N89-21410

EVIDENCE OF VOLCANIC ASH AT A K/T BOUNDARY SECTION: OCEAN DRILLING PROGRAM HOLE 690C, MAUD RISE, WEDDELL SEA OFF EAST ANTARCTICA; S. W. Wise, Geology Department, Florida State University, Tallahassee, FL 32306, N. Hamilton, Southampton Univ., U.K., J. Pospichal, Geology Department, FSU, Tallahassee, P. F. Barker, J. P. Kennett, S. O'Connell, W. R. Bryant, L. H. Burckle, P. K. Egeberg, D. K. Futterer, R. E. Gersonde, X. Golovchenko, D. B. Lazarus, B. Mohr, T. Nagao, C. P. G. Pereira, C. J. Pudsey, C. M. Robert, E. Schandl, V. Speiss, L. D. Stott, E. Thomas, and F. K. M. Thompson.

Rare vitric volcanogenic ash but more abundant clay minerals considered volcanogenic in origin are associated with an expanded and essentially complete K/T boundary sequence from Ocean Drilling Project (ODP) Hole 690C on Maud Rise in the Weddell Sea off East Antarctica. This site was drilled in January, 1987 in 2925.4 m of water at Latitude 60°09.621' S and Longitude 01°12.285'E. The K/T boundary has been placed by calcareous nannofossils within a highly bioturbated interval between 245.83 and 246.88 meters below sea floor where it is marked by the first evolutionary appearance of the Danian species Bianolithus sparsus. The lowermost Danian nannofossil Zone CP1a extends 45 cm above the boundary and contains common Hornibrookina, a high latitude coccolith genus not previously reported this low in the section. The boundary was captured within an essentially undisturbed core taken by the extended core barrel (XCB), and lies well within Chron 29R as determined by shore-based magnetostratigraphy. The uppermost Maestrichtian Nephrolithus frequens Zone extends down 23.6 m below the boundary.

The upper Maestrichtian-Danian section consists of white to pinkish white nannofossil chalk and ooze; in contrast, the basal Danian material stands out conspicuously due to its pale brown color. The color is attributed to the presence of clay minerals presumably derived from the alteration of volcanic ash. As the material is heavily bioturbated, considerable Danian material has been churned down into the underlying section, leaving only pods of relatively pure Cretaceous ooze in the boundary zone. Bioturbators have carried Danian material as much as 40 cm down into the Cretaceous section, but these burrows are easily distinguished by their dark color and the presence of Danian nannofossils. This illustrates an obvious difficulty one might encounter in accurately marking the K/T boundary in sections where there is not a strong color difference between the Danian and Cretaceous sediments.

Vitric ash is also present in a 40 cm interval immediately overlying the K/T contact in ODP Hole 689B, which is also located on Maud Rise 116 km northeast of Site 690 at 64°31.009'S, 03°05.996'E in 2091.3 m of water. Danian sedimentation rates at Site 689 were less, however, and the section there is more indurated and apparently not complete (Zone CP1a is either missing or else totally obscured by bioturbation). In addition, the boundary interval is greenish rather than brown.

Our results at this writing are preliminary and are still based to some extent on shipboard descriptions. Further shore-based studies are in progress. It would appear, however, that the presence of volcanic ash and altered ash in the Danian section beginning at the biostratigraphically and paleomagnetically determined K/T boundary on Maud Rise can be cited as evidence of significant volcanic activity within the South Atlantic-Indian Ocean sector of the Southern Ocean coincident with the time of biotic crises at the end of the Maestrichtian. This is a postulated time of tectonic and volcanic activity within this Southern Hemisphere region, including possible initiation of the Reunion hot spot and a peak in explosive volcanism on Walvis Ridge (1) among other events. A causal relationship with the biotic crisis is possible and volcanism should be given serious consideration as a testable working hypothesis to explain these extinctions.

(1) Officer, C. B., Hallam, A., Drake, C. L., and Devine, J. D. (1987) Nature, 326, p. 143-149.