highlight the paleo-depositional environment, the transgressive-regressive cycles during the highstands, and the eustatic-tectonic interplay in the terrace evolution. The morphotectonic evolution of mountain ranges is characterized by a "hanging valley" landform, landward-thickening sedimentary bodies, arranged in variable combinations of coarsening-upward (regressive) and fining-upward (transgressive) sequences, and a large exposure (Breitenbach and Fialko 1993). The description of the transition from the Mississippian to the Holocene beachrock to the paleo-sea cliff is characterized by an erosional-unconformity and by a coastal onlap, respectively. Significant thickness (~20 m or more) of the deposits (when the high relief and limited catchment basins adjoin to this coastline) indicates sedimentation in accommodation space created by rapid sea-level rise prevailed upon land uplift during highstands. On the basis of the stratigraphic architecture, sub-axialial eustatic cycles (e.g. Thompson e Goldstein, 2005) during some highstands reflected in the terraces sequences can be argued.

In order to retrieve the nominal paleoshorelines, we mostly relied on the elevation of the terraces inner margin (the best-uniform sea level datum) and computed on a site-by-site basis its uncertainty level. Error computation took into account accuracy in marker identification, measurement precision, thickness of cover shedding the inner edges, and paleo-sea level correlation uncertainty.

The restored paleoshorelines show that Late Pleistocene to Holocene terraces are differentially uplifted along the coast. Although a regional signal accounts for the NE-ward tilt of the terraces (Cucci and Cinti, 1998; Ferrantii et al., 2000), a second order signal with short-wavelength undulations is apparent. These undulations are interpreted in terms of paired anticlines and synclines. Preliminary work on arc-radiometric dating, together with geomorphologic and indirect datings, suggest that Late Pleistocene and Holocene uplift occurred at variable rates of up to 2 mm/yr. Unlike present-day forced trends (Bordoni and Valensise, 1998; Cucci e Cinti, 1998), the time-pattern of deformation argues for non-constant tectonic forcing.

References

SESSION T40
Neotectonica e sismotettonica: metodi di indagine ed applicazioni all'area italiana e mediterranea

T40-1 Invitato Poli, Maria Eliana
10.1474/Epito.me.02.00817.Geotalia2007
ACTIVE FAULTS AND SEISMOGENIC SOURCES AT THE FRONT OF THE EASTERN APENNINES, ITALY - AN INTEGRATED APPROACH.
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Key terms: Eastern Southern Alps; active fault; seismogenic sources

During historical time numerous destructive earthquakes (with Ms>5) hit the Veneto-Friuli area affecting the Quaternary evolution of the Eastern Shale Chain (ESC), a S-vetted terrestrial basin from Middle Miocene to Present. WSW-ENE E-W trending thrusts extend from Lessinia in central Italy to the northern Apennines, and today the external front of the Chain propagates toward the South by means low-medium angle oblique right-lateral strike-slip movements. Seismic and Quaternary stratigraphic successions. Deformation of post LGM deposits, historical and instrumental seismicity in the Eastern Southern Alps are characterized by the active tectonic activity of the area. The evolution and present-day structural framework of the ESC has been strongly controlled by the Messinian Sea basin. The Messinian Sea basin was closed by the Messinian Salinity crisis, which produced a passive continental margin, characterized by shallow marine carbonate platforms with the internal flat areas, separated by N-S and E-W trending normal faults. The inherited tectonic structures and palaeogeography influenced the development of the faulting system along the main fronts and changes of the geometry of the thrusts. Moreover, in the Camunian and Julian regions the young faults are also geometrically influenced by the inherited Paleogeno, NWN-WSW trending thrusts of the External Dinarides. Neotectonic picture available until the nineteenth was characterized by strong cylinderism, with thrust fronts, entirely active for the whole Quaternary and without any evidence of segmentation. During recent years means CANS (Udine, Maniago and Gemona sheets), GNTF - 2000 and PRIN Projects, definition of the active faulting framework of the Eastern Southern Alps was possible and new geological, geomorphological and structural data were collected: morphotectonic and neotectonic data and allowed to date the activity and to define the Quaternary kinematic of the active faults. Quaternary neotectonic was surveyed by USB units and the stratigraphic reconstruction was completed by radiometric dating and biostratigraphical analyses. The local site by site data was used to detect timing of Quaternary depositional and deformational processes. Geodetic and investigations were performed in order to identify the superficial traces of recent fault activity: gentle scarp connecting uplifted palesurfaces within the last glacial age with the present-day surface and considerable drainage anomalies, generally represent the most important morphotectonic elements. Mesosutural analysis allowed to reconstruct the Neogene-Quaternary stress pattern evolution and the present distribution of the G1 principal stress axis in the eastern Southern Alps. Moreover, statistical interpretation of the reflection seismic lines of the Veneto-Friuli plain allowed to describe 2D and 3D geometries of the blind thrusts. The updated structural sketch of the Plio-Quaternary front of the Eastern Southern Alps, shows a segmented system of thrusts in the Messinian basin: a series of epicontinental southeastern chains. Some major SWS-ESE to E-W trending thrusts (Susans-Tricesimo, Pozzuolo, Arba-Riapagone and Montelupi thrusts) will be presented and discussed.

The fault 3D geometry has permitted to draw seismogenic sources (which based on the empirical relations linking fault dimensions with Ms) may be responsible for earthquakes with Ms>5. This procedure has represented a fundamental step in the definition of the seismic hazard for a region with high frequency of destructive earthquakes but also high population density and highest density of industrial settlements.

T40-2 Invitato Barchi, Massimiliano Rinaldo
10.1474/Epito.me.02.00818.Geotalia2007
AN INTEGRATED MODEL FOR THE ACTIVE FAULTS OF THE NORTHERN APENNINES OF ITALY.
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Key terms: Active Faults; Normal Faults; Seismic Reflection Profiles; Northern Apennines

The axial region of the Apennines of Italy is one of the most important active extensional belts in the world, extending from Northern Tuscany to Northern Calabria. Historical and instrumental seismicity (Mmax ≤ 7), related to NW-SE trending normal faults, is characterized by the upper crust (D ≤ 15 km). The study is aimed to identify the characteristics and the kinematics of the Northern Apennines, comprised between the Mugello basin and the Norcia basin. This is a region of low extensional strain rate, where carbonate and surface ruptures are rare and their tectonic origin is debated. Consequently, the connection between "geological faults" (Quaternary faults at the surface) and "seismological faults" (seismic ruptures revealed by mainshocks focal mechanisms and aftershocks alignments) is difficult. The seismological reflection profiles give a significant contribution to address this topic, since they effectively image the "geological faults" down to the seismogenic depth (6-10 km). In the last ten years, after the CROR03 project, the determination of numerous commercial seismic profiles greatly contributed to the knowledge of the extensional belt of the Northern Apennines, mainly addressing:
- the recognition of the presence of east-dipping major detachment (Alto Tiberina fault, Etrurian fault system), whose role was previously unrecognized or largely underestimated;
- the reconstruction of the geometry of west-dipping normal faults, generating the moderate seismicity of the region, also contributing to reconstruct their length (i.e. along-strike continuity), slip variations and long-term slip rate;
- the definition of the subsurface stratigraphic and structural setting of the region, calibrated through deep wells, controlling the thickness of the seismogenic layer.

These observations have been integrated with other data sources (e.g. instrumental and historical seismicity, surface geology, geomorphology, paleoseismology) in order to identify the seismogenic sources of the studied region. This work produced a complete and realistic model for the region comprised between Città di Castello and Norcia, demonstrating the strict connection between the Quaternary faults and the seismic ruptures. In the last two years this approach was extended towards the north, to the region comprised between Sarnepoli and Mugello basins, where the connection between the direction of the earthquakes and the alignment of the continental basins is less evident. The latter research was developed by the Research Unit of Perugia University in the framework of the DPC 82 Project (Valutazione del potenziale sismogenico e probabilità dei forti terremoti in...
http://www.ingv.it/progettiSV/Progetti/Sismologic/Almostate peace_model.htm), mainly through the analysis of a new set of seismic profiles, made available by ENI.

SESSION T40

T40-3 Invitato Tortorici, Luigi
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ACTIVE FAULTING AND SEISMICITY ALONG THE SICULO-CALABRIAN Rift Zone (SOUTHERN ITALY)
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Key terms: Seismotettonics; Quaternary; normal faulting; Calabrian arc; eastern Sicily

Southern Italy is dominated by extensional tectonics that in the Calabrian arc and Eastern Sicily produced the development of the Siculo-Calabrian Rift Zone (SCRZ). This zone is represented by a x 370 km-long fault belt consisting of 10 to 50 km long distinct fault segments which extend both offshore and on land that, being also responsible of the crustal seismicity of this region. The geological and morphological observations indicate that the active normal faults of the SCRZ are characterized by a ~10 m/a extension rate and a strike-slip displacement. They accommodate an almost uniform horizontal extension rate of about 3.0 m/a along the WNW-ENE regional extension direction. Based on our field observations and following empirical relationships between magnitude and surface rupture length for the largest crustal earthquakes and distinct fault segments of the SCRZ, they have also been tentatively tested. Our data indicate that the morphological, kinematic and instrumental earthquakes are consistent with the estimated values and that the geometry and kinematics of the fault segments and the related different crustal features of the SCRZ control the different seismic behaviours of adjacent portions of the active rift zone.

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