

# Statistical properties of Antarctic ice cores

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Analyses of the relationship between the cross dated Antarctic and Greenland ice core isotope records have shown that there is a significant relationship in climate between the Northern and Southern hemispheres (the so-called "bipolar seesaw"). The Siple Dome record, which is independently dated but highly correlated with Byrd, confirms this general picture. However, the dating precision of both Byrd and Siple Dome remains too low to determine whether there is coherence with the Greenland records for timescales shorter than about two millennia; a clear relationship with Greenland is demonstrable only for the largest longest-lived millennial-scale events. For both Byrd and Siple Dome, as well as Dome C, we find that a simple stochastic climate model with 100-year averaged white noise forcing of amplitude 0.5 K is sufficient to account for the millennial scale variability. Importantly, all three of these Antarctic cores are highly coherent with each other, but not with Greenland, during the Holocene, and the amplitude of the noise forcing need not be larger in glacial compared with Holocene climate. This result casts doubt on the idea that the variability seen in Antarctic records on these timescales is a response to the abrupt climate changes in Greenland, since these are absent in the Holocene. The Greenland Dansgaard-Oeschger events are therefore perhaps better thought as a response to the background noise variability in the climate system, rather than the origin of such variability. We also note that the enigmatic low-snow-accumulation event at ~15 ka at Siple Dome, if it also occurred at Taylor Dome, would largely reconcile Taylor Dome with other East Antarctic ice core records.