

**The First Miocene Climatic Optimum (18-16 Ma):  
Stable Isotope and Mg/Ca Records from ODP Leg 189 Site 1168.**

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**Abstract**

Ice volume estimates for the early Miocene (~18-16 Ma) were derived from stable oxygen isotope records paired with Mg/Ca ratios from ODP Site 1168, located on the southwest slope of Tasmania. These records indicate the presence of a dynamic ice sheet in Antarctica with ice volume estimates up to present day levels co-existing with relatively warm bottom water temperatures during isotope events Mi1b (17.9 Ma), Mi2 (16.2 Ma), and the first Miocene climatic optimum (17.4-16.3 Ma). These records also indicate ice volume decreased significantly between ~17.2 to 16.9 Ma suggesting a complete collapse of the East Antarctic Ice Sheet, with ~1‰ decrease in oxygen isotope values of seawater as bottom water temperatures decreased. Bottom water temperatures derived from Mg/Ca ratios indicate temperature changes from ~8°C to 3°C, during the early Miocene. This phenomenon was also observed by *Lear et al., 2004* where expansions in ice volume were followed by deep sea warming. These records suggest Antarctic glaciation was influenced by the input of moisture by warm saline deep waters originating from the Indian Ocean/Tethys Sea as proposed by Woodruff and Savin [1989].

There was an overall increase in  $\delta^{13}\text{C}$  values which were also observed in previous records from other sites suggesting a possible increase in organic carbon burial which may have occurred globally.