Past excess CO_2 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 (pCO2). During this time, however, many climatic perturbations occurred, the most pronounced corresponding to the OAEs (Oceanic Anoxic Events) and to the "hypertermals" as the 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. For these reasons, these events, especially the PETM, are often suggested as the best past analogue for current and future climate change. 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 poorly known climatic perturbations in the upper Cretaceous-lower Paleogene hemipelagic sediments of the Veneto region (Italy) using an integrated approach and multidisciplinary methodologies. Joint actions by Padova, Ferrara, Modena Urbino, and Monaco 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 plankton; 2) to provide details about the isotopic, geochemical and mineralogical changes in order to contribute to a better understanding of the mechanisms triggering these short-lived perturbations in a critical area as the central-western Tethys. 3) to analyze the Paleocene-Eocene hyperthermals, that are still poorly documented in shallow-water environments on a global scale. If a sound and resolved time correlation will be achieved between the deep-sea and shallow-water sediments from the Veneto region, we will have the opportunity of comparing the response of the shallow-water biota with the calcareous plankton to the past episodes of CO_2 episodes.

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