

Coseismic displacements from the 2002 Mw6.7 and Mw7.9 Denali Fault earthquakes measured with GPS

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On 3 November 2002 a Mw7.9 earthquake occurred in central Alaska, rupturing portions of the Susitna Glacier, Denali, and Totschunda faults. The earthquake was preceded by a Mw6.7 right-lateral strike-slip earthquake on 23 October, with its epicenter only 22 km west of the Mw7.9 epicenter. Following the Mw6.7 earthquake GPS measurements were repeated at 13 existing stations on the Parks Hwy (N-S profile west of epicenter) and on the Denali Hwy (E-W profile south of epicenter) in order to estimate coseismic slip at these stations from the earthquake. All stations, north and south of the Denali Fault show eastward coseismic displacements that can not be explained by a simple strike-slip event alone. Several of these stations were still running when the Mw7.9 occurred. Including these GPS stations 38 existing points in the interior and south central Alaska were measured within two weeks of the Mw7.9 earthquake. In addition 12 permanent GPS sites were operating within 500 km of the epicenter at the time of the earthquake. In general the GPS data show a right lateral deformation field. North of the fault sites have eastward displacements and sites to the south have westward displacements. GPS sites closest to the epicenter show the effect of thrust motion on the Susitna Glacier fault. Inversion of the displacements indicate that the event was dominated by a complex, right-lateral strike-slip rupture along the Denali fault.