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Occurrence of the Cretaceous limestones from IODP Expedition 330: Louisville Seamount Trail

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Recent paleotemperature proxy and fossil assemblage analyses, particularly in the Atlantic and Indian Ocean, have described the late Cretaceous climate cooling followed by Paleogene warming. On the other hand, in the Pacific Ocean paleoclimatic and paleoceanographic analyses of these events based on biological provincialism and geochemical records are surprisingly poor. Because the Pacific was the largest ocean during the Cretaceous-Paleogene climate transition interval, investigating paleoceanographic conditions in the Pacific is key to understanding the nature of greenhouse climate systems. IODP Expedition 330 along the Louisville Seamount Trail in the South Pacific, between December 2010 and February 2011, collected epi- and/or mesopelagic sediments containing abundant Cretaceous to Paleogene fossils from several flat-topped seamounts. These fossils will help to constrain ancient paleoclimatic and paleoceanographic conditions in the Pacific Ocean.

According to geomantle dynamic models (Steinberger and Antretter, 2006), the Louisville Hotspot, which created the seamount trail, is modeled to have been located at approximately 40-50o S (this will be refined by paleomagnetic analyses post-cruise) during the Cretaceous. Therefore, the epi- and meso-pelagic sediments capping the seamounts will provide an important record of the paleobiogeography and paleoceanography of Pacific southern mid- to high latitudes. Late Cretaceous planktonic foraminifers and molluscs found in the sediments have ages comparable to previous 40Ar/39Ar age estimates for these seamounts or interpolations from the Louisville age progression. The planktonic foraminiferal assemblages are composed of double- and single-keeled globotruncanids, hedbergerids, and heterohelicids. The relative abundances of globotruncanids in the Louisville sediments compared to those in pelagic sediments in the Atlantic and Indian Ocean southern high latitudes, indicate a warmer water environment in the late Cretaceous southern mid- to high latitude Pacific. Our preliminary results contribute to an improved understanding of the expansion of tropical and subtropical climates during the Cretaceous cooling and Paleogene warming events. We will also discuss the paleobioprovince and paleoclimate at high latitudes in the southern Pacific during the Cretaceous.

Steinberger, B., and Antretter, M., 2006. Conduit diameter and buoyant rising speed of mantle plumes: implications for the motion of hot spots and shape of plume conduits. Geochem., Geophys., Geosyst., 7(11):Q11018.

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