Tertiary boundary, which has been attributed to a major impact event. The strong evidence for an impact origin of the Bunyeroo ejecta also points to a cosmic source for its PGE signature.

The shales above and below the Bunyeroo ejecta horizon also show Ir and Pt enrichments (0.073-0.45 ppb Ir, 3.1-313 ppb Pt), suggesting postdepositional mobilization of Ir and Pt. Interelement ratios of the PGEs within the ejecta horizon from different sites are also quite variable, again suggesting postdepositional, low-temperature mobilization of these elements. Indeed, all green shale horizons in the Bunyeroo Formation that were analyzed, regardless of their stratigraphic position, have relatively high levels of Ir and other PGEs. The diagenetic origin of these anomalies is indicated by their association with enrichments in Cu-V-Zn-Co-Ni in thin, permeable green-colored reduced beds in a predominantly red bed sequence. A redox precipitation model similar to that invoked for red bed Cu-U-V deposits has been proposed to explain the PGE anomalies in the green shales [5].

In summary, the Bunyeroo ejecta is unique as the only known example of a widely dispersed, coarse-grained ejecta blanket that is, moreover, strongly linked to a known major impact structure. The marked Ir-PGE anomalies in the ejecta horizon provide support for the hypothesis that meteorite impact events can produce Ir anomalies in terrestrial sediments. The findings also indicate that Ir can be mobilized and concentrated in sediments by low-temperature diagenetic processes. The identification of ejecta horizons in sedimentary rocks therefore should be based on the coincidence of shock-metamorphic features in the detritus and clear Ir anomalies.


OPTICAL AND TEM STUDY OF SHOCK METAMORPHISM FROM THE SEDAN TEST SITE. A. J. Gratz, Lawrence Livermore National Laboratory, Livermore CA 94550, USA.

Thus far, detailed petrologic studies of shock metamorphism have been performed on samples recovered from laboratory experiments and on a few natural impactites. The loading history of these samples is quite different: In particular, laboratory experiments spend only a short time (<1 μs) at peak pressure, whereas natural impactites may have stress pulses from 0.1–1 ms. On the other hand, laboratory experiments have known stress histories; natural impactites do not. Natural samples are also subjected to thousands or millions of years of postshock annealing and/or weathering. A useful intermediate case is that of nuclear detonation. Stress pulses for these events can reach 0.1 ms or higher, and samples are obtained in pristine condition. All three types of loading produce stresses of hundreds of kilobars.

Samples studied were taken from the Sedan nuclear test site, and consist of a coarse-grained granodiorite containing quartz, K-feldspar, cordierite, and hornblende. Samples were studied optically in thin section, then were thinned with an ion mill and studied by transmission electron microscopy (TEM).