

Hailfall analysis for June 2 and 3, 2022 using Twitter

*Hinako Hayashi¹

1. Ichikawagakuen Ichikawa high school

Hailstorms occurred in the Eastern part of Japan on June 2 and June 3, 2022 causing hail damage. Although local governments and media organizations have announced the damage caused by the hailstorms, no meteorological information such as changes in hail coverage or hailfall size nationwide has been available. In this study, we collected information on hailstorms from Twitter and attempted to examine the meteorological aspects of the hailstorms from the tweets.

Twitter is a social networking service that allows anonymous registration and is used by about 45 million people in Japan. Twitter allows users to post information and attach photos and other content of the moment in short sentences of up to 140 full-width characters, called a Tweet. Ishikawa et al. (2012) analyzed the damage caused by the San'in Region heavy snowfall disaster using Twitter, and Kawai and Fujishiro (2013) conducted an analysis of Twitter used as an information gathering tool during the Great East Japan Earthquake. However, these were surveys of communities connected by hashtags and web surveys, and did not take full advantage of the characteristics of the large scale of Twitter users. In this study, we attempted to increase the size of the survey target and obtain detailed meteorological information as well as damage information by surveying all Tweets by specifying only keywords about hailstorms, a weather phenomenon that is not constantly observed. The information used for the analysis was collected by searching and extracting all Tweets that contained the keyword "hail" in the text among all the Tweets posted during 46 hours from 11:00 a.m. on June 2, 2022 to 9:00 a.m. on June 4, 2022, and reading all of their contents. The analysis period was from October 10, 2022 to February 15, 2023. The total number of Tweets containing "hail" was 90790, of which 47622 contained weather information. The location information of such tweets was confirmed from the text and the posters' profiles, and the time of hailfall and attached photos were also recorded. Although there was a possibility that some of the tweets were inaccurate because we could not be sure that they were taken by the posters themselves, we reduced the proportion of inaccurate tweets by increasing the population of data, and we considered the contents of the tweets to be true unless the posters stated that they were provided by other parties. It is also possible that the object the poster Tweeted was not hail with a diameter of 5 mm or larger but hail with a diameter of less than 5 mm, but in this study, we considered the Tweet as hail if the Tweet said hail.

The time course of the hailfall area was considered from the Tweet collected by the above method. According to the Kumagaya District Meteorological Observatory (2022), the hailstorm area on June 2 appeared in Miyagi before 12:00 and then moved southwestward. The location of the hail was determined from the Tweet location information. All hail areas moved in an east-southeast direction, from southern Yamagata to Fukushima, from central Gunma to Ibaraki, and from western Gunma to Chiba. WeatherNews (2022) reports that clouds moving southward from western Gunma produced heavy hail around the Tokyo-Chiba border. A comparison with the rain cloud radar showed that most of the hailfall areas indicated by the Tweet were in areas with 10 to 40 mm of precipitation or more. However, hailstorms occurred several times a day in northern Fukushima, western Chiba, and central Tokyo on both days, all of which could be due to the tendency of cumulonimbus clouds to form in the plains that can produce hail.

We also compared the average number of Japanese people tweeting according to Social Media Trends

(2020) with the number of tweets collected in this study, and considered the possibility that the increase in tweets was due not only to hailstorms, but also to the time of day when people tend to tweet more. As a result, a slight peak was observed during the time when hail was not falling, and it was confirmed that many people tweeted during that time period, which led to an increase in the number of tweets. It was found that the time of the hailstorm was not related to this trend.

As described above, we were able to estimate the extent of hailfall from Tweets. We believe that SNSs are likely to contain erroneous information, and that at this stage, analysis of a vast amount of data can reduce the proportion of erroneous information and increase its accuracy. However, we have not yet discussed how to handle erroneous information based on scientific verification, so this will be an issue for the future.

Keywords: hail, Twitter, Meteorological Analysis