Geophysical Research Abstracts
Vol. 16, EGU2014-1361, 2014
EGU General Assembly 2014

How to identify Antarctica's "Oldest Ice" with geophysical data?

Olaf Eisen
AWI, Glaciology, Bremerhaven, Germany (oeisen@awi.de, +49 (0)471 4831 1926)

The International Partnership for Ice Core Sciences (IPICS) identified the retrieve of an "Oldest-Ice" ice core as one of the most important scientific challenges in ice core research for the near future. As the outcome of an "Oldest-Ice" workshop a general approach was recently suggested how to combine geophysical reconnaissance, numerical ice-flow modelling and sample drilling to identify the most promising sites where about 1.5 Ma old ice could most likely be found (Fischer et al., CP, 2013). The most critical unknown parameter is the geothermal heat flow underneath the ice, followed by bed topography and integrity of internal layering. Here, we propose the combined application of geophysical methods in conjunction with existing ice-core data to improve the knowledge on physical properties of the ice and the underlaying strata. It builds on (i) conventional application of potential field geophysics (gravimetry and magnetics) to estimate subglacial geology; (ii) radar internal architecture to determine layer integrity and bedrock topography; (iii) combination of ice-core profiles with radar to determine the origin - and thus confirm isochronity and age - of internal radar layers, complemented by layer attributes; (iv) extrapolation of ice-core impurities and the related attenuation of radar waves in space along internal layers; and (v) radar and seismic wave attenuation analyses to determine the englacial temperature distribution. This approach has the potential to improve our capabilities to estimate the spatial variation of geothermal heat flux and provide spatially distributed age-depth constraints for ice-flow models.