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Quantitative earthquake forecasts resulting from static stress-triggering

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In recent years, the triggering of earthquakes has been discussed controversially with respect to the underlying mechanisms and the capability to evaluate the resulting seismic hazard. Apart from static stress interactions, other mechanisms including dynamic stress transfer have been proposed to be part of a complex triggering process. Exploiting the theoretical relation between long-term earthquake rates and stressing rate, we demonstrate that static stress changes resulting from an earthquake rupture allow to predict quantitatively the aftershock activity without tuning specific model parameters. These forecasts are found to be in excellent agreement with all first-order characteristics of aftershocks, in particular (i) the total number, (ii) the power-law distance decay, (iii) the scaling of the productivity with the mainshock magnitude; (iv) the foreshock probability; and (v) the empirical Bath law providing the maximum aftershock magnitude, which indicates that static stress transfer is the major mechanism of earthquake triggering.