The Miocene accretionary complex and olistostromes at the front of Betic-Rifian External units (Gulf of Cadiz)

F. Camurri (1), L. Torelli (1), N. Zitellini (2) and E. Thiebot (3)

(1) Dip. Scienze della Terra, Università di Parma, Italy, (2) ISMAR-CNR, Bologna, Italy, (3) UBO-IUEM, Brest, France (camurri@nemo.unipr.it)

The study area comprises the external parts of the Betic-Rifian orogen located W of the Gibraltar Arc, between the Gulf of Cadiz and the NW Moroccan continental margin. The geodynamic interpretation of this area is very controversial and the existence in literature of many recent delamination and/or subduction evolution models, characterised by most varied geometries, corroborate this. In this area there is also the eastern termination of the Azores-Gibraltar Transform Zone where plate interactions seems to produce a diffuse crustal deformation (Sartori et al., 1994), expressed by WSW-ENE oriented structural highs, showing evidences of recent compression activity, connected to the recorded seismic activity W of Gibraltar (Zitellini et al., 1999, 2001; Gracia et al., 2003). In the past many authors have described and interpreted large volumes of allochthonous material characterised by high diffractive and opaque seismic signature at the front of external structural elements of the Betic-Rifian orogen and in the Horseshoe Abyssal Plain. By interpretation of the ArcRif92 deep seismic reflection data, first Torelli et al. (1997) subdivided Giant Chaotic Body (GCB) W of Gibraltar in: a) mainly gravity deposits (olistostromes) and b) tectonic mélange portion (accretionary wedge). Furthermore, they assumed that the gravity driven sector of GCB represent huge flow deposits of intrabasinal origin (endo-olistostromes) discharged by adjacent structural highs, in turn formed in response to the paroxysmal phase of Africa-Eurasia convergence. Recently, SISMAR 2001 deep seismic reflection and refraction data reveal, in its entirety, the W-vergent accretionary wedge related to external portions of the Gibraltar Arc (Gutscher et al., 2003). The recent re-interpretation of complete ArcRif92 and some IAM93 and SISMAR2001 deep seismic profiles, has been carried out in the general framework of european "SWIM" Euromargins program. Confirming the hypothesis of Torelli et al. (1997), this work has allowed to understand the real
nature of the GCB lying in the Horseshoe Abyssal Plain and its connection with the
Gibraltar Arc accretionary wedge. This is made up of at least three main confined in-
trabasinal chaotic bodies (endo-olistostromes), accumulated from oldest to youngest
in the Early(?)-Middle Miocene to Late Miocene. They partially overlap one another
and both theirs depocenters and lateral pinch-outs show a distinct migration trend from
W to E. This fact is in clear opposition with the propagation from E to W of the Gibral-
tar Arc accretionary wedge. Three endo-olistostromes also show deformation prior to
the accretionary wedge thrusting, occurred in the latest Miocene, onto their eastern
terminations. Olistostromes that really come from the accretionary wedge front and
accumulated on both S Portuguese continental margin and N Moroccan continental
margin are all later compared to the deposition of the three main endo-olistostromes
lying in the Horseshoe Abyssal Plain; furthermore, the formers have volumes, thick-
nesses and lateral extent of scale much inferior than the latters.

References

and tectonic evolution of the Gulf of Cadiz (SW Iberian Margin) at the convergence
of the Eurasian and African plates. Tectonics, 22, 4, 1033

Gutscher, M.-A., Malod, J.A., Réhault, J.-P., Contriucci, I., Klingelhofer, F., Mendes-
Geology, 30, 12, 1071-1074.

the Azores-Gibraltar line (central-eastern Atlantic) : An oceanic plate boundary with
diffuse compressional deformation. Geology, 22, 555-558.

Ocean off Gibraltar: new results from a deep seismic reflection survey. Marine and

1755 Lisbon earthquake and tsunami. Annali di Geofisica, 42, 1, 49-55.

Zitellini, N., Mendes, L.A., Cordoba, D., Danobeitia, J., Nicolich, R., Pellis, G.,
Ribeiro, A., Sartori, R., Torelli, L., Bartolome, R., Bortoluzzi, G., Calafato, A., Car-
rilho, F., Casoni, L., Chierici, F., Corela, C., Correggiari, A. Della Vedova, B., Gra-
cia, E., Jornet, P., Landuzzi, M., Ligi, M., Magagnoli, A., Marozzi, G., Matias, L.,
(2001). The 1755 Lisbon earthquake and Tsunami: localization and investigation of
the possible tectonic source. EOS Transactions, 82, 26, 285-291.