(7) CHICXULUB IMPACT CRATER AND THE K/T MASS EXTINCTION, REVISITED

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"Chicxulub crater not related to the K/T mass-extinction??"
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That would be a major claim indeed, if it were true. Familiar terms are used like "mounting evidence", "growing number of scientists", where the "evidence" and "scientists" are overwhelmingly from her own (Gerta Kellers) research group itself.

However, the "evidence" that purports to show that the Chicxulub crater is 300.000 years older than the K/T boundary, is exclusively based on resedimented coarse grained deposits in the vicinity of the crater, i.e. the Gulf of Mexico, that have been influenced by tsunami waves, mass-wasting and slumping and earthquakes triggered by the impact itself. Therefore, in all these places there is a sedimentological explanation for the doubling, tripling of layers with ejecta and iridium, creating the illusion of multiple impacts. The mechanisms mentioned above make the deposits very complicated indeed, including the sediments inside the crater. Among the cited evidence for a Chicxulub crater about 300kyr older than the KT boundary, is the occurrence of a so-called normal sedimentary layer with Cretaceous foraminifers above the ejecta of the Chicxulub crater. If that were correct, there would be indeed strong evidence that the crater is older than K/T. However, these "normal" sediments contain either already Tertiary fossils, and are therefore Tertiary in age, or are not "normal" sediments but part of the coarse grained deposits related to the impact itself, because they display grainsize grading.

A new element in the discussion are the results of the new Yaxcopoil-1 drilling inside the Chicxulub crater, where Gerta Keller claims that also there is evidence that the Cretaceous period persisted for 300kyr after the Chicxulub impact.

In this core the Chicxulub ejecta occur from 894-794.70m. The ejecta are overlain by a succession of 51cm of crossbedded dolomitic sands (794.70-794.19m), an 8cm thick hardground (794.19-794.12m), 2cm of clay (794.12-794.10m), and finally, the post impact infill of fine-grained sediments, that contain undisputed Tertiary foraminifers (794.10-404m).

The cited evidence comes from the core segment just above the ejecta, that consists of cross-bedded and parallel-bedded sands (794.70-794.19m). Samples of the same interval were split in two. One part was distributed to Gerta Keller, and the other part to Jose Arz and colleages from Zaragoza, Spain. I myself obtained samples adjacent to these samples that were analysed in Amsterdam. Neither the Zaragoza group, experienced micropaleontologists, nor I were able to find any determinable foraminiferal remains in any of these samples. Instead, we found in thin sections exclusively rhomb-like idiomorphic dolomite overgrowths of the sand grains. The rhombs resemble in size and thickness somewhat the testwalls of foraminifers. The "Bombshell results" presented by Gerta Keller at the EGS-AGU meeting in Nice are based on such dolomite overgrowths. The results of the three groups working on these samples will be published in the MAPS special volume on the Yaxcopoil-1 drilling. Discussions to be continued.

But even if the foraminiferal fossils were missed by the Zaragoza and Amsterdam groups, they would not permit any conclusion about the age of the crater. Cross- and parallel beds tell any sedimentologist that such sediments are deposited by currents or waves, and that all grains in those beds, including foraminiferal shells, are transported from another source. The grains could be washed in from inside the crater, from the rim or the direct surroundings of the crater, and may therefore be much older or younger than the crater itself. In other words, it is impossible to tell whether the foraminifera in that core-segments are contemporaneous, older or considerably younger than the crater. What we do know, however, is that the base of the Tertiary, including the iridium rich clay, is missing in the drill core, because the part of the magnetochron that represents this period, Chron 29R, is only 3-11cm thick in the Tertiary, where the same interval is 1.5m thick in the Gubbio (Italy) and over 5.1m in the Caravaca (Spain) sections.

Where we should be looking for multiple impacts at or near the K/T boundary, is far away from the impact and the resulting energetic events that influence the sedimentary records there. It is therefore laudable that Gerta Keller plans to test the record of the latest Cretaceous for evidence of volcanism, impacts and change of biota in the Indian Ocean. However, if we look critically at the most complete records known today (i.e. El Kef in Tunisia, Agost, Zumaya and Caravaca in Spain, and the Apennine sections in Italy), there is not the slightest undisputed evidence for multiple impacts.

So what and where is the best evidence that ties the Chicxulub impact to the K/T boundary extinctions? In my opinion those

are the impact layers laid down in quiet coalswamps in the US and Canadian western interior. Those layers are found over a wide area ranging from Alberta; Hell Creek, Montana; Dogie Creek, Wyoming; and Raton Basin, Colorado-New Mexico. Glenn Izett, Bruce Bohor and colleagues have shown that in those areas there is a single claylayer, composed of two parts. The lower sublayer is filled with spherules that are identical to the glassy spherules from around the Gulf of Mexico. Ar/Ar age dating, chemical and isotopic composition of the glass show that, barring a miracle, those spherules are derived from the Chicxulub impact. The upper sublayer is invariably enriched in iridium (according to Gerta Keller the fingerprint of the "unknown" K/T boundary impact) and shocked minerals. Additionally, the upper sublayer contains shocked zircon crystals that tie the sublayer to the Chicxulub target (panafrican) rocks. If Gerta Keller would be correct, than the lower and upper sublayers would be separated in time by about 300kyr. In reality, the two sublayers are not even separated by a single season of falling leaves, in all the localities mentioned above, and both comtain evidence linking them to Chicxulub.

I therefore still think the evidence overwhelmingly shows that the K/T boundary impact and the Chicxulub impact are one and the same.

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