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FINE STRUCTURE OF THE LATE EOCENE IR ANOMALY IN MARINE SEDIMENTS

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The following studies are part of a collaboration with several other scientists. The Late Eocene Ir abundance profile in deep sea cores from Ocean Drilling Program Leg 113 Hole 689B on the Maude Rise off of Antarctica was studied with 410 samples (encompassing about 5 million years of accumulation) which were collected continuously in 10 cm increments and measured with the Iridium Coincidence Spectrometer (ICS). The ICS was subsequently modified to measure 13 other elements simultaneously with the Ir. The abundance profiles of these elements were then determined in the Late Eocene Massignano section in central Italy with 250 samples (encompassing roughly 2 million years of accumulation) which were collected about every 5 cm in about 2 cm increments. These studies augmented a previous one (which included many elements) of deep sea cores from Deep Sea Drilling Project Site 592 on the Lord Howe Rise in the Tasman Sea between Australia and New Zealand. In the latter study 50 samples (encompassing roughly 0.7 million years of accumulation) were collected continuously in 10 cm increments.

In all three studies one major Ir anomaly, spread over 25 or more cm, was found with respective net abundances in parts-per-trillion (ppt) of 156±10 over an average background of 5.9±1.8, 156±19 over an estimated average background of 42.5±1.2 and 191±6 over an average background of 8.5±0.3. The respective positions of the main peaks were ODP 113-689B 14H-6, 100-110 cm; 5.61 meters (about 7.9 meters below the top of combined nannoplankton zone 19/20) based on the field meter markers in the Massignano section; and DSDP 90-592 38-5 50-60 cm (about 14.4 meters below the top of combined nannoplankton zone 19/20). The main Ir peak had a shoulder on the lower side which had net abundances of 13±5, 27±6 and 27±2 ppt, respectively, and was separated from the main peak by about 30, 17 and 30 cm, respectively. The precision of the first measurement was not good enough to be sure the peak was real. In two of the sections, Massignano and Site 592, another Ir peak was observed 131 and 220 cm respectively, above the main peak with respective net abundances of 27±5 and 19.2±1.5 ppt. A possible similar peak with a net Ir abundance of 17±7 ppt over a background of 6 ppt was observed in Hole 689B samples 330 cm above the main peak. The ICS was operating in a scanning mode in that region, however, and the precision of the measurement was not good enough to be certain the peak was real. The main Ir peaks tail upward in the three sections, and the tails may contain additional structure. An isolated sample at 10.24 meters in the Massignano section had an unusually high Ir abundance (313 ppt) and a Se abundance 200 times higher than the samples above and below.

The ramifications of the data with respect to relative chronology and relative sedimentation rates at the different sites and implications with respect to the comet cluster hypotheses of periodic impacts on the Earth will be discussed.