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EVIDENCE FOR CLIMATE MODULATION OF THE ^{10}BE SOLAR ACTIVITY PROXY

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Quantifying the contribution of solar variability to past and present climate change has been an important and controversial aspect of climate research. ^{10}Be records from polar ice have played an important role in solar activity reconstructions prior to the period of direct observations of the sun. The processes responsible for ^{10}Be production variability are well known; high solar shielding of the galactic cosmic rays during periods of high solar activity decreases the ^{10}Be production rate and vice versa for low solar activities. However, the processes governing the delivery of ^{10}Be to the polar ice core archives, atmospheric transport and deposition, are poorly understood and introduce uncertainty to record interpretation. In particular, the extent to which transport is influenced by climate is uncertain.

This study used a high resolution ^{10}Be record from a snow pit in conjunction with detailed snow accumulation data and oxygen isotope records to examine atmospheric transport and deposition effects at Law Dome, Antarctica. In contrast to previous ice core studies in Antarctica, our record is of sufficiently short duration (~1-year) that fluctuations reflect mainly atmospheric transport processes rather than solar modulation of production. ^{10}Be concentrations were clearly sensitive to meteorology. A significant ($P < 0.01$) anti-correlation of ^{10}Be with oxygen isotope ratio (which may be interpreted as a local temperature proxy) was observed. This anti-correlation associates increased local temperature with reduced ^{10}Be concentrations. In this case, the variations are clearly transport related; in longer studies, such an effect could be misinterpreted as solar-induced warming. This result supports the need for caution in drawing causal links between climate and solar activity reconstructed from ^{10}Be records.