Forecast trial of postseismic deformetion after the 2011 Tohoku-Oki earthquake by recurrent neural network

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The 2011 Tohoku-Oki earthquake caused large postseismic deformation, hiding possible small signals, such as slow slips and volcanic events. In general, postseismic deformation is fitted by a logarithmic, exponential or their combined function. To forecast postseismic deformation more accurately, we introduce a recurrent neural network method which is one of the machine learning approaches. This method autonomously learns relation between input and output data. We use 700-days sequence of GNSS time-series data of 191 stations (GEONET) as input data and the following data as output data for training the neural network. The results of the neural network better forecast the time-series data than those of regression analyses in an E-W direction. However, in an N-S direction, the neural network does not work better than regression analyses. These facts indicate that data with a sufficiently small signal to noise ratio is needed for the neural network. In the results of the E-W direction, we find several regions with low precision of the forecast, partly corresponding to the Niigata-Kobe strain concentration zone, as well as along the coast of Sea of Japan in northern Tohoku.

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