

COSMIC MARKERS IN AN AMMONITE FROM THE K/T SECTION OF BIDART (FRENCH BASQUE COUNTRY). by ROBERT ROCCHIA¹, ERIC ROBIN¹, JAN SMIT², OLIVIER PIERRARD¹ and IRENE LEFEVRE¹. ¹LSCE, Laboratoire des Sciences du Climat et de l'Environnement, Bât. 12, Domaine du C.N.R.S. Avenue de la Terrasse. 91198 Gif-sur-Yvette cedex. France. ² Inst. of Earth sciences, Vrije Univ, de Boelelaan 1085, 1081HV Amsterdam. N.L.

Scientific context. The extinction of ammonites is still a subject of debate. A rather common, old and persisting opinion is that ammonites disappeared within the Cretaceous after a long period of decline. This position is based on two kinds of observations: a presumed loss of diversity from the Campanian through the Maastrichtian and the stratigraphical position of the last ammonites well below the K/T boundary. These two points should now be reconsidered.

A-Evolution of ammonite diversity. In a recent work, Ward [1] identified 35 taxa for the lower Maastrichtian and 27 for the upper Maastrichtian. He concluded that "the long-described, gradual decline in ammonite diversity was perhaps less marked than previously believed and that the purported long-term diversity reduction of ammonites near the end of the Cretaceous might be more a product of sea-level change than evidence for a slide toward extinction".

B-Extinction levels of ammonite species. Fifteen years ago, ammonites were supposed to get extinct more than 10 metres below the boundary in sections of the Basque country. But in his 1990 review, Ward [1] reported the presence (in the same sections) of ammonites a few tens of centimetres below the boundary.

New observations. Our recent findings confirm Ward conclusions. In the Baie de Loya section near Hendaye, we have found three specimens in the last 20 cm of the Maastrichtian. The highest ammonite was located less than 15 cm below the Ir level. It is difficult to derive a time equivalent for these last 15 cm as few micropaleontological data are available. However, we have no obvious reason to suspect an hiatus at the top

of the Cretaceous; the K/T cosmic event has been perfectly recorded: iridium is there together with Ni-rich spinel. On the other hand, paleomagnetic data indicate a reversed polarity for at least the last 18 metres of the Cretaceous [2]. Then, the duration of the Cretaceous part of chron 29R being 350 kyrs, the "last" identified ammonite could have been deposited there less than 3000 yrs before the K/T event.

Iridium and Ni-rich spinel in an ammonite from the Bidart K/T section. In this section a single specimen was found by one of us (J.S.) less than five centimetres below the boundary clay layer, in cretaceous sediments which usually contains a small amount of Ir [3] (diffusion-bioturbation from the overlying clay layer). The specimen itself contains iridium: 0.3 ng/g in the upper part, 0.2 ng/g in the lower part confirming its near K/T stratigraphical position. We have also found a few crystals of Ni-rich spinel in the ammonite filling material. One could argue that the ammonite could be an old one reworked in the uppermost Maastrichtian, but the presence of Ni-rich spinel inside the shell does not support this idea. It rather suggests that the ammonite was deposited empty shortly before the K/T boundary event and partly filled with remains of this event. A major objection against the Bidart section [1] is that the upper part of the Cretaceous was measured with a normal [4] rather than with a reversed magnetic polarity, suggesting that the uppermost Cretaceous might be missing. This objection is no more valid: recently it has been shown that the primary polarity of this part of the section is reversed [2]. Therefore, we have no reason to suppose that this section is not complete. On the other hand, micropaleontological data indicate that

Comic Markers in an Ammonite from the K/T Section of Bidat: R. Rocchia et al.

the section is characterized by a very rapid sedimentation rate. If so, and according to the estimates of Ward [1], the deposition of the Smit's specimen would have occurred less than 200-600 yrs before the K/T event.

Conclusion. The reported data illustrate a general trend observed in paleontological studies around the K/T boundary: ammonites are found closer and closer to the boundary but never in the Tertiary (unless reworked). The same trend is observed for dinosaur remains in continental sections. These observations, especially the finding at Bidart

of a specimen loaded with Ir and Ni-rich spinel, support the idea that ammonites existed up to the very top of the Cretaceous and disappeared suddenly right at the K/T boundary.

References.- [1]Ward P., D., (1990) GSA sp. paper 247, 519-530. [2]Galbrun B., (1997) Abstract, EUG9, Strasbourg. [3]Rocchia et al., (1987) Mém. Soc. Géol. France, N.S., n°150, 95-103. [4]Delacotte et al., (1985) Géologie de la France, v.3, 243-254.