Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09672, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09672
EGU General Assembly 2008

Active tectonics and deformation pattern in the central Adriatic Sea: evidence by integrating seismic profiles, GPS data and focal mechanisms

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The central Adriatic represents the foreland of the Dinarides and Apennines, and is characterized by the occurrence of a poorly defined belt of moderate seismicity that connects the two fold-and-thrust belts, just north of the Gargano promontory. The pattern and nature of the tectonic deformation which is responsible for the observed seismicity are the subject of an ongoing debate. Several different models have been proposed, ranging from variously located microplate boundaries, to Dinaride subduction thrust, and to Apennine thrust front.

This contribution aims at integrating different sets of data, namely medium-high resolution multichannel seismic profiles, GPS velocities and well constrained CMT focal mechanisms, in order to define the deformation pattern of the central Adriatic region.

GPS data, combining both original and published velocities, indicate a limited NE shortening across the central Adriatic region, which is in agreement with the limited seismic activity and with compressional focal mechanisms. The hypocentral depth of the larger events is typically around 15 km, suggesing that the basement is likely involved in the deformation.

Contractional structures represent the most common type of deformation also observed on seismic profiles, typically with the appearance of upright, open folds

with low amplitude and large wavelength. The main tectonic trends are NW-SE to NNW-SSE and NE-SW to ENE-WSW. The Tremiti Deformation Belt, a narrow NE-SW-trending belt located north of the Gargano Promonotory, shows Plio-Quaternary growth strata all the way to the sea floor. This belt merges to the N, with a soft link, to a broad NW-trending belt of diffuse but limited deformation. In some instances the WNW-ESE folds seem to be the lateral prolongation of the thrust-related folds occurring in the southern part of the Dinaride front, where contractional deformation is still active and the direction of the frontal folds swings from NW-SE to almost E-W.

Deformation is active until present over most of the central Adriatic Sea, as indicated by seismicity, although different structures are active at different time, defining a pattern of complex and diffuse deformation. Moreover, folding occurred in places before late Miocene, as indicated by the path of Messinian erosional channels which is controlled by fold topography. Altogether, the observed pattern of deformation can be interpreted as an example of active foreland tectonics.

The implications that our study bears on the larger-scale kinematic of Adria will be also discussed.