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STRESS PARAMETERS OF REPEATING EARTHQUAKES IN THE NUCLEATION VOLUME OF THE APRIL 6, 2009, MW 6.1 L'AQUILA EARTHQUAKE

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We analyze the state of stress for 28 repeaters, foreshocks, mainshock and aftershocks, in the rupture nucleation volume of the destructive L'Aquila earthquake including the strongest Mw4.1 foreshock occurred one week before the mainshock. In a previous paper, earthquakes clustered in this crustal volume were used to detect a transient anomaly of shear wave velocity in the fault zone a ten of hours after the Mw 4.1 foreshock. The purpose of this study is to investigate whether stress parameters had concomitantly temporal or spatial variations. Brune stress drop was computed in a EGF-approach and apparent stress was derived from energy of seismograms. Estimates of individual stations and individual events showed large fluctuations, mostly due to rupture directivity and site effects. A procedure was adopted to decrease the estimate uncertainty obtaining a 39% of the total variance reduction. Brune stress drop and apparent stress showed similar trends implying stable values of radiation efficiency around 0.23, which is the value expected for self-similar ruptures. No evident temporal change emerges from the analyzed stress parameters of repeaters.

In contrast, the spatial pattern of Brune stress drop shows a correlation with the b-value obtained by Suga et al., 2014 that evidenced an asperity characterized by a low b-value on and around the nucleation zone of the mainshock.