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A study of probabilistic assessment of tephra fall hazard based on a tephra distribution database in Japan.

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Tephra fall has affected transportation and electricity network facilities (e.g. Wilson et al., 2014). Although numerical probabilistic hazard assessments for tephra falls have been performed (e.g. Bonadonna et al., 2005; Bear-Crozier et al., 2016), it is important to assess hazard based on long-term geological records. To assess the hazard of tephra load in Japan, we re-digitized the existing database of 512 tephra distribution maps (Suto et al., 2007) using ArcGIS. It enables us to present hazard curves of tephra load at arbitrary localities in Japan. Discreet temporal thresholds are selected based on eruption volume to account for the quicker decline in preservation ratio of tephra layers for smaller events (Nakada, 2015; Kiyosugi et al., 2015). To calculate hazard, we have used data in the last 10,000 years for VEI<=5 eruptions (VEI: Volcanic Explosivity Index; Newhall and Self, 1982), and the last 100,000 or 150,000 years for VEI>=6 events. Hazard curves for tephra fall load were made at 47 prefectural seats throughout Japan. Regional characters are found. Probabilities are relatively high, and exceed 1×10-4 at 0 kg/m2 in the area to the east (down-wind) side of the volcanic front from Kanto to Tohoku regions in northeast Japan and Kyusyu region in southwest Japan. Maximum loads are heavier, and its probabilities are relatively low (less than 10-4), in much of southwest Japan. Tephra from large VEI (VEI>=6) events are predominant hazard in this area. The probability of tephra load exceeding 100 kg/m2 is relatively uniform throughout Japan, and is concentrated at 3×10-4 in two-thirds of the prefectural seats. We plan to improve the digitized database by incorporating tephra distribution maps from recent literatures, and by revising questionable maps. Improving methods to join discontinuous contour segments and to interpolate between contour values are also considered.