Geophysical Research Abstracts, Vol. 5, 10619, 2003

SEARCHING FOR BLIND, SILENT SEISMOGENIC FAULTS: LESSONS FROM THE 2002 MOLISE (SOUTHERN ITALY) EARTHQUAKE

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Italy has one of the longest record of historical seismicity that spans more than two millennia and is considered complete for M>6 earthquakes for the past 700 yr. The largest earthquakes in Peninsular Italy are normal faulting up to MÅ7 occurring along the crest of the Apennines (#1); reverse faulting up to MÅ6.5 characterising the Adriatic margin of the Apennines (#2); slightly deeper, kinematically ambiguous events (probably compressional) up to MÅ7 occurring in between the two previous alignments or at the margin of the Apulia and Hyblean foreland areas (#3). Historical data alone provide a satisfactory image of the seismicity of the country. However, paleoseismological and archaeoseismological investigations highlighted that recurrence intervals of large earthquakes on individual faults are consistently longer than a millennium and hence that not all Italian seismic sources have expressed themselves through the historical record. Geological and paleoseismological characterization of seismogenic faults thus plays a critical role in the understanding of Italian seismicity. Unfortunately, we have been able to recognize the causative source only for a limited part of the large historical earthquakes reported in the Italian Catalogue. This is mainly due to the scarce geomorphic and geologic visibility of Italian seismogenic faults, resulting from a youthful tectonism superimposed on a complex and highly deformed structure. Thanks to a few key earthquakes (1908, Messina Straits; 1915, Fucino basin; 1980, Irpinia; 1997, Umbria-Marche), we have been able to grasp the basic rules that control the inception of seismogenic faulting along the major seismogenic zones (#1 and #2). But imaging potential sources outside these trends remains a substantial problem, and the 2002 Molise earthquake sequence (Mw 5.7) supplies clear evidence of this limitation. The area struck by these events is located between the main Apennines and the Gargano seismogenic zones and contains no historical seismicity nor geomorphic evi-

dence for seismogenic faulting. As a consequence, it was considered free from shaking due to local seismogenic sources. The 2002 Molise earthquakes show that there is a new category of undetected seismogenic sources coincident with pre-existing E-W lineaments playing a new role in the present stress field. Recent ground-based magnetic anomaly images of the Italian territory supply evidence for these large-scale discontinuities cutting the magnetic basement below the sedimentary cover. This suggests that high resolution modelling of the potential field can be a powerful methodology to be integrated with classical geological data to shed light on the deformation pattern at typical basement depths (10-20 km).