Concordia Seismic Experiment (CASE-IPY)

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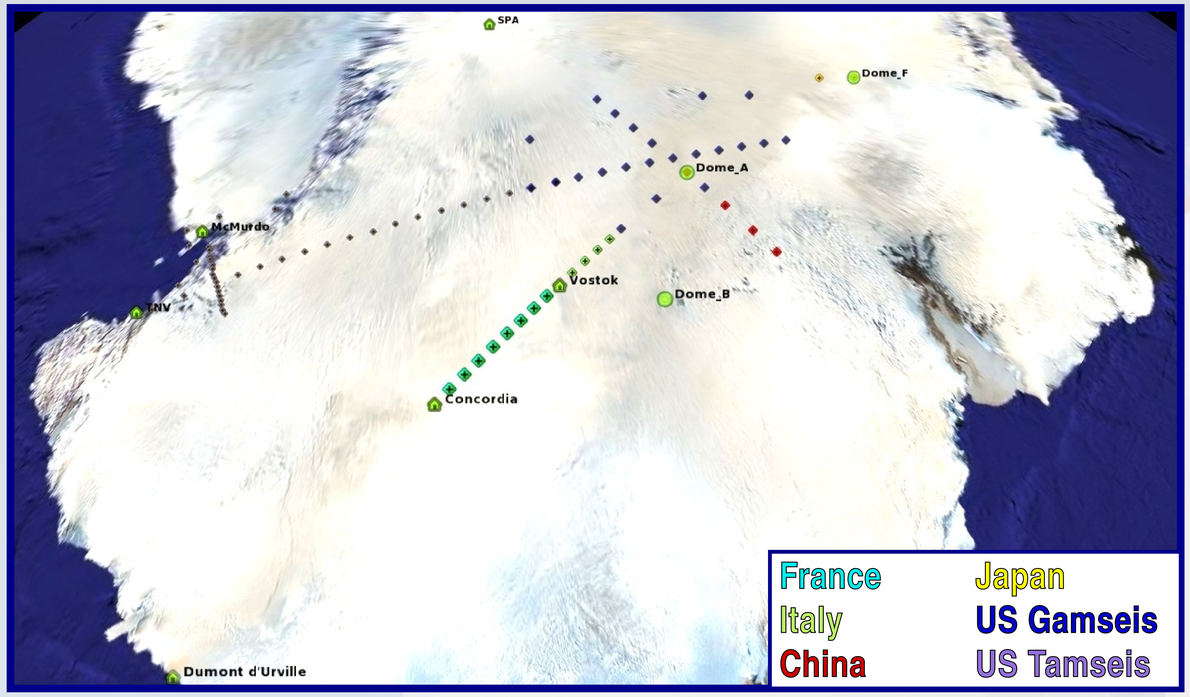


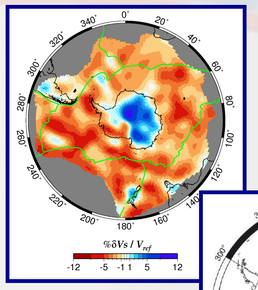
Scientific Objectives

The East Antarctica POLENET network (station map and U24D-03) will provide unprecedented coverage, allowing us to:

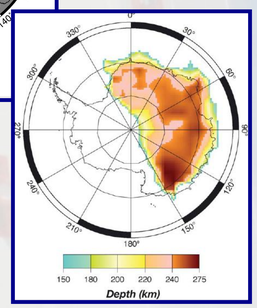
(1) Improve our knowledge of regional crustal structure. Crustal thickness measurements from the combined array will help trace the boundaries of the units that make up East Antarctica, enhancing our comprehension of the formation and breakup of Gondwana.

(2) Improve our knowledge of regional lithospheric structure. The combined array will allow lateral variations in the structure of East Antarctica to be imaged at higher resolution than previously possible using both earthquake data and ambient noise.

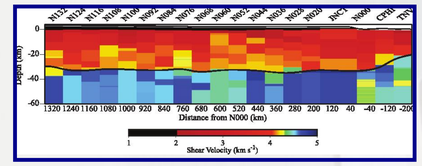
(3) Improve our sampling for inner core studies. Analysis of inner core anisotropy and heterogeneity requires seismic paths nearly parallel to the Earth's rotation axis. The deployment of stations in Antarctica will dramatically increase the number of available paths.



Left: Vs at 175 km depth (Sieminski et al, 2003).



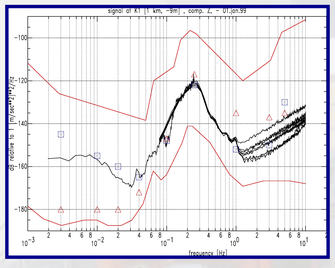
Right: Estimated lithospheric thickness of East Antarctica (Morelli Danesi, 2004).
Bottom: Shearwave velocity structure and moho depth along the TAMSEIS profile (Lawrence et al, 2006).



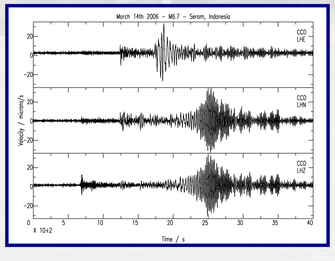
Top: Concordia station in 2005.
Bottom: The two STS-2 seismometers at Concordia.

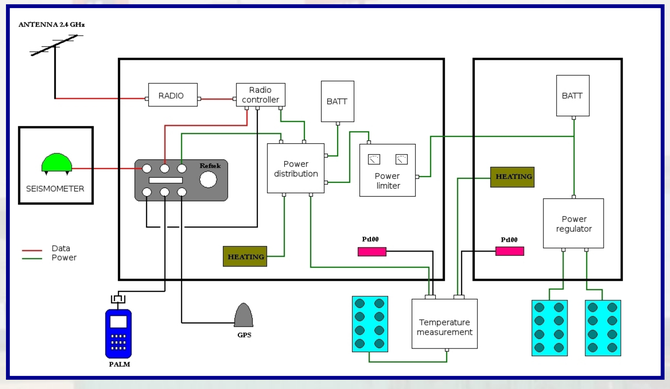
Concordia Permanent Station

Concordia is the site of an experimental permanent seismic observatory station, which has been operational since 2005. The extreme temperatures present at the site (-60°C) imply difficult operating conditions for the seismological equipment. The quality of data we obtain from this station has been steadily improving as we resolve the technical issues related to working at such low temperatures.

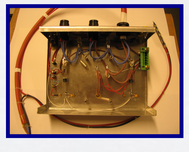


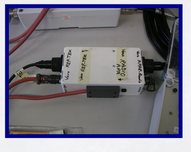
Top: Noise density spectra for Concordia for a 12-hour record. Blue symbol: noise at South Pole (SPA). Red symbol: noise at Harvard (HRV).
Bottom: Three components seismograms for 14th March 2006, M6.7, Seram, Indonesia event.





Above: Contents and cabling of our Antarctic seismic stations.
Below: Elements designed in house: power regulator (left), power limiter (center), radio controller (right).





2007-2008 Summer Campaign

This year we shall deploy three prototype stations within a 10 km radius of Concordia. Each station contains a broad-band seismometer (STS-2, Trillium-120P, GMG-40), a RefTek-130 data recorder, a 2.4GHz radio transmitter, solar panels, batteries, heating elements, and power control electronics. Each box is protected by 16-20 cm insulation. Data is telemetered to Concordia once a day. At sundown, when the battery charge falls below a cut-off level, the stations will shut down; they will wake up in the spring, when the solar panels have re-charged the batteries.