

Article

Structural Complexity and Seismogenesis: The Role of the Transpressive Structures in the 1976 Friuli Earthquakes (Eastern Southern Alps, NE Italy)

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Supplementary Material – S3

Coulomb stress changes

Our depicted seismotectonic framework of the central-eastern Friuli area suggests that the M_L 6.4 mainshock of May 1976 rupturing the southeastern portion (ST-SE) of the Susans-Tricesimo Thrust (ST), was likely triggered by M_L 4.5 foreshock occurred on the transpressive Predjama Fault (PRJ).

To investigate this hypothesis, we calculated the static Coulomb stress changes on the ST-SE fault plane (strike/dip/rake = $123^\circ/30^\circ/118^\circ$), that is the plane associated with the M_L 6.4 mainshock (May 6, 1976, hrs 20:00) induced by the previous M_L 4.5 foreshock occurred few minutes before.

In particular, we model the Coulomb stress using as the causative fault of the M_L 4.5 event, the rupture geometry of the Predjama Fault (strike/dip/rake = $135^\circ/78^\circ/130^\circ$) and the empirical relation of [106] are used to compute rupture parameters of the M_L 4.5 foreshock, assuming a constant slip distribution on few fault patches of the PRJ fault plane, equivalent to a M_w 4.6 seismic event. We tested different depth distribution of the assumed fault slip of the M_L 4.5 foreshock, as its exact slip distribution is not known. We tested also two values of the effective friction coefficient, that is assuming a value of 0.4, as is commonly used in stress interaction studies and a value of 0.8, as is assumed for continental thrust faults [107].

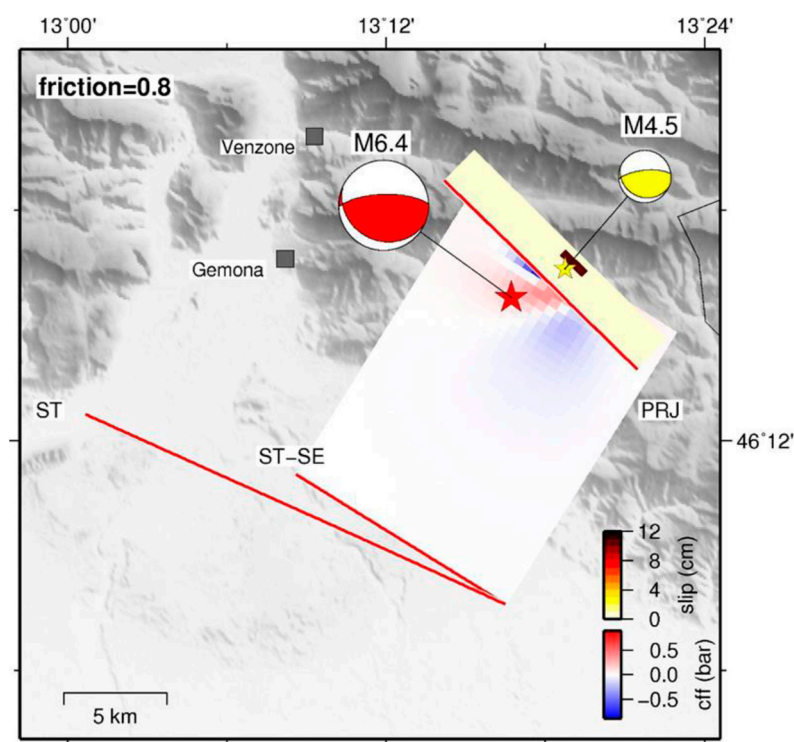


Figure S4. Change of Coulomb stress on the ST-SE fault plane before the occurrence of the May 6, 1976 main event M6.4 resolved on the fault plane (friction coefficient = 0.8). The red star is the M_L 6.4 mainshock of the 1976-1077 Friuli seismic sequence; the yellow star represents the M_L 4.5 foreshock. Solid red lines represent the surface trace of the modelled fault planes (ST-SE = southeastern Susan-Tricesimo, PRJ = Predjama). The coloured fault patches on the PRJ fault plane indicate the assumed slip (between 6-8 km depth) during the foreshock.

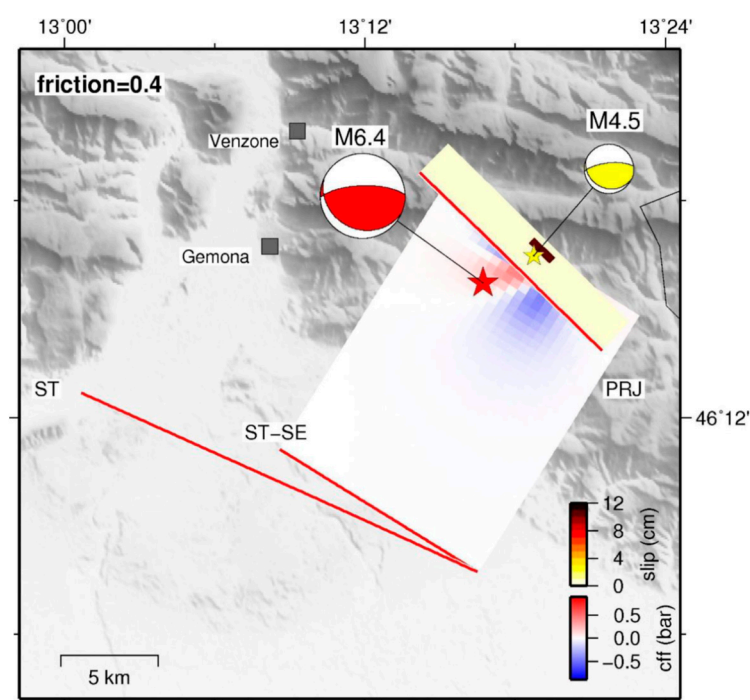


Figure S5. Change of Coulomb stress on the ST-SE fault plane before the occurrence of the May 6, 1976 main event M6.4 resolved on the fault plane (friction coefficient = 0.4). The red star is the M_L 6.4 mainshock of the 1976-1077 Friuli seismic sequence; the yellow star represents the M_L 4.5 foreshock. Solid red lines represent the surface trace of the modelled fault planes (ST-SE = southeastern Susan-Tricesimo, PRJ = Predjama). The coloured fault patches on the PRJ fault plane indicate the assumed slip (between 6-8 km depth) during the foreshock.

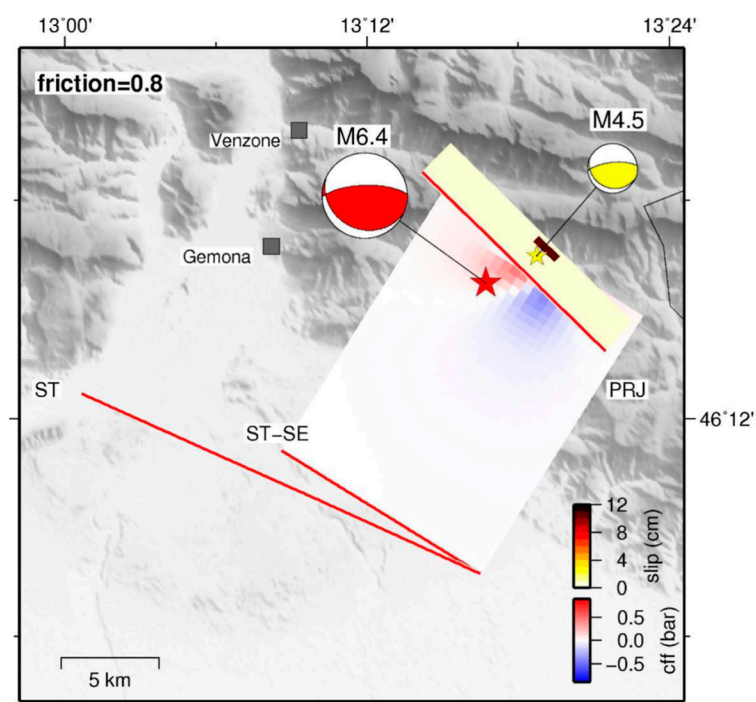


Figure S6. Change of Coulomb stress on the ST-SE fault plane before the occurrence of the May 6, 1976 main event M6.4 resolved on the fault plane (friction coefficient = 0.8). The red star is the M_L 6.4 mainshock of the 1976-1077 Friuli seismic sequence; the yellow star represents the M_L 4.5 foreshock. Solid red lines represent the surface trace of the modelled fault planes (ST-SE = southeastern Susan-Tricesimo, PRJ = Predjama). The coloured fault patches on the PRJ fault plane indicate the assumed slip (between 7-9 km depth) during the foreshock.

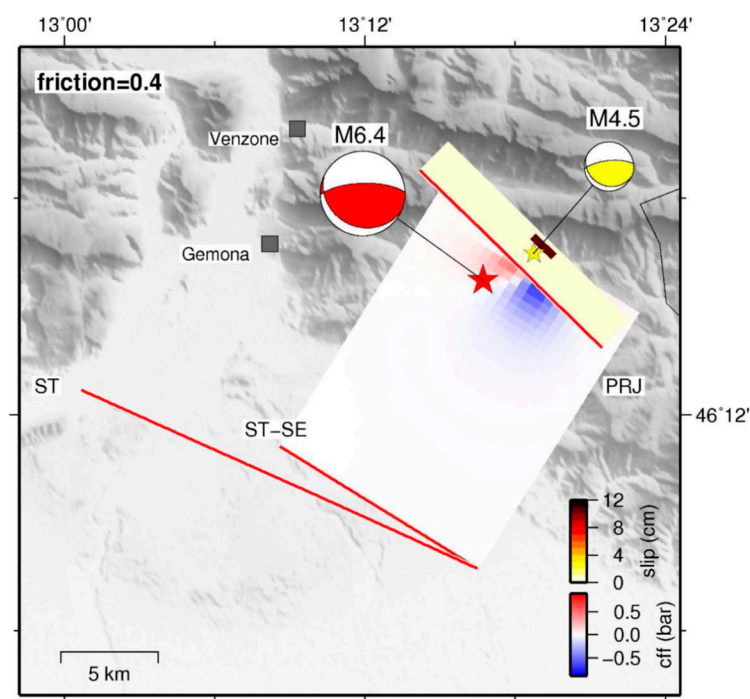


Figure S7. Change of Coulomb stress on the ST-SE fault plane before the occurrence of the May 6, 1976 main event M6.4 resolved on the fault plane (friction coefficient = 0.4). The red star is the M_L 6.4 mainshock of the 1976-1077 Friuli seismic sequence; the yellow star represents the M_L 4.5 foreshock. Solid red lines represent the surface trace of the modelled fault planes (ST-SE = southeastern Susan-Tricesimo, PRJ = Predjama). The coloured fault patches on the PRJ fault plane indicate the assumed slip (between 7-9 km depth) during the foreshock.