Comparison of a Portion of the K/Pg Boundary Deposits in Two Locations: Webb County, Texas, and LaSalle Parish, Louisiana

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EXTENDED ABSTRACT

The Chicxulub Crater on the Yucatan Peninsula of Mexico resulted from impact of a bolide at about 65.5 Ma (Pope et al. 1991; Hildebrand et al., 1991), ending the Cretaceous and leading to an impact generated worldwide deposit. Sanford et al. (2016) documented the extend and volume of this impact generated deposit in the Gulf of Mexico Basin by utilizing over 210,000 km of 2D seismic data, about 9000 square km of 3D seismic data and 408 wells that penetrate the Cretaceous. They demonstrated that the Cretaceous-Paleogene boundary deposit (KPBD) within the Gulf of Mexico varies markedly with distance from the center of the crater and with topography/bathymetry of the site of deposition.

We present preliminary analyses of lithologies and sedimentary structures of the latest Cretaceous and earliest Paleocene strata in cored sections of two wells in the Gulf of Mexico basin margin rim: (1) Murexco A–1 Leyendecker well, Tom Walsh Field, Webb Co., Texas (Fig. 1) and (2) Louisiana Central IPNH No. 2 well, LaSalle Parish, Louisiana (Fig. 2). These cores provide insights into the far-field effects of the Chicxulub bolide impact at the Yucatan Peninsula, about 1200 km away (Fig. 3).

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Comparison of a Portion of the K/Pg Boundary Deposits in Two Locations: Webb County, Texas and LaSalle Parish, Louisiana

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We analyze and compare lithologies and sedimentary structures of the latest Cretaceous and earliest Paleocene strata in cored sections of two wells in the Gulf basin margin rim: 1) Murexco A-1 Leyendecker well, Tom Walsh Field, Webb Co. TX and 2) Louisiana Central IPNH No. 2 well, LaSalle Parish LA. These cores provide insights into the far-field effects of the Chicxulub bolide impact at the Yucatan Peninsula, over 1200 km away.

From 5280 feet to about 5295 feet, the A-1 Leyendecker well core contains a 15 ft thick fine -grained quartzose sandstone with low angle, hummocky cross stratification and a sharp basal contact. The core of the IPNH No. 2 well contains a section from about 4495 feet to a sharp base at 4640 feet (not seen in the available core but indicated on the log) consisting of fine grained carbonate sandstone with low angle cross stratification. The upper contact of each of the cored boundary sequences is burrowed and trace fossil structures exist within the upper ten or so feet of each contact. The paleogeographic positions of these wells are consistent with locations on the shelf within the middle to inner neritic zones. Though the thicknesses of the two sections are quite different, as are the mineralogies, we hypothesize that the two represent the Cretaceous/Paleogene boundary deposit and may be, at least in part, tsunami deposits or related to tsunami backwash currents that affected these shallow shelf settings within hours of the impact event.

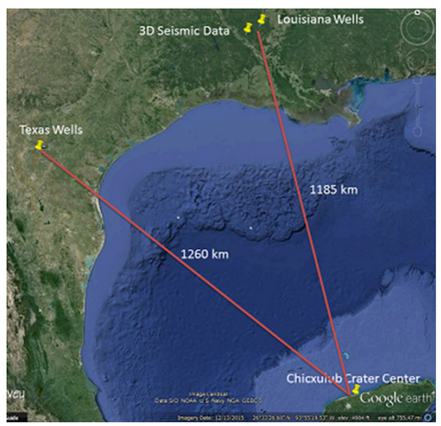
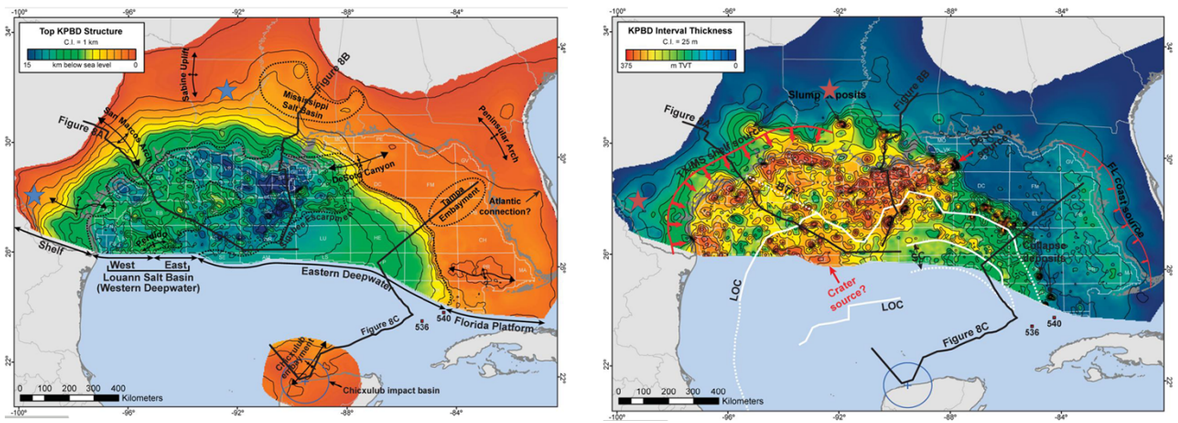


Figure 3. Location of Leyendecker well in South Texas, IPNH No.2 well in Louisiana and 3D seismic survey in Louisiana. Distances from the center of the Chicxulub Crater to the wells are also shown.



Structure at the top of the Cretaceous/Paleogene Boundary Deposit (KPBD) in the northern Gulf of Mexico (left) and interval thickness of the KPBD in the northern Gulf of Mexico. Stars locate the wells of this study. (After Sanford et al., 2016).

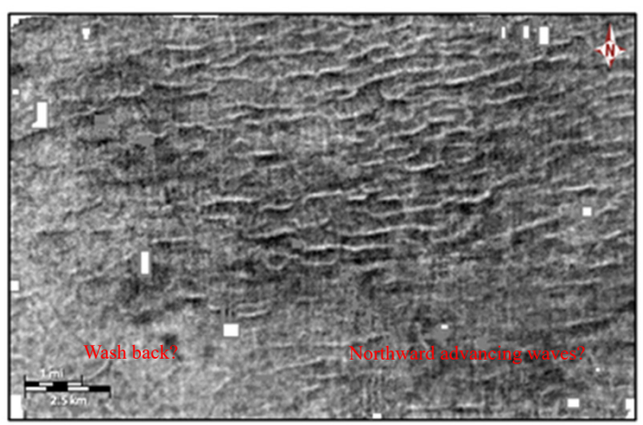


Figure 8. Image from seismic data (location in map to far left of this poster) showing undulatory features on the top of the KPBD, which we interpret as tsunami wave generated bedforms. Note the orientation of the interpreted bedforms with respect to the direction to the Chicxulub Crater…to the south by over 1000 km. Bedforms are perpendicular to the direction to the tsunami waves originating at the crater.(modified from Egedahl, 2012; Egedahl et al., 2012; Strong, 2013 and Strong and Kinsland, 2014).

Figure 2. Core photograph from LA Central IPNH No. 2, 4490 - 4508 ft.

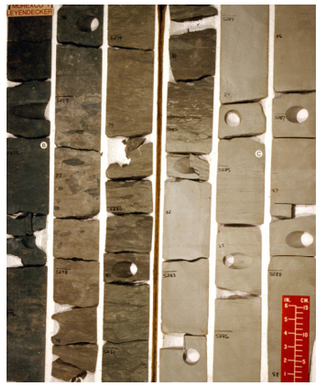


Figure 1. Core photograph from Murexco A-1 Leyendecker, 5275 - 5288 ft.

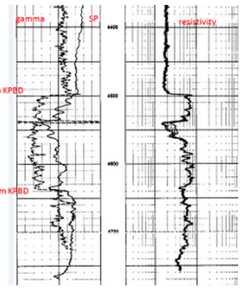


Figure 6. Portion of the well-log from the LA Central IPNH No. 2 well showing log signature of the KPBD. The top is at about 4495 ft and the base is at about 4640 ft.

Figure 4. Core photograph showing hummocky cross-stratification in the Murexco A-1 Leyendecker well at 5286 ft.

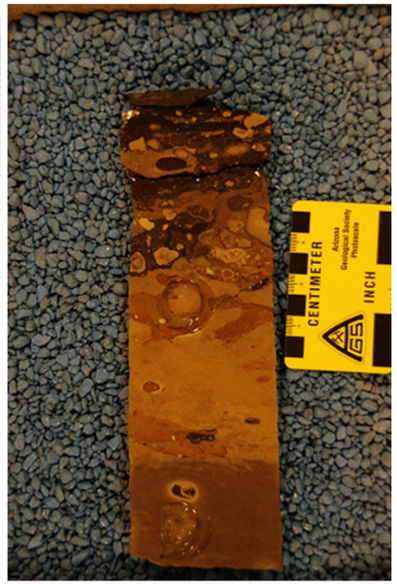


Figure 7. Core photograph showing the top portion of the KPBD in the core from the LA Central IPNH No. 2 well.

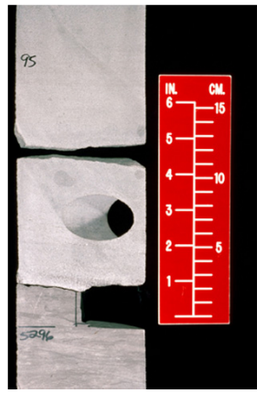


Figure 5. Core photograph showing sharp base of the KPBD in the Murexco A-1 Leyendecker well at just less than 5296 ft.

EXTENDED ABSTRACT

The Chicxulub Crater on the Yucatan Peninsula of Mexico resulted from impact of a bolide at about 65.5 Ma (Pope et al. 1991; Hildebrand et al., 1991) ending the Cretaceous and leading to an impact generated worldwide deposit. Sanford et al. (2016) document the extent and volume of this impact-generated deposit in the northern Gulf of Mexico Basin by utilizing over 210,000 km of two dimensional seismic data, about 9000 square km of three dimensional seismic data and 408 wells which penetrate the Cretaceous. They demonstrate that the Cretaceous-Paleogene boundary deposit (KPBD) within the Gulf of Mexico varies markedly with distance from the center of the crater and with topography/bathymetry of the site of deposition.

We present preliminary analyses of lithologies and sedimentary structures of the latest Cretaceous and earliest Paleocene strata in cored sections of two wells in the Gulf of Mexico basin margin rim: 1) Murexco A-1 Leyendecker well, Tom Walsh Field, Webb Co. TX (Fig. 1) and 2) Louisiana Central IPNH No. 2 well, LaSalle Parish LA (Fig. 2). These cores provide insights into the far-field effects of the Chicxulub bolide impact at the Yucatan Peninsula, about 1200 km away (Fig. 3).

From measured depths of 5280 feet to about 5295 feet, the A-1 Leyendecker well core contains a 15 ft thick fine -grained quartzose sandstone with low angle, hummocky cross stratification and a sharp basal contact (Figs. 4 and 5; Snedden and Cooke, 1987). The core of the IPNH No. 2 well includes a section from about 4495 feet measured depth to a sharp base at 4640 feet (not seen in the available core but indicated on the log; Fig. 6) consisting of fine grained carbonate sandstone with low angle cross-stratification. The upper contact of each of the cored KPg boundary sequences is burrowed and trace fossil structures exist within the upper few feet of each contact (Figs. 1, 2 and 7).

The paleogeographic positions of these wells are interpreted to be on the shelf within the middle to inner neritic zones based on plantktonic and benthic foraminifers. Though the thicknesses of the two sections are dissimilar, as are the mineralogies, we hypothesize that the two represent the Cretaceous/Paleogene boundary deposit and may be, at least in part, tsunami deposits or related to tsunami backwash currents (e.g. hummocky cross stratification) that affected these shallow shelf settings within hours of this major impact event.

Further evidence for at least part of these cores being deposited by tsunami related waves in Louisiana is illustrated in Figure 8. This figure is the result of flattening a 3D seismic volume on the strong reflection at the top of the KPBD and then imaging the amplitude of a time slice slightly above that flattened reflection. The surface of the KPBD is undulatory (suggestive of wavy generated bedforms) in the original data so that the reflection above is now undulatory in the flattening process and the "new" time slice cuts in and out of the amplitude of these features revealing the large bedforms in the KPBD (Egedahl, 2012; Egedahl et al., 2012; Strong, 2013 and Strong and Kinsland, 2014).

The upper 8 - 10 centimeters of the IPNH No. 2 well from Louisiana consists of pebbles surrounded and supported by finer grained material. The pebbles exhibit rinds about cores of several different materials. Whether this part of the deposit consists of accretionary lapilli directly from the ejecta of the impact or of pebbles with rinds deposited in the vadose zone from subaerial weathering of KPBD exposed subsequent to its deposition is unknown as we have yet to be able to analyze this core beyond a brief visual inspection in the repository and the photos shown here (Figure 2 and 7). Alternatively, the pebbles are derived from exposed Cretaceous rocks to the north and backwashed into the study area.

We plan a thorough investigation of these cores macroscopically, microscopically, geochemically, and paleontologically in order to compare and contrast KPBD deposits in the two localities, nearly equidistant from the impact but separated by about 800 km and consisting of different mineralogies.

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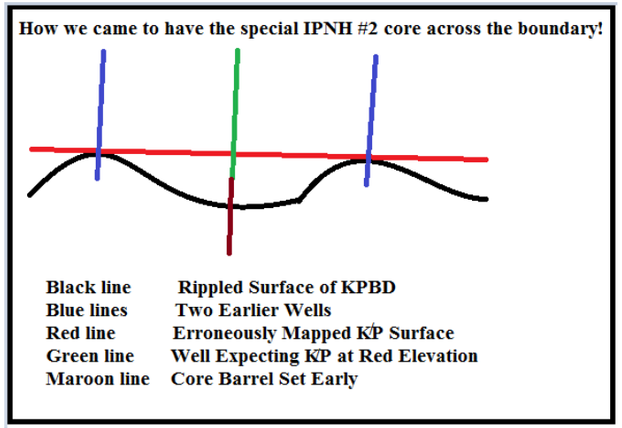

RIPPLES Wavelength ½ mi
Height 50 ft

"They were drilling ahead slowly in the Midway Shale expecting to tag the carbonate of the Cretaceous near the depth where it was mapped when 'the boss' drove up and said to put the core barrel on and drill ahead." Word from Justiss Oil Company.