

Crack coalescence model for precursors to the 2003 Tokachi-Oki earthquake ($M_w=8.3$)

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The Tokachi-Oki earthquake $M_w8.3$ occurred in September 2003. Clear changes in seismicity started five years prior to the main shock. (1) The number of earthquakes decreased by 40 % between $M3.3$ and $M6.0$, (2) the number of earthquakes decreased between $M3.3$ and $M4.0$ though the number of earthquakes increased larger than $M5.0$, thus, (3) the b-value of the magnitude-frequency relationship decreased from 0.65 to 0.45, and (4) the rate of the seismic moment increased. These facts are not explained by the preslip model: Stress accumulated on a seismic fault is released partly due to the preslip and the number of small earthquakes decreases. Earthquakes larger than $M5.0$ are also expected to decrease. Yamashita & Knopoff [1989] simulated a foreshock activity numerically by assuming the coalescence of cracks on a seismic fault. The model explained the decrease in b-value prior to the main shock.