The Early Cretaceous was time of global perturbations in the ocean–climate system, thought to be initiated by plate reconfiguration of tectonic plates, especially linked to breakdown of supercontinent Pangea and stepwise opening of the Proto-Atlantic. These events caused episode of massive volcanic activity that introduced large quantities of $CO_2$ into global environment, producing a stepwise warming. The combination of high $CO_2$ concentrations and elevated nutrient input in the oceans led to high phytoplankton productivity in superficial layer that introduced a huge mass of organic matter (OM) into water column. These sinking OM caused gradual oxygen consumption, widespread oceanic anoxia, and deposition of black shales.

Such episodes repeated during the Cretaceous several times. Each can lasted more than one million years. During these events, the global disturbance in carbon budget was recorded as abrupt $\delta^{13}C$ negative shift, interpreted as coincided with a maximum global warming. It also coincided with a high sea-surface primary productivity, marked reduction in biocalcification, presence of stressed plankton in response to ocean acidification, and further evolutionary changes in calcareous marine biota. The Early Cretaceous period was also a time of great changes in depositional processes, manifested in outstanding changes in sedimentation.

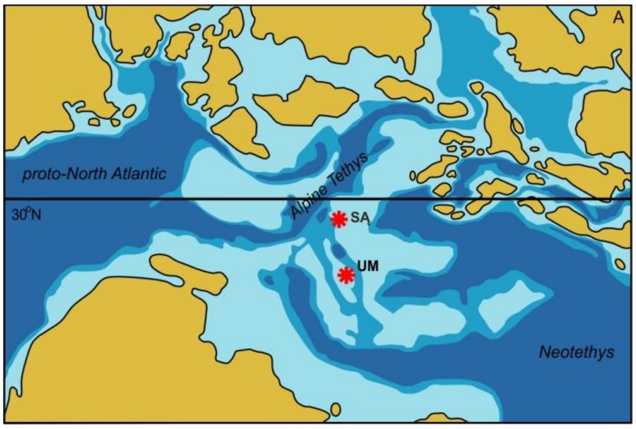



**Figure 1. A:** Paleogeographic map for the early Aptian (after Folmi, 2012) with location of two areas planned to study, Abbreviations: SA – Swiss Prealps, UM – Umbria-Marche. **B:** The photograph of spectacular outcrop located near the Gubbio in the Umbria-Marche area showing the Lower Cretaceous deposits with black shales represent OAEs events (Photograph made by M. Bąk).

Changes of the oceanic environment around the OAEs will be studied in the current project using radiolarian, foraminiferal and calcareous dinocysts assemblages recorded in the Lower Cretaceous sediments including the Selli Level in two selected sections of carbonate platforms, from the tropical and subtropical regions of the ancient Tethys Ocean (Fig. 1). Radiolaria are the marine protists which producing internal skeletons builds of opaline silica. They are commonly present in the sediments of the Cretaceous oceanic anoxia. The studies of modern radiolarian assemblages show that their skeleton morphology is strongly related to the type of nutrition, water temperature, and fertility. We make an assumption that fluctuations of radiolarian diversity and their richness in the Lower Cretaceous sediments followed the sea surface temperatures and changes of thermocline and nutricline depth. These parameters of water column could coincided with multi-decadal to millennial climate oscillations, which finally lead to the "greenhouse" and "icehouse" climate stage. We expect to find changes of radiolarian assemblages that will be observed in millimeter scales of consolidate rocks, which will reflect such multi-decadal to millennial fluctuations of water column state coinciding with the climatic oscillations.

Studies on contemporary climate change during the last decade have highlighted the relevance of how atmospheric patterns affect climate conditions over the equatorial region, and how it is important with respect to large-scale modes of climate variability, such as El Niño Southern Oscillation (ENSO), Pacific Decadal Oscillation, Atlantic Multi-decadal Oscillation, and Equatorial Indian Ocean Oscillation. Recently, these cyclical oceanographic phenomena have been recognized as possess strong influence on the global climate changes. Based on these recent studies, we attempt to apply their results to explain the main causes of changing in circulation pattern within the equatorial zone during the Early Cretaceous interval, which affected the changes in ocean water column parameters in the Western Tethys, relevant to the growth of siliceous plankton.