



Records from Antarctic ice and Southern Ocean climate archives – Messages on climate mechanisms

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Sediment cores from the Southern Ocean and the European Project for Ice Coring in Antarctica (EPICA) document Pleistocene climate development at high and ultra-high resolution. We combine marine records from cores recovered during Ocean Drilling Program (ODP) Leg 177 and RV Polarstern cruises in the Atlantic and Pacific Southern Ocean recovered which document sea surface temperature (SST) and sea ice extent during the past seven climate cycles (ca. 650,000 y) with atmospheric signals from the EPICA Dome C (EDC) and the EPICA Dronning Maud Land (EDML) ice cores drilled on the East Antarctic Ice Sheet. The diatom transfer function derived SST records compare remarkably well with the ice core temperatures, including the shift from lower to higher interglacial temperature regimes around 450,000 years ago. This makes temperature a useful tool for correlation of marine and ice core records. Maximum winter and summer sea ice extents, reconstructed from diatom sea ice indicators, coincide with coldest ice core temperatures and increased dust deposition. The Antarctic sea ice field, which expanded during glacials to double the present extent, represents a major player in global climate development because of its impact on the albedo, ocean and atmosphere circulation, and atmospheric CO₂ concentration. The combination of the high-resolution marine and ice core records provides detailed insight into the sequence of ocean and atmosphere environmental events at the past 7 glacial/interglacial transitions. This documents the complex interplay of external and internal forcing and amplification mechanisms driving climate development and its variability.