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Analysis of the aftershock sequence of the 2002 Mw7.9 Denali Fault, Alaska earthquake from the regional seismic data

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Denali fault is the longest intra-continental strike-slip fault system in North America. The 2002 Denali fault earthquake sequence began with the magnitude Mw6.7 Nenana Mountain event on October 23, 2002.Ten days later on November 3, the magnitude Mw7.9 Denali Fault earthquake ruptured nearly 340 km of the combined fault length with the maximum vertical and horizontal surface offsets of 2.8 m and 8.8 m, respectively. Inversions of the seismic, geodetic, InSAR data and combined datasets indicate variable subsurface slip, mainly restricted to the shallow depths with the three main pulses of the moment release. We will present results of the analysis of the spatial and temporal variations in the seismicity and stress state within the central Denali fault system before and during the earthquake sequence. There was a significant increase in the seismicity rate prior to the Mw7.9 event within its epicentral region, starting about eight months before its occurrence. The majority of the aftershocks are located within the upper 11 km of the crust and form several persistent clusters with a few aseismic patches along the ruptured fault. The most active aftershock source is associated with the epicentral region of the earthquake. The overall b-value of the aftershock sequence is 0.96 with the highest b-values within the epicentral region. We estimate that it will take 14 years for the seismicity rate to drop back to the background level. The stress regime across the region varies in space and time. The inferred stress regime after the 2002 sequence reflects an interchanging thrusting and strike-slip faulting along the ruptured fault. The thrust faulting is concentrated in the epicentral region of the Mw7.9 event and along the rupture segments showing the largest surface offsets.