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WHAT DO STRONTIUM ISOTOPES IN LAW DOME ICE TELL US ABOUT THE TRANSITION?

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In recent times there has been increasing interest in Sr as an isotopic tracer in environmental studies. There is the potential to characterise dust inputs at a certain site by transport of material from source areas if the isotopic compositions of the site and source areas are known. Furthermore, sources and transport mechanisms may elucidate previous climatic conditions. A correlation between climate and isotopic composition could provide information on the spatial extent of glaciation, changing vegetation cover, desert formation and other mechanisms thought to play a role in the character of dust reaching polar regions. However, relatively few attempts have been made to interpret climatic effects from variations in the provenance of aerosol dust.

Thermal ionisation and isotope dilution mass spectrometry were used to measure the Sr concentrations and isotopic compositions of decontaminated Law Dome ice-core samples spanning the period ~ 6 – 35 ky BP. Sample processing on small volumes of ice (< 10g) for mass spectrometry was carried out in a dust-free clean laboratory supplied with HEPA-filtered air using new techniques developed by the authors.

Preliminary measurements of strontium isotopes in Law Dome ice reveal changes in dust concentration and isotopic compositions with time. These variations appear to be correlated with temperature. While changing concentrations may be explained by changes in wind strengths, the changes in isotopic composition may reflect changing source areas for dust deposited in the snow. The Sr isotopic compositions of potential source area materials (eg dust, loess) are available in the literature and analysis of these in conjuction with our data may allow us to identify the source areas. The Ba/Sr, and Pb/Sr elemental ratios of the samples do not fall in the range defined by crustal and seawater end members indicating that other materials such as sediments or volcanic emissions are captured in Law Dome ice.