# New stable isotopic records of the Middle Eocene Climatic Optimum (MECO) from central Turkey and the Equatorial Atlantic Ocean

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**ABSTRACT:** The Middle Eocene Climatic Optimum (MECO) is a climate-warming event that occurred around 40 Ma ago. Similarly to hyperthermals (i.e., PETM, ETM2 and ETM3), this event is accompanied by a decrease in $\delta^{18}O$ in marine carbonates and an increase in atmospheric $pCO_2$. Despite of it, the duration of the MECO is particularly long for being explained by classical climatic models that attribute warming to enhanced greenhouse effect due to increased amount of $pCO_2$ in the atmosphere (Sluijs et al., 2013). Carbonate $\delta^{13}C$ records display a few differences from site to site. The MECO is commonly accompanied by a gradual $\delta^{13}C$ rise of ~0.7‰, which in some archives is preceded by one or two rapid negative excursions of about 0.5‰ magnitude (e.g. Spofforth et al., 2010). In other sections and sites no negative excursion precedes the $\delta^{13}C$ rise, while in some cases a small 0.5‰ $\delta^{13}C$ negative spike is observed just at the maximum thermal peak of the MECO (Bohaty et al., 2009; Sluijs et al., 2013). Here we present new high-resolution $\delta^{13}C$ and $\delta^{18}O$ records from central Turkey (Baskil) and the Brazilian Equatorial Margin (Ceará Rise, ODP site 929E). These two records offer the opportunity to study the MECO in two understudied regions, such as the portion of the Neo-Tethys close to the Indian Ocean and the Equatorial Atlantic Ocean. The exceptional continuity of the two records shows that the MECO occurs during a longer-term increasing $\delta^{13}C$ trend, which starts about 1 Myr earlier. Stable isotopes data from benthic, deep- and shallow-water dwelling planktonic foraminifera reveal that this period was also accompanied by a re-arrangement of the water masses, which resulted in a more stratified water column in the Neo-Tethys after the MECO. Our results suggest that the MECO was different from the other warming events occurring during the Paleogene, and was related to a period of unstable oceanic conditions that might have been triggered by a peculiar configuration of the Earth eccentricity phases. Moreover, our work also highlights the high potential of the Brazilian Equatorial Margin as a paleoclimate archive.

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