A Southern Hemisphere Study of dinoflagellate cysts and miospores assemblages from the Cretaceous-Paleogene boundary – Ecosystems response and restitution time

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This comparative study of Southern Hemisphere latest Maastrichtian to early Paleocene marine and terrestrial ecosystems aims at providing detailed knowledge of how the two different types of ecological systems responded, timing of events and restitution of the biota following the Cretaceous-Paleogene Boundary (KTB) event. For this purpose samples across the KTB in several marine Southern Hemisphere sites are investigated palynologically with focus on correlation of marine organic-walled dinoflagellate cysts (phytoplankton), spores and pollen.

Global, massive turnovers in the terrestrial and marine ecosystems coincident with the KTB event have been reported from both hemispheres (Vajda et al., 2001; 2003; Nichols & Johnson, 2002). However, the global dinoflagellate cyst record shows no major extinction related to the KTB. Instead, evolution of dinoflagellate taxa takes place in earliest Paleocene and several new species turn up in the fossil record e.g. *Carpatella cornuta, Damassadinium californicum* and *Senoniasphaera inornata*.

Interestingly, in the southwest Pacific the first occurrence of *Trithyrodinium evittii* is immediately above the KTB and this species becomes very abundant in two periods during the earliest Paleocene (Helby et al., 1987: Wilson, 1987; 1988; Willumsen 2003; 2004; 2006; Willumsen et al., 2004). In the New Zealand region the two earliest Paleocene "acme intervals" of *T. evittii* are separated by an acme interval of *Paleoperidinium pyrophorum* (Willumsen, 2002; 2003; Willumsen et al., 2004). The sudden occurrence of *P. pyrophorum* are interpreted to reflect a regional cold water pulse taking place after a period with relatively warmer sea-surface temperature e.g. *T. evittii* dominated dinocyst assemblages. The early Paleocene biological production is considered to be relatively high in the ocean surrounding New Zealand continent, because marine sediments from this period contain, apart from palynomorphs, high concentrations of radiolarian test and diatom frustules (Hollis et al., 1995; Hollis et al. 2003). The rapid changes in the dinoflagellate cyst composition during the earliest Paleocene reflect that major ecological shifts took place in the on the shelf during the first c. 1.5 Ma after the KTB event (Willumsen et al., 2004). In the aftermath of the asteroid impact *T. evittii* invaded the southwest Pacific, which support an extended recovery period in the marine realm compared with the terrestrial record. This observation is in accordance with D´Hondt et al. (1998) who propose that the marine ecosystem was radically altered due to the KTB event and that the open-ocean ecosystem did not fully recover for the first c. 3 Ma of the early Paleocene.

Earliest Paleocene acme intervals of *T. evittii* have also been observed in middle to higher latitudes on the Northern Hemisphere (Nøhr-Hansen and Dam, 1999; 1997). The sudden abundance of this "warm-water" species has been interpreted to reflect Early Paleocene global warming (Smit & Brinkhuis, 1996; Galeotti et al., 2004).

Recently, Habib and Saeedi (2007) reported that a spike of *Manumiella seelandica* is present immediately below the KTB in Bass River section, New Jersey, USA. They correlate this spike, based on isotopic evidence, to a mild global cooling period of tens of thousands of years preceding the KTB event. However, in the New Zealand Region is the genus *Manumiella*, including *M. seelandica*, are most abundant in the earliest Paleocene strata during which siliceous sediments were deposited in an outer shelf to slope setting. Based on the evidence available from New Zealand we therefore conclude that high relative occurrence of *Manumiella* is not restricted to marginal marine sediments, or exclusively observed in uppermost Maastrichtian strata. Thus, further investigations are needed and will focus on carrying out several detailed studies of palynomorph assemblages from marine sediments deposited on the shelf.

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