

# The Storm Within: Hurricanes and Socio-Political Leaning in Climate Change Group Behavior

**Arianna Pera**  
IT University of Copenhagen  
arpe@itu.dk

**Luca Maria Aiello**  
IT University of Copenhagen  
luai@itu.dk

## 1 Introduction

Climate change is a pressing global crisis marked by a surge in extreme weather events, requiring societal responses and mitigation efforts. Collective reactions to these events are intricately tied to socio-political stances, complicating our understanding in such contexts. Research has shown how real-world events can greatly affect activity on social media, as exemplified by the migration from Twitter to Mastodon [2]. While evidence points to correlations between extreme weather events and surges in the public interest in climate change discussions [6], a gap remains in our comprehension of how such events impact the interaction dynamics of people engaging in climate-related discussions. In particular, two competing hypotheses have been put forward about climate concern being mediated mainly by political orientation [1] or economic wealth [3], suggesting diverse influencing factors.

In a preliminary contribution to bridging this research gap and quantitatively assessing these two alternative hypotheses, we examine the impact of the most significant events in the 2022 Atlantic Hurricane season [4] on climate change-related group behavior. Our study centers on Reddit, which enables us to investigate topical discussion groups, characterize them in terms of their socio-political leaning, and analyze their responses to climate change discourse following these events. Our objective is to shed light on how extreme climate events affect engagement in climate change discourse differently across diverse socio-political spectra.

## 2 Methodological framework

We selected two extreme climate events that occurred in 2022: Hurricane Fiona (Sept 14 - Sept 24) and Tropical Storm Ian (Sept 24 - Oct 1). We focused on a six-month timeframe, divided into pre-shock (June 1 - Sep 13) and during/after shock (Sep 14 - Dec 31) periods. From a set of 22 popular subreddits relevant to climate change, we extracted discussion threads that developed from posts containing words within a validated list of keywords related to climate change [5]. For each subreddit and each of the two time periods under consideration, we constructed a directed reply network from the respective climate-related discussion threads. These reply networks contain 147k unique users altogether.

To gain a clearer understanding of the possible impact of the shock events on the interaction dynamics of these discussion groups, we analyzed the variation in their level of reciprocity, average clustering coefficient, and average degree centrality. These metrics provide insights into, respectively, changes in user engagement and interactions, variations of conversational fragmentation, and fluctuations in the concentration of influential nodes. To assess whether shifts in the structure of the conversation network are associated with the socio-political leaning of the group, we estimated the *affluence* and *partisan score* of each subreddit based on an established methodology that considers community embedding projections on social axes defined by seed subreddits [7]. Affluence is expressed on a spectrum that goes from financial adversity (negative scores) to financial prosperity (positive scores). Partisan scores define a spectrum that goes from left-leaning (negative scores) to right-leaning (positive scores).

## 3 Preliminary results

Figure 1 shows the variation ( $\Delta$ ) of the three network measures after the natural disasters in the reply graphs across the different subreddits and relates it to affluence and partisanship. Despite the high variability of the signal, the data hints at an overall trend toward heightened interaction, formation of

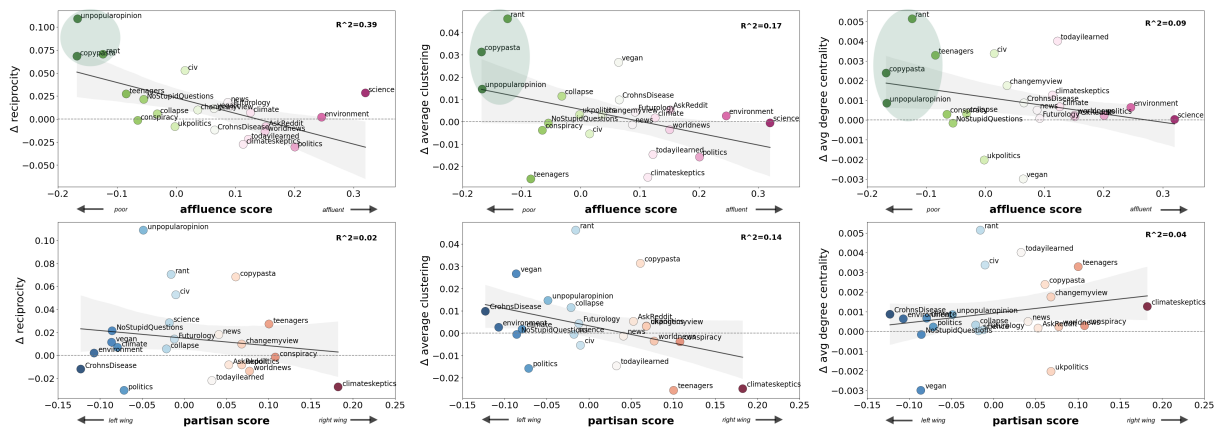


Figure 1: Distribution of difference in reciprocity, average clustering coefficient, and average degree centrality in relation to socio-economic (affluence) and political (partisan) leanings of reference subreddits, after the shock events. We report  $R^2$  of linear regression fits and highlight significant groups of subreddits in terms of metrics variation.

tighter-knit communities, and higher concentration of influential nodes driving the discourse in subreddits that tend to exhibit a higher level of financial adversity. In particular, we observe a distinct cluster of low-affluence communities that experienced a marked increase in all three network metrics. In contrast, the role of political leaning in influencing post-shock engagement and network clustering appears less pronounced. Although a few subreddits experience metric shifts around the target events, the association between these changes and the political orientation is weaker than that observed for affluence.

#### 4 Future work

Within the realm of online climate change discourse, understanding how extreme events affect group behavior, particularly in relation to diverse socio-political leanings, remains a complex and nuanced endeavor. Our preliminary findings highlight the significance of socio-economic conditions in explaining the shifts in climate change-related group behavior, seemingly outweighing the influence of political affiliations. Future research will broaden the analysis, examining various shock events, focusing on the difference between those of human and natural origin, and delving deeper into a comprehensive analysis of network dynamics and language-based variations in online climate change discussions.

#### References

- [1] Thea Gregersen et al. “Political orientation moderates the relationship between climate change beliefs and worry about climate change”. In: *Frontiers in psychology* 11 (2020), p. 1573.
- [2] Lucio La Cava, Luca Maria Aiello, and Andrea Tagarelli. “Get Out of the Nest! Drivers of Social Influence in the# TwitterMigration to Mastodon”. In: *arXiv preprint arXiv:2305.19056* (2023).
- [3] Alex Y Lo and Alex T Chow. “The relationship between climate change concern and national wealth”. In: *Climatic change* 131 (2015), pp. 335–348.
- [4] NOAA. *Damaging 2022 Atlantic hurricane season draws to a close*. Accessed: 2023-10-10. 2022. URL: <https://www.noaa.gov/news-release/damaging-2022-atlantic-hurricane-season-draws-to-close>.
- [5] Mohammad S Parsa et al. “Analyzing Climate Change Discussions on Reddit”. In: *2022 International Conference on Computational Science and Computational Intelligence (CSCI)*. IEEE, 2022, pp. 826–832.
- [6] Maddalena Torricelli et al. “Hurricanes Increase Climate Change Conversations on Twitter”. In: *arXiv preprint arXiv:2305.07529* (2023).
- [7] Isaac Waller and Ashton Anderson. “Quantifying social organization and political polarization in online platforms”. In: *Nature* 600.7888 (2021), pp. 264–268.