

Southern Ocean drilling proposal: Antarctic Cryosphere evolution project (AnCEP)

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The Southern Ocean has played a significant role in the global climate system during the geologic past. In order to understand the paleoceanographic variations with the polar front system and Antarctic Circumpolar Current (ACC), we conducted two cruises KH-07-4 and KH-10-7 in the Indian sector of the Southern Ocean. Two piston cores were collected from the Conrad Rise. We examined centennial-scale changes of diatom assemblages and stable isotopic ratios in planktic foraminifera during the Holocene in a high-accumulation-rate sediment core from the Conrad Rise. Although abundances of dominant diatom taxa (*Fragilariopsis kerguelensis* and *Thalassiothrix antarctica*) are comparatively constant, relative abundances of secondary taxa fluctuate. Before ca 9900 cal. yr BP, winter sea-ice and cold water covered the Conrad Rise. Following deglaciation the sea-ice retreated from the Conrad Rise. The Polar Front moved southward during the early Holocene optimum and north Antarctic Zone waters covered the Conrad Rise for about 650 yr. After 9300 cal. yr BP, solar insolation strongly influenced sea surface temperature and primary productivity in the Southern Ocean. In the high-latitude Indian Sector, productivity increased 1500 yr after the onset of late Holocene neoglaciation. Periodic $\delta^{18}O$ and cold-water diatom taxa spikes (at intervals of 200 and 300-500 yr, respectively) occurred after 9300 cal. yr BP, probably associated with solar activity. Fluctuations in short-term sea surface temperature and cold-water taxa are synchronous with changes in δD observed in an east Antarctic ice core.

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