In this article, we investigated the expression of emotional responses to the 2011 Great East Japan Earthquake by analyzing the frequency of negative emotional terms in tweets posted on Twitter, one of the most popular social media platforms. We focused on differences in time-series variations and diurnal changes between two kinds of disasters: natural disasters (earthquakes and tsunamis) and nuclear accidents. The number of tweets containing negative emotional responses increased sharply shortly after the first huge earthquake and decreased over time, whereas tweets about nuclear accidents showed no correlation with elapsed time. Expressions of anxiety about natural disasters had a circadian rhythm, with a peak at midnight, whereas expressions of anger about the nuclear accident were highly sensitive to critical events related to the accident. These findings were discussed in terms of similarities and differences compared to earlier studies on emotional responses in social media.

**Keywords:** social media, disaster, big data, emotional response, time-series variation.