HIGH RESOLUTION CARBON AND OXYGEN ISOTOPE PROFILES OF FORAMINIFERA AND THE CA-NORMALIZED SR CURVE FROM LATE MAASTRICHTIAN ACROSS THE KTB AT ELLES, TUNISIA. D.Stüben [1], U.Kramar [1], Z. Berner[1], M. Leosson[1] ,G. Keller[2], W. Stinnesbeck[3] and Th. Adatte[4], [1]Institut für Petrographie und Geochemie, Universität Karlsruhe, Kaiserstr. 12, 76128 Karlsruhe, Germany (Doris.Stueben@bio-geo.uni-karlsruhe.de), [2]Department of Geosciences, Princeton University, NJ 08544, USA, [3]Geologisches Institut, Universität Karlsruhe, Postfach 6980, D-76128 Karlsruhe, Germany, [4] Institute de Géologie, 11 Rue Emile Argand, 2007 Neuchâtel, Switzerland.

Introduction: Due to the discussion of global catastrophic events at the Cretaceous-Tertiary (KT) boundary based on various reason e.g. [1], [2], [3], [4] and to controversial discussion on the faunal extinction based on high-resolution biostratigraphic investigations e.g. [5], [6] studies to investigate the climate record of the last million years of the Maastrichtian became important.

Stable isotope studies of deep sea sites in the Pacific and South Atlantic reveal a terminal Cretaceous warm event as a distinct 2-3^{o}C warming of intermediate waters across latitudes and a 2-3^{o}C warming in surface waters in middle and high southern latitudes [7]. The well documented long-term cooling trend that characterizes the late Cretaceous was terminated by a short-term warming followed by a rapid cooling near the end of the Maastrichtian 100-200 kyr before the KT boundary [8], [9].

However, different sample resolution, condensed or erosional sedimentation, short-term hiatuses, bioturbation, diagenetic alteration etc. makes a high-resolution chemostratigraphy necessary to determine the nature of this terminal Cretaceous warm event and the cooling shortly below the KT boundary.

Climate and depositional variations during the last 570 000 years of Late Maastrichtian are presented for a 26 m long ELLES section on the base of a high-resolution chemostratigraphy (δ^{13}C, δ^{18}O isotopes and Ca-normalized Sr gradients)..

Material and Methods: High resolution chemistratigraphy was undertaken for a Late Maastrichtian section, at Elles, Tunisia. The section comprises a 26 m long sedimentation record of almost 600 Kyrs. The sedimentation is dominated by dark grey sandy to silty marl. Biostratigraphic zonation is based on the zonal scheme by [7] with zones CF1, 2 and CF4 marking the upper part of the Abathomphalus mayaroensis zone.

The sample interval of this study is every 20 cm. From each subsample benthic (Anomalinoides acuta) and planktic formaminifera (Rugoglobigerina rugosa) were hand-picked under microscope in Princeton for further detailed geochemical studies. Samples revealed well preseved foraminiferal tests with little evidence of alteration.

Stable carbon and oxygen isotope data for foraminifera were obtained from several species usings a fully automated preparation system (MultiCarb) connected on-line to an Optima Isotope Ratio Mass Spectrometer (Micromass Limited UK).

Strontium, Ca concentrations in foraminiferes were determined by using total reflection X-ray fluorescence (TXRF, Atomika EXTRA II).

Time series: To determine periodicities in the sediment column time series analysis was performed for the sediment profile from 1.2 m to 18 m below KT. A hiatus of several hundred kyr at 18 m below KT (Keller et al. in prep.) hinders the applicabitity of time series techniques to the complete profile. Time series analysis was applied to the Sr/Ca ratio data and to δ^{18}O- values of both benthics (*Cibicides*) and planktics (*Rugo Rugosa*).

Results and interpretation: Due to δ^{18}O excursions three cooling periods at around 22m, 10m and 2 m and two warm periods at around 15 m and 6 m can be distinguished. The cool periods are characterized by a small surface-to-deep T gradient reflecting intense mixing of the water column. The surface-to-deep Sr/Ca gradient correlates to the oszillating ΔT trend but is more pronounced reflecting corresponding dissolution rates of Sr from carbonate shells during sealevel changes. Carbon-isotope composition of foraminifers show upsection a general trend towards a progressive decrease in values of planktic foraminifers accompanied by a corresponding increase of δ^{13}C of benthic foraminifers which suggests a continuous decrease in surface bioproductivity over late Maastrichtian period (Fig. 1).

At the onset of warming at 65.5 Myrs the decrase in Δ °C and the decrease in surface δ^{13}C reflects a reduction in surface productivity as a result of decreasing upwelling that accompanied global warming and increased CO_2 possible related to Deccan Trap volcanic degassing.

The isotope and Sr/Ca records of planctic and benthic foraminifera suggests that Maastrichtian ocean-climate evolution was tectonically driven and caused changes in seawater masses.

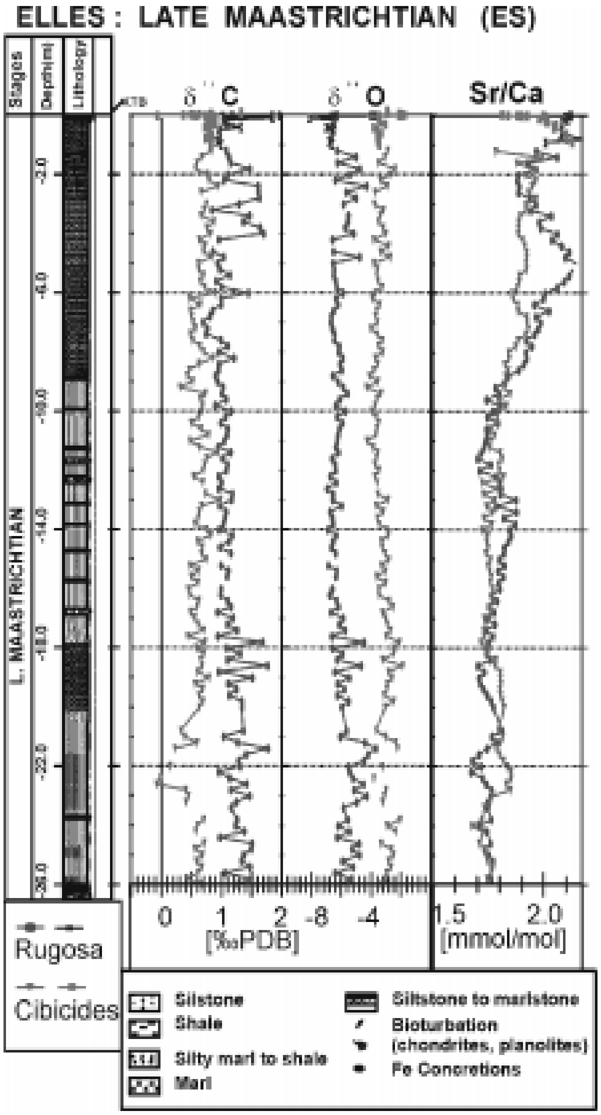

Fig. 1: Carbon and oxygen isotope values and Sr/Ca - ratios in benthic and planktic formaminiferes of the Maastrichtian section at ELLES/ Tunisia.

The KT boundary represents an abrupt increase and adjustment of $\delta^{18}O$ in benthic and planktic foramininfers supposing a drastic change in the water regime to cooler conditions and reduced differences between the $\delta^{18}O$ values of benthic and planktic foraminiferes as a result of short term intense mixing of the water column (Fig. 2).

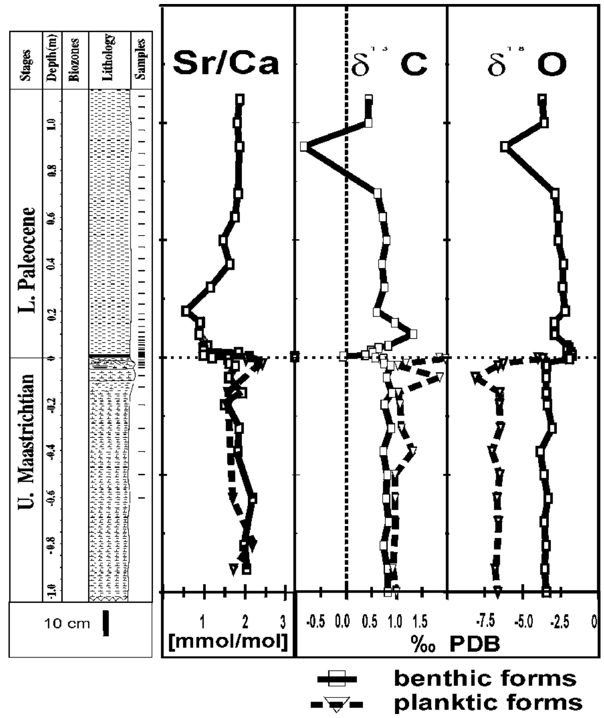

Fig. 2: Carbon and oxygen isotope values and Sr/Ca - ratios in benthic and planktic formaminiferes across the KTB at ELLES/ Tunisia.

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