



RICE ice core: Black Carbon reflects climate variability at Roosevelt Island, West Antarctica

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The Roosevelt Island Climate Evolution (RICE) project successfully drilled a deep ice core from Roosevelt Island during the 2011/2012 and 2012/2013 seasons. Located in the Ross Ice Shelf in West Antarctica, the site is an ideal location for investigating climate variability and the past stability of the Ross Ice Shelf. Black carbon (BC) aerosols are emitted by both biomass burning and fossil fuels, and BC particles emitted in the southern hemisphere are transported in the atmosphere and preserved in Antarctic ice. The past record of BC is expected to be sensitive to climate variability, as it is modulated by both emissions and transport. To investigate BC variability over the past 200 years, we developed a BC record from two overlapping ice cores (~1850-2012) and a high-resolution snow pit spanning 2010-2012 (cal. yr). Consistent results are found between the snow pit profiles and ice core records. Distinct decadal trends are found with respect to BC particle size, and the record indicates a steady rise in BC particle size over the last 100 years. Differences in emission sources and conditions may be a possible explanation for changes in BC size. These records also show a significant increase in BC concentration over the past decade with concentrations rising over 1.5 ppb (1.5×10^{-9} ng/g), suggesting a fundamental shift in BC deposition to the site.