Seasonality in sulfur isotopic compositions of atmospheric sulfate in East Antarctica

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Sulfur stable isotopic compositions of sulfate in the Antarctic snow and ice cores have been used to investigate the contribution of its sources such as marine biogenic activity and volcanic emissions, as well as its formation pathways. However, temporal variability of those signatures in the present Antarctic atmosphere has never been examined. Here we report a year-round observation of sulfur isotopic compositions of sulfate in aerosol samples collected in the year 2011 at Dome C (75°10'S, 123°30'E; 3233 m a.s.l.) and Dumont d'Urville Station (66°40'S, 140°01'E; 40 m a.s.l.), inland and coastal sites in East Antarctica. The $\delta^{34}S_{nss}$ values showed clear seasonal variations with summer maxima and winter minima, and were in good agreement between inland and coastal sites. In summer periods, $\delta^{34}S_{nss}$ value were similar to the values observed in dimethyl sulfide (DMS) produced by marine biota, in contrast to ^{34}S depletion during winter, which suggest the contribution of other sources or unknown processes. Combined with the uniform $\delta^{34}S_{nss}$ values observed in surface snow in a different sector of East Antarctica, the spatial variation suggests that the net isotopic fractionation through SO_2 oxidation during the transportation is insignificant for changes in $\delta^{34}S_{nss}$ values. In the presentation, we will discuss the factor controlling $\delta^{34}S_{nss}$ values and the relative importance of various sulfur sources including marine biogenic, volcanic, stratospheric, and anthropogenic sulfate.