of comments. Comments within this category frequently advanced accusations of institutional alarmism, deliberate exaggeration, or structural manipulation, framing news media outlets not as objective vehicles for science communication, but as agents responsible for manufactured fear-mongering. Representative examples include:

> "Trash journalism serving the woke agenda."—(Translated from the original Portuguese by the authors)

> "Spreading fear and alarmism to scare people."

These results suggest that a significant vector of climate dissent is not directed at the empirical scientific evidence itself, but rather at the socio-epistemic intermediaries responsible for its public dissemination. Within this rhetorical framework, the press ceases to be perceived as a neutral translator of scientific consensus and is instead depicted as an ideological or political apparatus aligned with institutional "elites" or hidden macroeconomic interests. By transforming a scientific reality into a hyper-politicised debate, this discursive strategy effectively erodes the credibility of environmental reporting and diminishes public trust in media-mediated science communication (van der Linden, 2023).

This pattern of climate dissent is consistent with broader international trends documented in recent literature. For instance, the Edelman Trust Barometer (Edelman, 2025)

both signal a gradual erosion of trust in legacy media and major social institutions, driven by a growing public perception of systemic bias and an accelerated exposure to digital misinformation. On Instagram, this systemic distrust manifests as a direct challenge to the legitimacy of knowledge-producing and knowledge-disseminating institutions, providing a fertile ground for alternative, counter-scientific narratives.

Concurrently, it is worth noting that contemporary news media faces structural challenges that may inadvertently feed these adversarial dynamics. In a highly competitive digital attention economy, the reliance on sensationalist headlines or the oversimplification of complex meteorological models can compromise the perceived rigor of climate coverage (Russill, 2023).

In this post, which contained 16 analyzed comments, most comments expressed concern about the phenomenon or valued the information provided, while only a small number contained elements of climate dissent or distrust. Although this isolated observation does not support causal claims, it illustrates how patterns of audience response may vary across individual publications and warrants further investigation through comparative analysis of journalistic framing and comment characteristics.

Although this isolated observation does not support causal claims, it raises the possibility that more contextualized and expert-informed reporting may be associated with different patterns of audience response. This observation should be interpreted cautiously and warrants further investigation using comparative designs across a larger number of publications.

4.4. Discrediting of Science and Experts

The discrediting of science and experts constituted another category identified in the analyzed comments. The discourses framed in this category sought to question the credibility of scientists, research institutions, and bodies responsible for climate monitoring, with frequent references to alleged economic interests, data manipulation, or ideological biases within the scientific community. Among the comments observed, the following statements stand out:

"Scientists paid with our money to say outrageous things."

"The sheep believe what they see on television."

"Wake up."

"Do your own research."

"The scientists. . ." "Experts are bought off."

These comments generally focused less on directly refuting scientific evidence than on discrediting those who produce or communicate this knowledge. Instead, they focused on discrediting those who produce or communicate this knowledge. This type of strategy falls under the concept of manufacturing doubt, described by Bramoullé and Orset (2018), whose objective is not necessarily to demonstrate that science is wrong, but rather to generate enough doubt to compromise public trust in scientific research. Similar strategies have been used previously in debates related to the effects of tobacco or vaccination (McKee, 2017; Herrera-Peco et al., 2021).

The results obtained can also be interpreted in light of the concept of epistemic populism or epistemic anti-elitism (Mehl et al., 2025). According to this perspective, knowledge produced by experts tends to be perceived as less credible because it is associated with institutions considered part of an "elite," while common sense, individual experience, or the opinion of ordinary citizens are presented as more authentic forms of knowledge or reliable.

This type of discourse represents a particularly relevant challenge for scientific communication. When trust in scientific institutions is replaced by alternative forms of knowledge validation, based on personal opinion, individual experience, or the popularity of certain discourses on social media, it becomes more difficult to promote a public debate supported by scientific evidence. In this context, the denialism ceases to focus solely on climate change as a physical phenomenon and begins to encompass the very mechanisms of production, validation, and communication of scientific knowledge.

4.5. Conspiracy Narratives

Among the conspiracy narratives identified, several references to the supposed influence of so-called chemtrails on climate change stood out. According to this conspiracy theory, the condensation trails left by aircraft (contrails) would actually be deliberate releases of chemical substances intended to modify the climate, control the population, or cause environmental changes. Chemtrail narratives have been examined in the literature as a specific form of conspiracy belief associated with climate and geoengineering discourse (Cairns, 2014; Debnath et al., 2023; Tingley & Wagner, 2017).

However, this claim is not supported by scientific evidence. The white lines observed behind aircraft correspond, in most cases, to condensation trails (or contrails), formed by the condensation and freezing of water vapor present in engine exhaust gases when they come into contact with very cold and humid air masses at altitude. This is a well-established physical phenomenon in atmospheric science (Buck, 2025; Llanes Álvarez et al., 2016).

More broadly, climate conspiracy narratives may contribute to the rejection of scientific explanations and climate-related action. Research on conspiracy beliefs has linked them to distrust in scientific institutions and rejection of scientific consensus (Douglas et al., 2019). A meta-analysis of 22 independent samples further found that climate conspiracy beliefs were associated with lower acceptance of climate science, lower trust, lower environmental concern, and lower support for pro-environmental policies (Biddlestone et al., 2022). These findings provide a broader context for interpreting the conspiracy narratives identified in the present corpus.

In relation specifically to chemtrail claims, Shearer et al. (2016) surveyed 77 experts in atmospheric chemistry and geochemistry and found that 76 (98.7%) reported having encountered no evidence supporting the existence of a secret, large-scale atmospheric spraying program. The evidence commonly cited by proponents could instead be explained by established physical and chemical processes associated with aircraft contrails and atmospheric aerosols (Shearer et al., 2016). Thus, the chemtrail comments identified in the present corpus illustrate a specific form of conspiracy-based interpretation that persists despite the absence of supporting scientific evidence.

4.6. Use of Personal Experiences as Evidence

The use of personal experiences as evidence was the least frequent category identified in this study, although it remains relevant as it illustrates a recurring pattern of interpreting climate change. The comments in this category frequently relied on personal memories to challenge the existence or severity of the phenomenon.

Expressions such as “when I was a child it was also this hot” or “there were already similar heat waves fifty years ago” illustrate the tendency to use personal experiences as a criterion for validating climate reality, attributing greater credibility to individual memory than to scientific evidence produced through climatological research. This type of discourse highlights difficulties in distinguishing between weather and climate. While weather describes the atmospheric conditions observed in a given location and time, climate corresponds to the statistical behavior of these variables over extended periods,

conventionally at least 30 years, considering multiple indicators such as temperature, precipitation, humidity, wind, and atmospheric pressure (WMO, 1973; IPCC, 2021).

Consequently, isolated episodes of heat, cold, or precipitation, as well as individual memories associated with these events, do not constitute sufficient evidence to characterize climate trends. Climate assessment is based on the analysis of extensive time series systematically collected from thousands of geographically distributed weather stations and supplemented by observations from satellites, ocean buoys, and other monitoring systems (NOAA, 2018; NASA, 2024a).

The literature in cognitive psychology also contributes to understanding this discursive pattern. According to Tversky and Kahneman (1974), individuals tend to evaluate complex phenomena using the so-called availability heuristic, attributing greater importance to events that are easily remembered or personally experienced. Similarly, Weber (2010) demonstrates that recent or emotionally significant meteorological experiences often exert a greater influence on public perception of climate change than scientific information based on long-term time series.

The results obtained suggest, therefore, that part of the observed climate change debate is based on the substitution of scientific evidence with individual experiments. This prioritization of personal experience over information from climatological research poses a significant challenge to communicating climate change and reinforces the importance of promoting climate literacy and understanding the fundamental principles of climate science. The findings can also be considered alongside those reported by Ramos et al. (2025) in their analysis of climate-related discourse on Facebook in Portugal. Although the two studies differ in platform, sampling strategy, observation context, and analytical procedures, both identify forms of climate contestation that extend beyond explicit rejection of climate change, including the attribution of climatic phenomena to alternative causes and challenges to scientific or institutional credibility. The present findings therefore provide complementary evidence that climate dissent in Portuguese social-media environments may take multiple discursive forms. However, direct comparison of the prevalence of specific categories across the two studies should be avoided because their methodological designs are not equivalent.

4.7. Limitations

This study presents several methodological limitations that should be considered when interpreting the findings.

First, data collection was restricted to a single high-profile climatic event and to one social media platform, Instagram. The findings should therefore not be generalized to other climate-related events, platforms, or time periods.

Second, the analysis focused on top-level comments responding directly to the news publications, while replies to comments were excluded. This decision allowed the study to maintain a clear focus on users' direct responses to journalistic content but also meant that subsequent interpersonal exchanges were not captured. Future research could examine full comment-thread structures to investigate how climate-related claims are contested, reinforced, or negotiated between users.

Third, the researchers could not independently verify whether comments had been removed, hidden, or otherwise curated by the Instagram accounts or the platform before or during the observation period. Consequently, the corpus should be understood as a snapshot of publicly accessible comments rather than a complete record of all comments submitted to the selected posts.

Finally, although the study provides contextual information on the demographic profile of Instagram users in Portugal, demographic and political information about individual

commenters was not collected. It is therefore not possible to determine whether the observed discursive patterns are associated with particular demographic or political groups, or whether the commenters analyzed reflect the broader Portuguese Instagram population or the Portuguese population as a whole.

Despite these limitations, the study provides an initial characterization of climate-change dissent discourses present in the Instagram comment sections of selected Portuguese news outlets.

5. Conclusions

This study characterized the main discursive patterns identified in Instagram comments associated with climate-related news published by selected Portuguese news outlets during a European heatwave. The findings indicate a substantial presence of climate-dissent discourses within the analyzed corpus, with indirect forms of contestation more common than explicit rejection of the existence of climate change. These included the attribution of climate change to natural factors, the normalization or trivialization of extreme phenomena, distrust toward news media and scientific institutions, conspiracy narratives, and the use of personal experience as evidence. This pattern is consistent with previous research describing a shift from explicit climate-change denial towards more indirect forms of contestation and delay (Lamb et al., 2020; Ramos et al., 2025).

The findings also indicate that climate dissent may involve challenges to the institutions and intermediaries through which scientific knowledge is communicated, rather than being limited to disagreement with scientific evidence itself. This distinction is relevant for understanding how climate-related information is contested in digital environments, particularly where distrust in media and scientific institutions forms part of the discourse (van der Linden, 2023).

Although this study did not test educational or communication interventions, the findings highlight the relevance of scientific, climate, and media literacy for enabling citizens to evaluate sources critically and distinguish scientific evidence from opinion. These implications should be understood as recommendations informed by the observed discursive patterns rather than as effects demonstrated by the present study (OECD, 2024; UNESCO, 2024).

Future research should examine whether these patterns persist across different climate events and social media platforms, as well as investigate how journalistic framing may relate to differences in audience responses. Further research should also examine full comment-thread structures to better understand how climate-related claims are contested, reinforced, or negotiated through user interactions.

Overall, the study provides an initial characterization of climate-dissent discourse in a specific segment of the Portuguese digital media environment. Its findings contribute to understanding how climate change is contested not only through rejection of scientific claims, but also through normalization, institutional distrust, alternative explanations, and competing forms of knowledge validation.

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Institutional Review Board Statement: No formal ethics committee review was sought prior to data collection. The study involved the analysis of publicly accessible comments posted on the

official Instagram profiles of Portuguese news media outlets, without direct interaction with users or attempts to identify individual commenters. Ethical considerations included the public nature of the material, the non-interactive design, and the protection of users' privacy. The identities of the news outlets and individual commenters are not disclosed in the manuscript, and no personally identifiable information is reported. Comments were paraphrased where appropriate to reduce the risk of identifying individual users through searches of verbatim text. The study was informed by the Association of Internet Researchers' *Internet Research: Ethical Guidelines 3.0*.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data supporting the findings of this study are not publicly available due to privacy considerations and the risk of indirect identification of individual commenters. The aggregated data supporting the findings are presented in the article. Further inquiries regarding data availability may be directed to the corresponding author, subject to applicable privacy and ethical considerations.

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