The Early Eocene Climatic Optimum (EECO) as recorded by planktonic foraminiferal and stable carbon isotope changes in the classical Tethyan Possagno section (NE Italy)

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Increasingly scientific attention is dedicated to definitely outline the features of the composite, not-linear evolution of the Paleogene climate. The available paleoclimatic records (e.g., Zachos et al., 2001 Science 292, 2008 Nature 451) indicate that the Earth experienced in the Early Paleogene a pronounced warming trend that peaked during the Early Eocene Climatic Optimum (EECO; ca. 50–52 Ma, basically in Chron C23n) that represents the interval, ice free, with the highest global temperature recorded in the past 70 myr.

Although a relatively high data set has been recently generated from the analysis of several Paleogene successions, included numerous ODP Legs in Atlantic and Pacific Oceans (e. g., Lyle et al., 2002: Proc. ODP, Init. Repts.199; 2010: IODP Expeditions 320 and 32, Zachos et al., 2004: Proc. ODP, Init. Repts. 208; Pälike et al., 2009: IODP Prel. Rept. 320), several aspects concerning this crucial time interval still need to be addressed. The specific nature of climate variability, how stable climate was during the EECO interval and the origin of this event are still a matter of intense scientific debate thus forcing the acquisition of new widespread high-resolution data.

Given the importance of planktic foraminifera that are extremely sensitive to environmental modifications, the quantification of their changes is an excellent proxy for the comprehension of past surface-water variations during this interval of extraordinary warmth.

The EECO has been recently identified by Agnini et al. (2006: Earth and Planetary Science Letters 241) in the classical early Paleogene section of Possagno (Venetians Pre-Alps of northern Italy; Bolli, 1975: Schweizerische Palaeontologische Abhandlungen 9) that accounts a reliable magnetostratigraphy and calcareous nannofossil record. This continuous section, deposited in a bathyal setting, provides an excellent record of the Lower-middle Eocene transition as occurring in a marginal basin of the centralwestern Tethys.

Our detailed quantitative study of the planktic foraminifera shows a major change between 16 and 21 m-level resulting in a marked decline of the cold indices subbotinids balanced by prominent increase of the warm indices acarininids (from mean relative abundance less than 50% up to ca 80%). These significant variations well correlate the geochemical expression of the EECO event, consisting of a pronounced, composite negative $\delta^{13}C$ perturbation.

A further, crucial change is the distinct reduction in abundance of the specialized, symbiont-bearing, warm-indices morozovellids that virtually collapses from a mean abundance of ~24% in the lower part of the section to less than ~6% of the total population above the EECO and never recover up section. The causes of this apparently irreversible decline, occurred about 6 Ma before the *Morozovella* extinction, may include the decrease in temperatures and changes in the pCO_2 following the EECO event. The consequent modification in the water column structure may have negatively affected the ecological niches of the highly specialized muricate forms.