

Coupling of climate, dust and productivity in the Southern Ocean during the late Miocene to Pleistocene

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Dust potentially affects global climate via the direct and indirect effect on radiative balance of the atmosphere and by supplying essential limiting micronutrients such as iron to the ocean. In fact, supply of dust to the Southern Ocean increases during the glacial periods of the late Pleistocene may have contributed to the decrease in concentration of CO₂, suggesting strong coupling of climate, dust and productivity in the subantarctic Southern Ocean during the Pleistocene. However, link among the climate, dust and productivity in earlier times and its role in the evolution of the long-term climate since the late Miocene have remained unclear. Here we report long-term record of SST, dust and productivity in the Southern Ocean over the past 10 million years based on the analysis of marine sediments from ODP Site 1123, South Pacific sector of the subantarctic zone. Our new records show strong coupling of climate, dust and productivity over the past 10 million years with increase in dust and productivity during cold glacial periods including the late Miocene cooling (6-7 Ma). This finding suggests that the Southern Ocean played a key role in drawdown of atmospheric CO₂ level during the late Miocene.

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