

A 200-Year Sulfate Record from 16 Antarctic Ice Cores and Associations with Southern Ocean Sea Ice Extent

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Data from sixteen, 50m- to 115m-deep, sub-annually dated ice cores are used to examine the recent spatial and temporal concentration variability of sea salt (ss)SO₄²⁻ and excess (xs)SO₄²⁻ over West Antarctica for the last 200 years. The preservation of seasonal layers throughout the length of each record results in a dating accuracy of better than one year based on known global scale volcanic events. Our xsSO₄²⁻ records with volcanic peaks removed do not display any evidence of an anthropogenic impact on West Antarctic SO₄²⁻ concentrations but do reveal that a major climate transition takes place over West Antarctica at ~1940.

Based on linear correlation analysis ssSO₄²⁻ concentrations are higher when sea ice extent (SIE) is greater and xsSO₄²⁻ concentrations are higher when SIE is lesser. The South Pole receives the majority of its xsSO₄²⁻ from different sources than the rest of West Antarctica and the Weddell region may be a significant source of aerosol chemistry for eastern West Antarctic sites.