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Effect of Coulomb Stress on the Gutenberg-Richter Law for the Seismicity after the Landers Earthquake

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Coulomb-stress theory has been used for years in seismology to understand how earthquakes trigger each other. Whenever an earthquake occurs, the stress field changes, and places with positive increases are brought closer to failure. Earthquake models that relate earthquake rates and Coulomb stress after a main event, such as the rate-and-state model, assume that the distribution of earthquake magnitudes is not affected by the change in the Coulomb stress. We apply several statistical analyses to the aftershock sequence of the Landers earthquake (California, USA, 1992, moment magnitude 7.3), to show that the distribution of magnitudes is sensitive to the sign of the Coulomb-stress increase; in particular, the $b-$value of the Gutenberg-Richter law is significantly decreased for events that received a decrease in the Coulomb stress. These events have a distribution of focal mechanisms very close to the one of the previous-to-mainshock seismicity, whereas the events with a positive increase of the stress are characterized by a much larger proportion of strike-slip events.