



# Spatiotemporal Analysis of Forecasted Natural Hazard Risk via Twitter Data

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## Abstract

In a digitally driven society, it is not uncommon for users to share natural hazard-related status updates on social media platforms such as Twitter. Such posts, known as tweets, capture various attributes related to events including expected areas of impact as well as associated damage. In this regard, Twitter serves as an incredibly powerful mechanism to better understand natural hazard risk communication. This study builds upon current literature to ultimately investigate social media in forecasted levels of natural hazard risk (FLR). Two natural hazards of varying spatial and temporal scales are considered: Winter Storm Gia and the March 2019 tornado outbreak. Pertinent tweets from these case studies were analyzed in terms of their geographic location in relation to the event. Expected findings offer a productive discussion regarding the role of social media in natural hazard risk communication, information that is beneficial to all community members.

## Research questions

1. Does a spatiotemporal analysis of Twitter data yield trends based on forecasted levels of natural hazard risk?
2. Is the spatial extent of tweets, within the context of natural hazards, dependent upon subjected levels of forecasted risk?

## Literature review

Growing interest surrounding natural hazards and Twitter:

- Kryvasheyev et al. 2016: Sandy-related tweets increased in cities closer to impact
- Ripberger et al. 2014: Tweets demonstrated greater attentiveness to tornado warnings versus watches
- Alam et al. 2018: Tweeting assisted in coordinating emergency management efforts

## Data

- Twitter Streaming Application Programming Interface (API)

Case studies of varying spatial and temporal scales

- Winter Storm Gia: January 10<sup>th</sup> – 14<sup>th</sup>, 2019
- March 2019 Tornado Outbreak: March 3<sup>rd</sup>, 2019

## Methodology and Future work

- Spatiotemporally analyze tweets in relation to forecasted levels of natural hazard risk (FLR)
- Compare tweet concentrations across counties of varying FLR through spatial statistics and time series analysis
- Poisson regression with tweets and socioeconomic variables

Tornadoes Shelter  
Wind(s) Hail Tornado Severe Weather  
Basement Funnel cloud Tornadoes



Winter Blizzard  
Storm  
Snow Gia

## References

- Alam, F., M. Imran, F. Ofli, M. Aupetit. 2018. A Twitter tale of three hurricanes: Harvey, Irma, and Maria. Conference proceeding. Paper presented at the 15th International Conference on Information Systems for Crisis Response and Management, Rochester, NY, <http://arxiv.org/abs/1805.05144>
- Kryvasheyev, Y., H. Chen, N. Obradovich, E. Moro, P. Van Hentenryck, J. Fowler, M. Cebrian. 2016. Rapid assessment of disaster damage using social media activity. *Science Advance* March: 1 – 12. doi: 10.1126/sciadv.1500779.
- Ripberger, J. T., H. C. Jenkins-Smith, C. L. Silva, D. E. Carlson, M. Henderson. 2014. Social media and severe weather: Do Tweets provide a valid indicator of public attention to severe weather risk communication? *Weather, Climate, and Society* 6(4): 520 – 530. doi: 10.1175/WCAS-D-13-00028.1.