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Annual layers in the Roosevelt Island (coastal Antarctica) ice core determined from conductivity and calcium measurements

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The Roosevelt Island Climate Evolution (RICE) Project aims to determine the stability of the Ross Ice Shelf and thus the West Antarctic Ice Sheet in a warming world. A 764 m ice core (79.36° S, 161.71° W) was drilled in 2011-13 at the summit of the Roosevelt Island ice dome, a location surrounded by the Ross Ice Shelf. The site has high accumulation (0.26 m ice equivalent) and a mean annual temperature of -23 ºC. From 2012 to 2014, continuous flow analysis (CFA) of the ice core enabled continuous measurements of conductivity, acidity, calcium and insoluble dust particle concentrations along the core.

The RICE ice core features high background levels of sulphate and marine salts, due to the low altitude of the site (550 m asl) and its proximity to open ocean. At Roosevelt Island, calcium is influenced by both dust and marine salt inputs. By investigating the residual offset between conductivity and calcium, it has been possible to calculate non-sea salt conductivity and hence determine impurity layers deriving from volcanic eruptions. We present a preliminary chronology for the last 2000 years of deposition in the RICE ice core, composed of counted impurity layers and constrained by a limited number of large, well-dated volcanic eruptions.