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IRIDIUM, SHOCKED MINERALS, AND TRACE ELEMENTS ACROSS THE CRETACEOUS/TERTIARY BOUNDARY AT MAUD RISE, WEDELL SEA, AND WALVIS RIDGE, SOUTH ATLANTIC OCEAN;

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Sediments spanning a 5 meter section across the Cretaceous/Tertiary boundary at ODP holes 689B and 690C, Maud Rise, Wedell Sea and hole 527, Walvis Ridge, are being analyzed for shock deformation, PGE's and other trace elements (including REE's). Mineral separates from each sample were studied with optical microscopy to determine the distribution and microstructural state of quartz and feldspar present in the sediments. Samples from Maud Rise were taken of the K/T transition and at about 50 cm intervals above and below it. These samples consist of carbonate-rich (62 to 96 wt. %) sediments, with the K/T transition marked by a change from white Maastrichtian oozes to a greenish ooze with higher concentrations of altered volcanic clay and vitric ash. The Walvis Ridge site is characterized by more clay-rich sediments with average carbonate content about 60-70 percent.

Initial results from RNAA studies indicate that iridium is present in all the Maud Rise samples in concentrations equal to or greater than 0.01 ppb (whole-rock basis). Enrichment of iridium at the K/T transition does not coincide precisely with the boundary as defined by the ODP core logs at site 689B (figure 1), presumably because of the reported 0.5-1 m zones of bioturbation in the cores. Maximum enrichments (11.1 and 1.0 ppb, carbonate-free basis; in 689B and 690C, respectively) in our data occur at 50 cm from the paleontological boundary in both holes with enrichments of somewhat lesser magnitude at 2 to 2.5 meters above and below the boundary at site 689B. These iridium enrichments are similar to those observed at the classic Contessa and Bottacione sites at Gubbio, Italy (Crocket et al., 1988), and a K/T section in Spain (Courtillot, personal communication, 1988). Initial results from INAA indicate the presence of peaks away from the K/T boundary for other trace elements as well.

Preliminary results from optical microscopy indicate the occurrence (6 to 35%) of shock mosaicism in quartz and feldspar in all of the samples studied (figure 1). In stark contrast to the frequency of mosaicism, is the paucity of shock lamellae with no multiple sets of planar features observed in any of the Walvis Ridge samples and no lamellae of any kind at Maud Rise. To date, single sets of planar features oriented parallel to $\omega\{10\bar{1}3\}$ have been observed in only two grains at the K/T transition and in only one grain about 2 meters below the K/T in the Walvis Ridge section.

The pervasiveness of shock mosaicism and presence of planar features to 2 meters from the K/T boundary, as at Gubbio (Carter et al., 1988), indicates that a single impact or volcanic explosion 66 ma may be ruled out as responsible for the K/T event. A similar conclusion may be drawn independently from the distribution of Iridium and other trace elements. Regardless of the source of the shock waves and sediment contamination, multiple events are required over a ca. 0.5 my timespan; currently we favor endogenous sources.

References:

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