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The Cenomanian-Turonian oceanic anoxic event in Tibet, a real anoxic condition? Clues from Phosphorus, Carbon and Traces Elements accumulations.

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The Cenomanian-Turonian boundary is marked by an Oceanic Anoxic Event (OAE 2) characterized by finely laminated organic carbon rich sediments deposited under oxygen depleted conditions, coinciding with a positive shift in 13C isotope excursion. The main goal of the present research is to get a better understanding of mechanisms which triggered these OAEs, and particularly the paleoenvironmental conditions which characterized the onset of that major anoxic event and their evolution. Mort (2007) demonstrated that the onset of the Cenomanian-Turonian OAE was triggered by a short-lived but significant increase in phosphorus burial. Then bottom waters became anoxic and switched from being a P sink to a P source, sustaining the productivity in a positive feedback loop. Increased aridity, removal of atmospheric CO2 by burial as organic carbon in black shales and reduction in nutrient availability may have been factors bringing about the return to more oxic oceans.

However, Total Phosphorus (Ptot) and trace metals behaviour is not well known at larger scale, away from main black shales source (Western Tethys and Central Atlantic). It is especially interesting to see if P distribution will show a similar maximum predating the positive carbon excursion.

We investigate therefore the section of Gongzha (Tibet, China) located at the north margin of the Indian plate in the Tethys Himalayas zone (SE Tethys). These sediments are deposited in open marine basin and slope settings under hemipelagic environment (Li et al., 2006). Clay analyses show that the sediments have been overprinted by burial diagenesis and tectonic processes, but the biostratigraphy by foraminifera and nannofossils, microfacies and carbon stable isotopes data indicate a quite good preservation and absence of significant hiatus.

Carbon isotope analyses exhibit the classical C-T positive shift with a first peak near the end of R. cushmani zone, a second in the lower part of W. archaeocretacea zone, followed by a plateau which ends the excursion. A bloom of Heterohelix and Guembelitria, low oxygen tolerant foraminifera, is observed in the upper part of the 13C shift (W. archaeocretacea zone) indicative of depleted oxygen conditions. Significant peaks in Ptot is observed at the onset of the 13C shift, followed by a depletion at the end of R. cushmani zone, persisting up to the end of W. archaeocretacea zone.

In Tibet, P distribution patterns during OAE2 are quite similar to the ones observed in numerous sections in western Tethys and Central Atlantic (England, Italia, Spain and USA, Mort et al., 2007) and appear therefore to be global, coinciding partly with increased detrital inputs.

Trace-metals values are under background level compared with sections characterized by strong anoxic conditions and redox sensitive elements such as Va, Ni, Co, U, generally indicative of anoxic conditions, do not show any increase during the maximum of 13C excursion and Heterohelix and Guembelitria shifts. This suggests that dysoxic rather than anoxic conditions prevailed in Tibet area during OAE 2. Increased Mg, Na, Ca contents to the detriment of Al suggest a change to more arid climate conditions from the base of archaeocretacea zone upwards.

REFERENCES

JENKYNS, H.C. (1980). Cretaceous anoxic events: from continents to oceans. Journal of the Geological Society, 137, 171-188.

LI, X., JENKYNS, H.C., WANG, C., HU, X., CHEN, X., WEI, Y., HUANG, Y. & CUI, J. (2006). Upper Cretaceous carbon-and oxygen-isotope stratigraphy of hemipelagic carbonate facies from southern Tibet, China. Journal of the Geological Society, 163, 375-382.

MORT, H., ADATTE, T., FÖLLMI, K., KELLER, G., STEINMANN, P., MATERA, V., BERNER, Z., & STÜBEN, D. (2007). Phosphorus and the roles of productivity and nutrient recycling during Oceanic Anoxic Event 2. Geology, 35, 6, 483-486.

SCHLANGER, S.O. & JENKYNS, H.C. (1976). Cretaceous anoxic events: causes and consequences. Geologie en Mijnbouw, 55, 179-184.

SCHOLLE, P. & ARTHUR, M.A. (1980). Carbon isotopic fluctuations in pelagic limestones: potential stratigraphic and petroleum exploration tool. AAPG Bulletin, 64, 67-87.