of pelitic arenaceus sequence found out in the Centuripe–Enna–Caltanissetta area is included between the Lower and Middle Pliocene age, whereas in the Piazza Armerina Mazzarino--Barrafranca area it is included between the Upper Pliocene and Lower Pleistocene. Between S. Michele di Ganzaria and Gela and along the western Hyblean margin, the two facies are of Lower Pleistocene age.

The facies tectonic control (Roda 1968, Butler et al. 1995), is mainly marked by their inner discontinuity. The age of the first and lower of them is Lower Pliocene, and it is in linked with the Trubi Fm. and Marne di Enna Fm. The second, which is to be dated to the early Upper Pliocene, is referred to the contact between the Geracello Fm. and Capodarso Fm. The age of third one is referred to lower Pleistocene and it regards the younger part of Pleistocenic deposit overlying the different terms of the Gela nappe and the Hybleian substrate. Minor unconformities were found out inside the Capodarso Fm. and in the younger terms.

The tectonic interference has frequently affected the sedimentary structure. It affects several levels and it has both extensional and compressive style with folds and faults of various types.

In a preliminary way and subordinately in the light of the acquired knowledge, the stratigraphic and sedimentological characters show that can not be excluded that the evolution of the aforementioned facies is related mainly to the younger and south-eastern part of the Sicilian thrust belt dynamic translation besides to the glacio-eustasy (Gela nappe: Ogniben 1969, Lentini et al. 1990). It began during the lower Pliocene and it ended in the lower Pleistocene generating a piggy-back depositionary basin (Ben Avram et al. 1990, Catalano et al. 1993). This translation affected the sedimentation generating the facies progradation from North toward south and toward east with facies repetitions and partial overlaps.

The area, during the upper Pleistocene as well as nowadays, is affected by an elevated uplifting phase and for this reason, Pleistocene coastal sediments are placed at 850 metres above the sea level.

Ben Avraham Z., Boccaletti M., Cello G., Grasso M., Lentini F., Torelli L., Tortorici L. (1990): Principali domini strutturali originatisi dalla collisione neogenico-quaternaria nel Mediterraneo centrale. Mem. Soc. Geol. It., 45(1), 453–462.

Butler R.W.H., Grasso M., Lickorish H. (1995): Plio-Quaternary megasequence geometry and its tectonic controls within the Maghrebian thrust belt of south-central Sicily. Terra Nova 7, 171–178.

Catalano R., Di Stefano E., Lo Cicero G., Infuso S., Vail P.R., Vitale F.P. (1993): Basin analysis and sequence stratigraphy of the Plio–Pleistocene of Sicily. (Ed. by: Max M.D. & Colantoni P.)– Geological developement of the Sicilian–Tunisian Platform, UNESCO Report in Marine Science 58, 99–104.

Lentini F., Carbone S., Catalano S., Grasso M., Monaco C. (1990): Principali elementi strutturali del Thrust Belt Appenninico–Maghrebide in Sicilia centro-orientale. Mem. Soc. Geol. It., 45 (1), 495–502.

Ogniben L. (1969): Schema introduttivo alla geologia del confine calabro–lucano. Mem. Soc. Ge*ol. It., 8, 453–763.*

Roda C. (1968): Geologia della tavoletta Pietraperzia (Prov. Di Caltanissetta ed Enna, F. 268, III-NE). Atti Acc. Gioenia Sc. Nat. Catania S.6, 19, 145–254.

Cenozoic-Pleistocene alpine signatures in the southern Upper Rhine Graben

M. DIRAISON[1], B. NIVIERE[2], CH. LE CARLIER DE VESLUD[1] , T. WINTER[2] & M. FORD[1]

[1]*ENSG (CRPG-CNRS), France*
[2]*BRGM, BP 6009, 45060 Orléans, France*

The NNE-SSW trending Upper Rhine Graben (URG) initiated in the Late Eocene as part of the West European rift system. Subsidence curves record rapid subsidence during the Oligocene and early Miocene accompanied by uplift of the rift shoulders (Vosges and Black Forest). This period of E–W extension in the foreland coincided with the peak of Alpine collision to the south. 3D models of the southern Rhine Graben, constructed in the gOcad geometric modelling package and constrained by an extensive database of boreholes and seismic reflection lines as well as published data, are used to reconstruct the Cenozoic evolution of the southern URG. Initial results in the Dannemarie Basin, which forms the SW limit of the URG, indicates that subsidence increased northward during the Rupelian, but toward the south during the Chattian. We propose that this change in asymmetry was due to the influence of alpine flexure.

During the Aquitanian the southern URG was uplifted along with its rift shoulders while subsidence continued to the north in the graben. Further to the south the alpine foreland basin continued to subside but no longer migrated northward. Therefore its forebulge also became stationary. We investigate the possibility that this forebulge was positioned on the southern URG.

At 12–11 Ma the alpine detachment encountered Triassic evaporitic facies and migrated rapidly toward the NW to form the Jura fold and thrust belt. Approximately 30 km shortening was accommodated during the Pliocene and Pleistocene. The NE Jura fold belt overlaps with the southern edge of the URG and the deformation front is classically identified to the south of Basel. However, analysis of the Quaternary deposits, river terraces and geomorphological features reveals that, on the Mulhouse horst, post-Pliocene alpine shortening propagated some 30 km further north along the Triassic evaporitic decollement. This shallow northward propagation is limited to the Mulhouse horst whose bounding normal faults acted as strike-slip lateral ramps.

The role of lithospheric mantle in orogenesis: Coupled or uncoupled?

M.R. DRURY[1], J. NEWMAN[2], W.M. LAMB[2], R.L.M. VISSERS[1] & H.L.M. VAN ROERMUND[1]

[1]*Vening Meinesz Research School of Geodynamics, Utrecht University, Utrecht, Netherlands, martynd@geo.uu.nl*

[2]*Texas A&M University, College Station, Texas, USA*

The role of the lithospheric mantle during continental deformation and collision is uncertain. In some models of collision lithospheric mantle is deformed by subduction which is uncoupled from deformation in the thickened crust. Other models regard crust and lithospheric mantle as a coupled viscous sheet. The extent of coupling across the crust mantle boundary is strongly influenced by the relative rheological properties of lower crustal and upper mantle rocks. In the standard model of lithosphere rheology the lower-most crust is weak compared to the upper-most few tens of kilometres of strong upper mantle with the crust-mantle boundary as the primary de-coupling horizon.

In this contribution we review the deformation properties and rheology of upper mantle peridotites based on experimental deformation studies and studies of deformation processes in exposed mantle rocks. Studies of naturally deformed peridotites show that deformation at high temperatures $T > 950$ °C occurs by relatively uniform dislocation creep deformation in km-scale deformation zones. Lower temperature deformation is commonly concentrated in metre to km scale shear zones. The shear zone rocks are mylonitic rocks with fine grainsizes (1–100 μm) that show evidence for deformation by grain boundary and diffusion creep. Estimates of the viscosity of these mylonites suggest that the mantle shear zones are potentially weaker than lower crustal rocks.

Studies of natural mantle shear zones show that grainsize reduction often involves continuous net transfer metamorphic reactions, which occur over a range of PT conditions in the lithospheric mantle. In dry lithosphere the plagioclase to spinel reaction and spinel to garnet reaction are important while hydration reactions producing amphibole, chlorite and serpentine are important in hydrated lithosphere.

Extrapolation of experimental deformation data suggests that the lithospheric mantle can exhibit a large variation in integrated strength. At one extreme if deformation is accommodated by diffusion creep in fine-grained hydrated shear zones then the lithosphere is relatively soft and is unlikely to behave as a subductable plate. At the other extreme dry coarse-grained lithosphere will behave more like the standard model of strong lithospheric mantle.

We suggest that oceanic plates and continental regions affected by earlier granulite facies metamorphism are examples of strong lithosphere. Continental margins and supra-subduction zone lithosphere may represent examples of soft lithosphere.