



Cenomanian-Turonian carbon-isotope stratigraphy for Italy and northern Africa: peculiar features of a Bonarelli Level (Novara di Sicilia section) in northeast Sicily

G. Scopelliti (1), A. Bellanca (1), E. Erba (2), H.C. Jenkyns (3), R. Neri (1), P. Tamagnini (2)

(1) Dipartimento Chimica e Fisica della Terra ed Applicazioni, Palermo, Italy, (2) Dipartimento Scienze della Terra, Milano, Italy, (3) Department of Earth Sciences, Oxford, UK (giovannas@unipa.it / Fax: +39 091 6161574)

Carbon-isotope stratigraphy has become a powerful tool for dating and correlation of Mesozoic pelagic sediments. In particular, the Cretaceous Period is characterized by a series of marine anoxic phases associated with widespread organic-matter burial and a concomitant positive shift in carbon-isotope values of both marine carbonate and marine and terrestrial organic matter. Among these episodes, the oceanic anoxic event (OAE) at the Cenomanian–Turonian boundary (C/T OAE2 or Bonarelli Event) is the most pronounced and best studied.

The present work is focused on a peculiar sedimentary expression of OAE2 partially exposed within the Antisicilidi Varicoloured Clays Unit (Cretaceous–Paleogene), in an area near the town of Novara di Sicilia (NdS; northeast Sicily, Italy) and characterized by an exceptional thickness of organic-rich sediment compared with other Italian Bonarelli Levels (BL). The outcropping portion, 19 metres thick, is constituted by irregularly bedded marly limestones, light and dark marlstones, mudstones and calcarenites passing upwards to about 9.5 metres of thick black shales rhythmically alternating with marlstones and mudstones.

Based on new biostratigraphic data, together with C_{carb} and C_{org} isotope ratios, the NdS section is compared with another Sicilian equivalent level from Calabianca beach and with the type-locality Bonarelli Level from the Bottaccione Gorge (Umbria–

Marche Basin). Positive shifts recognized in the $\delta^{13}\text{C}_{org}$ depth-profiles allowed us to demonstrate that the organic-rich level cropping out at NdS is characteristic of the early part of OAE2. The same isotopic shifts delineate five intervals (four in the organic-rich portions) corresponding well with those previously defined, based on elemental geochemistry, for the Calabianca and Bottaccione sections (Scopelliti et al., 2004 and Scopelliti et al., in press). Assuming that these intervals record eccentricity cycles, the correlation proposed here indicates a sedimentation rate for the NdS section of one order of magnitude higher than those proposed for the other Italian sections (~ 3 cm/ky against ~ 0.3 cm/ky on average).

Because the estimated sedimentation rate is comparable with that of the North African C/T organic-rich strata, a stratigraphic correlation with a well-known coeval interval from the Tarfaya section (Morocco; data from Tsikos et al., 2004) is also proposed. Common features for both sections include, as well as thickness, the presence of smectite-dominated clay-mineral assemblages indicating outer shelf to upper bathyal depth in the order of 200–300 m (Tarfaya data from Lüning et al., 2004), TOC, HI, OI and Tmax values (Tarfaya data from Kolonic et al., 2002). These relationships are suggestive of an origin for the NdS section within a sedimentary basin on the north African shelf. This interpretation is consistent with the origin of the Antisicilidi Varicoloured Clays Unit (in which the organic-rich strata are included) as structurally dislocated exotic material overthrust onto the Peloritani Hercynian basement with a movement opposite to that of the general tectonic vergence (Ogniben, 1960).

References

- Kolonic et al., 2002. *Journ. Petroleum Geology*, 25, 325-350.
- Lüning et al., 2004. *Earth-Science Reviews*, 64, 51–117
- Ogniben, 1960. *Riv. Min. Sic.*, 64-65, 183-212.
- Scopelliti et al., 2004. *Palaeogeogr., Palaeoclimatol., Palaeoecol.*, 208, 293-317.
- Scopelliti et al., 2006. *Chemical Geology*, in press.
- Tsikos et al., 2004. *J. Geol. Soc. (London)*, 161, 711–719.