

Past excess CO₂ worlds: biota responses to extreme warmth and ocean acidification during the Late Cretaceous-Eocene

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The "Greenhouse Earth" of the Late Cretaceous-Eocene was characterized by warm temperatures and elevated Partial Pressure of Carbon Dioxide ($p\text{CO}_2$). During this time, however, many climatic perturbations occurred, the most pronounced corresponding to the OAEs (Oceanic Anoxic Events) and to the "hyperthermals" as the iconic PETM (Paleocene/Eocene Thermal Maximum, ~ 56 Ma). Most of these events were geologically brief and began with rapid warming across the globe and massive input of ^{13}C -depleted carbon to the ocean and atmosphere. They were also times of extreme variations in the ecosystems, biota, hydrological cycle and ocean acidification. Although cause and effect relationships during anoxic events and hyperthermal events, as well as links between them, remain uncertain, they are crucial intervals for investigating past global warming and their repercussions on environment and biota. The main aim of this project is to explore some climatic perturbations in the upper Cretaceous-lower Paleogene hemipelagic sediments of the Veneto region (Italy) and ODP cores using an integrated approach and multidisciplinary methodologies. Joint actions by Padova, Modena, Urbino and Paris Sorbonne Universities and CNR will move along a synergistic line of interaction focused on the analysis of such events characterized by carbon cycle perturbations. The main goals of the project are: 1) to investigate how these extreme climatic events affected deep-sea calcareous nannofossils and foraminifera; 2) to provide details about the isotopic, geochemical and mineralogical changes in order to contribute to a better understanding of the mechanisms triggering these climatic-perturbations in a critical area as the central-western Tethys. 3) to analyze the tempo and mode of the extinction and recovery pattern of calcareous nannofossil and foraminifera communities during the Oceanic Anoxic Event 2 (OAE2), the late Turonian event and the Paleocene-Eocene hyperthermals in order to compare the response of the biota to the past episodes of CO₂ excess from two timeframes with different background conditions.

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