COULOMB STRESS CHANGES FROM GROUPED MAGNITUDE 7+ EARTHQUAKES IN SOUTH ITALY

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Neri et al. (2005) performed an investigation of the seismic, geologic and geodynamic information available for the Calabro-Sicilian region in South Italy and proposed on these grounds a unifying view of the magnitude 7+ earthquakes which have occurred in the same region in the last millennium. These earthquakes define a sort of space-time megacluster because they occurred in a relatively short time interval of about three centuries and were located in a narrow curvilinear extensional belt passing through Western Calabria and Eastern Sicily (WCES belt) and including a nearly continuous north-to-south succession of east-dipping normal faults. In Neri et al.'s (2005) reconstruction of the seismogenic process producing the WCES megacluster, faulting is activated by WNW-ESE extension induced by residual rollback of the Ionian subduction slab.

In the present work, we first estimated the Poisson Dispersion Coefficient (PDC) of the time series of M7+ earthquakes occurring in the study region over the millennium. PDC is given by $(\langle n_i^2\rangle - \langle n_i\rangle^2)/\langle n_i\rangle^2$, where n_i is the number of events in the i-th period of assigned length Δt, and the symbol $\langle\ \rangle$ indicates the average calculated considering all intervals equal to Δt that can be extracted from the complete period under investigation. PDC is 1 in the Poisson model, and the difference between the value of PDC determined for a certain sequence of events and 1 gives information on the level of interdependence between the events of the sequence. By this

procedure the occurrence of M7+ earthquakes in the WCES belt was proven to be highly non-random. Then, we estimated the Coulomb stress changes induced by the individual events of the cluster in relation to the following events in the same cluster. Relatively small values of Coulomb stress changes were found, leading us to suggest that the clustering tendency of the events is not due to direct interaction between the events, but to other factors. We tentatively propose that in the framework of the extensional process generated by the subduction trench retreat, the nearly continuous north-to-south succession of east-dipping normal faults in the belt (equiparable to a sort of megafault consisting of partially linked segments) activates with clustered-in-time failures giving rise to the observed magnitude 7+ earthquakes.

Finally, the space distribution of the earthquakes under investigation indicates a silent zone along the megafault, corresponding to the 30 km-long Scaletta-Fiumefreddo segment in Eastern Sicily (Neri et al., 2005). Since recurrence times are on the order of a millennium for M7 earthquakes along different parts of the WCES belt, and historical data for destructive earthquakes in the 1st millennium AD are not detailed enough to allow reliable identification of the source zones, it cannot be stated whether or not there is a late-stage seismic gap for a large earthquake in eastern Sicily. Other workers are currently performing tomographic investigations of Gutenberg-Richter's b-value in this region and this could bring evidence of asperity, or aseismic creep mechanisms in the Scaletta-Fiumefreddo silent zone.

References

Neri, G., Oliva, G., Orecchio, B., and Presti, D. (2005). *A Possible Seismic Gap Within a Highly Seismogenic Belt Crossing Calabria and Eastern Sicily, Italy.* Submitted to BSSA