

First ground traverse between Concordia and Vostok stations, East Antarctica, austral summer 2011-2012

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A scientific traverse was conducted during Austral season 2011-2012 between the French-Italian Concordia and the Russian Vostok stations on the East Antarctic Plateau. This traverse is one component of the IPY lead project TASTE-IDEA (Trans-Antarctic Scientific Traverses Expeditions – Ice Divide of East Antarctica) and is also linked to the international SCAR project ITASE.

The project aims to collect new data on the Antarctic plateau for climate and environmental objectives. A major issue is the snow surface mass balance.

Continuous measurements (snow radar, albedo) were done as well as new series of snow and ice sampling from pits and shallow cores covering recent period from 50 years (for which some meteorological observations are available) extended to 200 years (which covers the main period for increasing anthropogenic activities). Atmospheric measurements (Hg, aerosols) were performed and an automatic weather station was installed. This is the first time a traverse is done on this route. It represents a 1300 km route through a poorly known polar area and is a unique opportunity to survey this part of Antarctica.

I – Traverse route

Total route: DC-Vostok 616 km + Vostok-DC: 620 km

General planning:

Departure from DC: December 20; Arrival Vostok: January 3

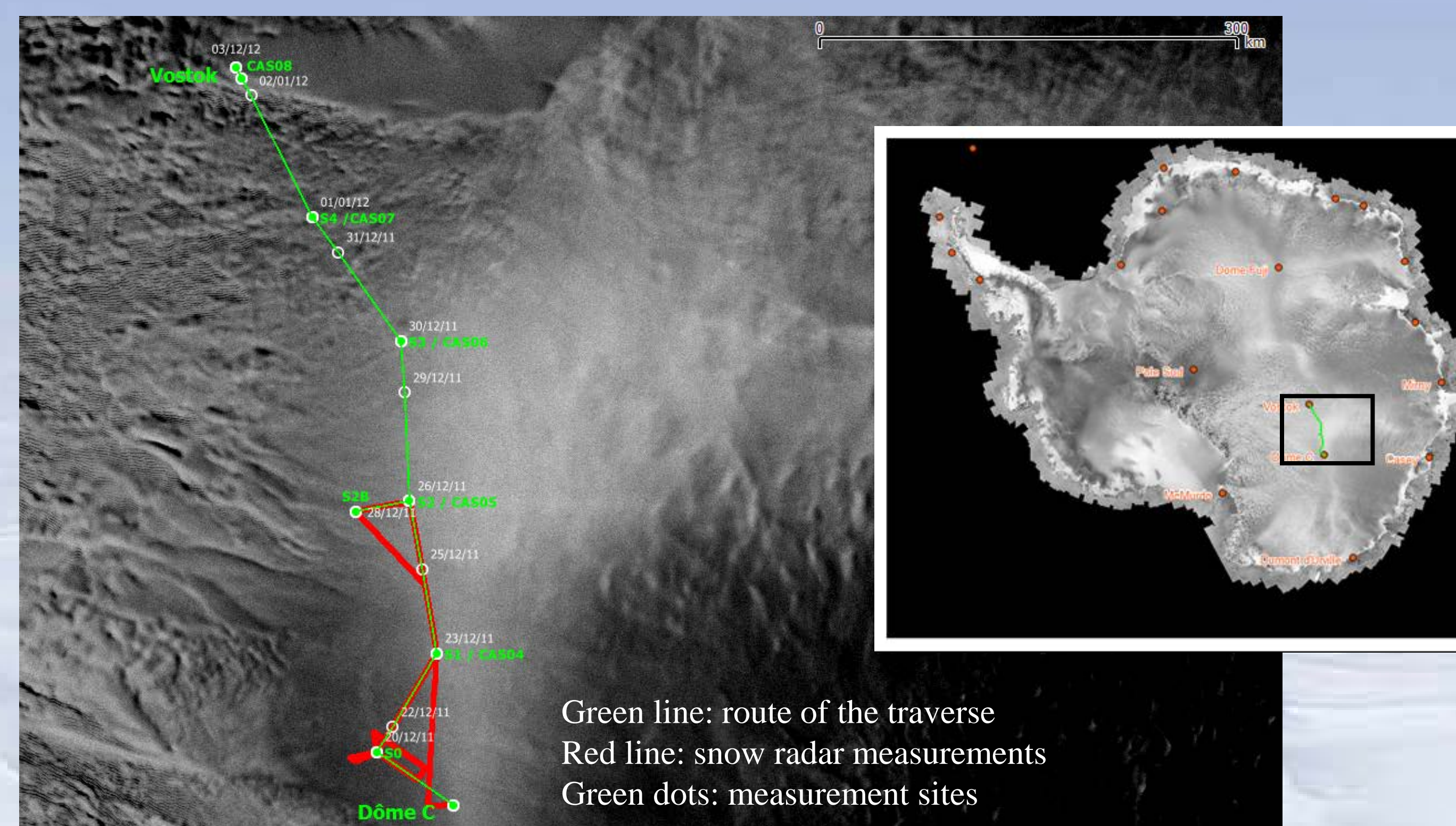
Departure Vostok: January 5; Arrival DC: January 25

Travel: 18 days

Sites: 6 days for the traverse program (5 sites) + 7 days for an intermediate 110 m ice drilling at Point Barnola (S0 on the map)

Traverse team: 5 scientific personnel (including 1 for seismology) + 3 logisticians

Traverse vehicles: 4 vehicles + 5 sledges + 3 fuel tanks



II – Measurement sites

Snow accumulation

9 shallow ice cores (20 m) for radioactive and volcanic horizons.

Snow physical characteristics

5 snow pits and 10 shallow cores down to 10 m.

Density, temperature, continuous snow grain size with an optical device, thermal conductivity.

Meteorological station at S2:

Temperature at 2 levels, pressure, wind, humidity, surface height

Snow temperature at 24 levels down to 20 m

Transmission of data with ARGOS system

Snow chemistry:

Four 1m + one 3m snow pits with high resolution sampling (up to 3 cm)

Samples for: water isotopes, nitrates, Hg, microbiology, etc.

Air chemistry

Continuous measurements at each site: Mercury, ozone

III – Continuous measurements

Snow radar

500 km with ground penetrating radar (100 MHz) + GPS

for snow accumulation (300 years)

Spectral albedo every 500 m

Snow reflectance spectrum (spectral range: 400-1000 nm)

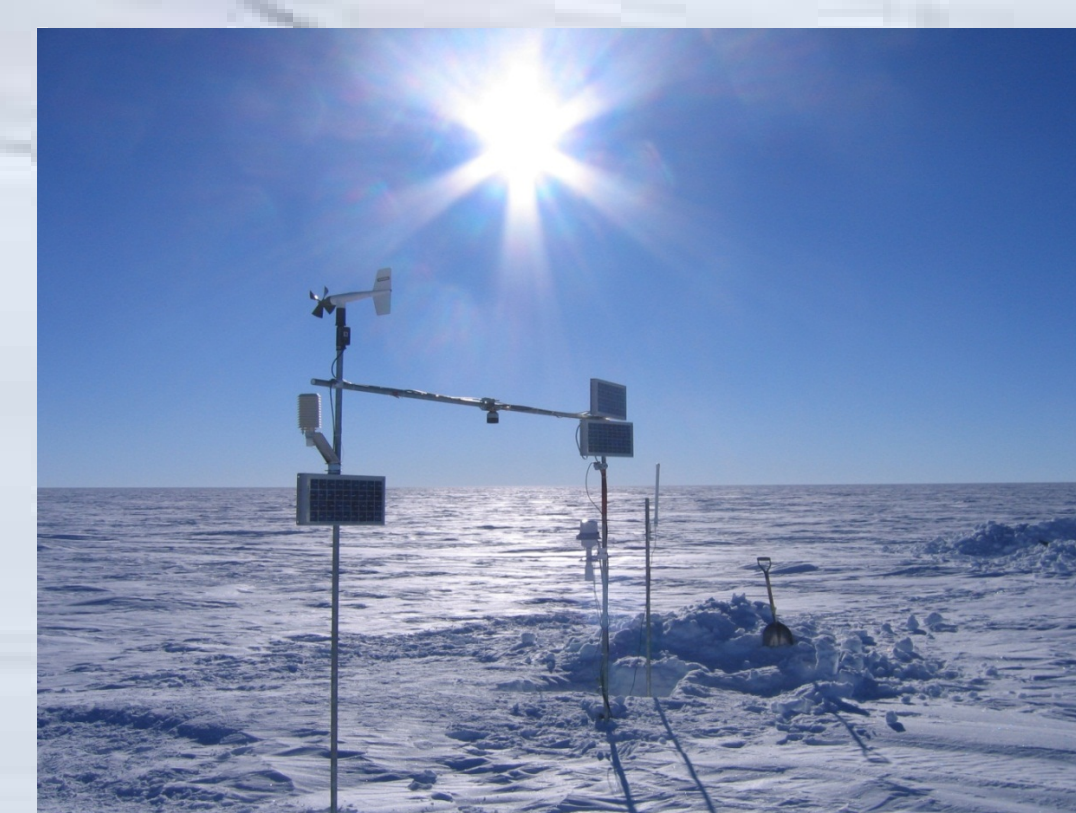
+ GPS, inclinometer and IR photography.

Snow surface sampling every 20 km

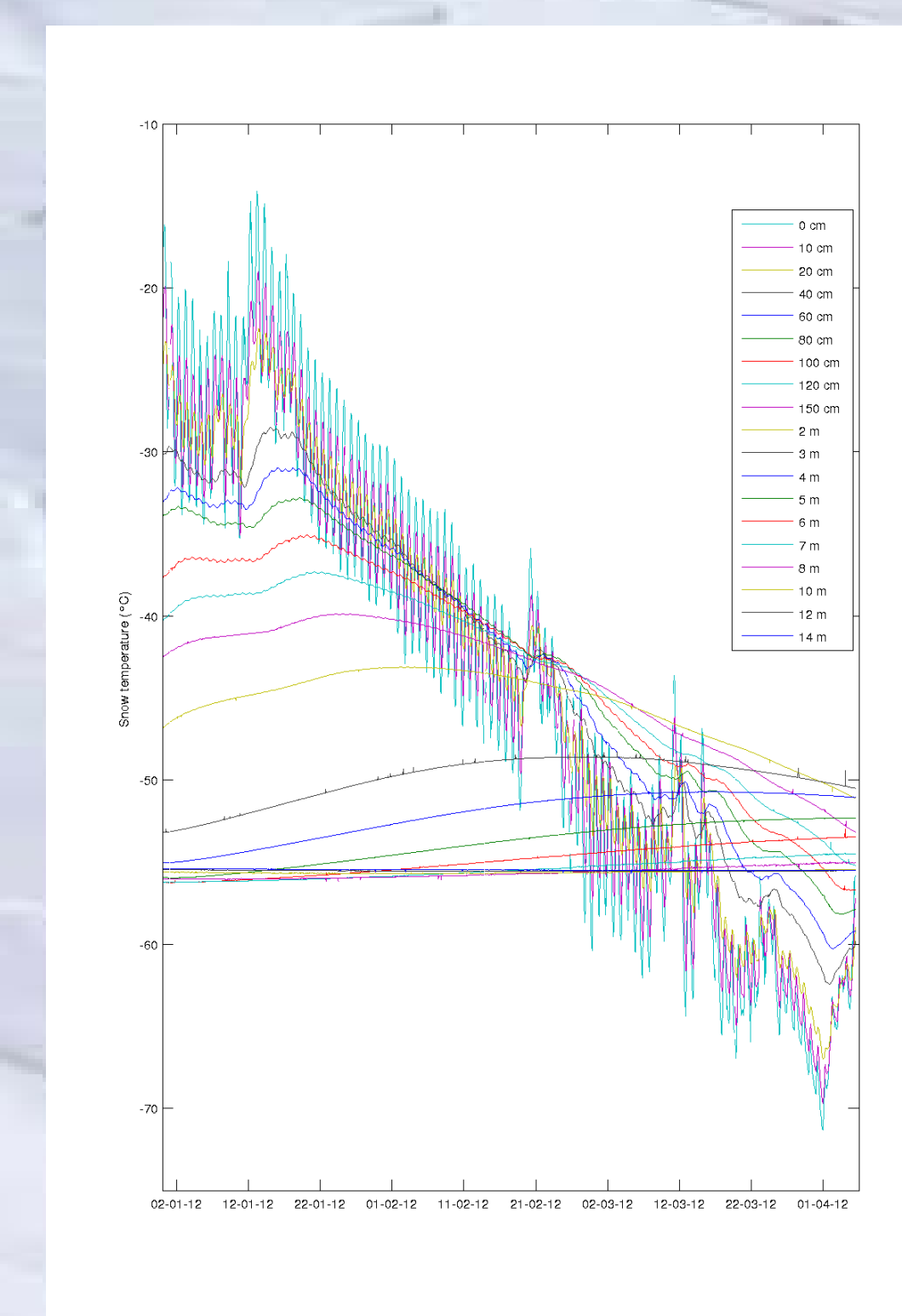
for water isotopes and nitrates



Radar set up on one vehicle of the traverse.



Meteorological station at S2

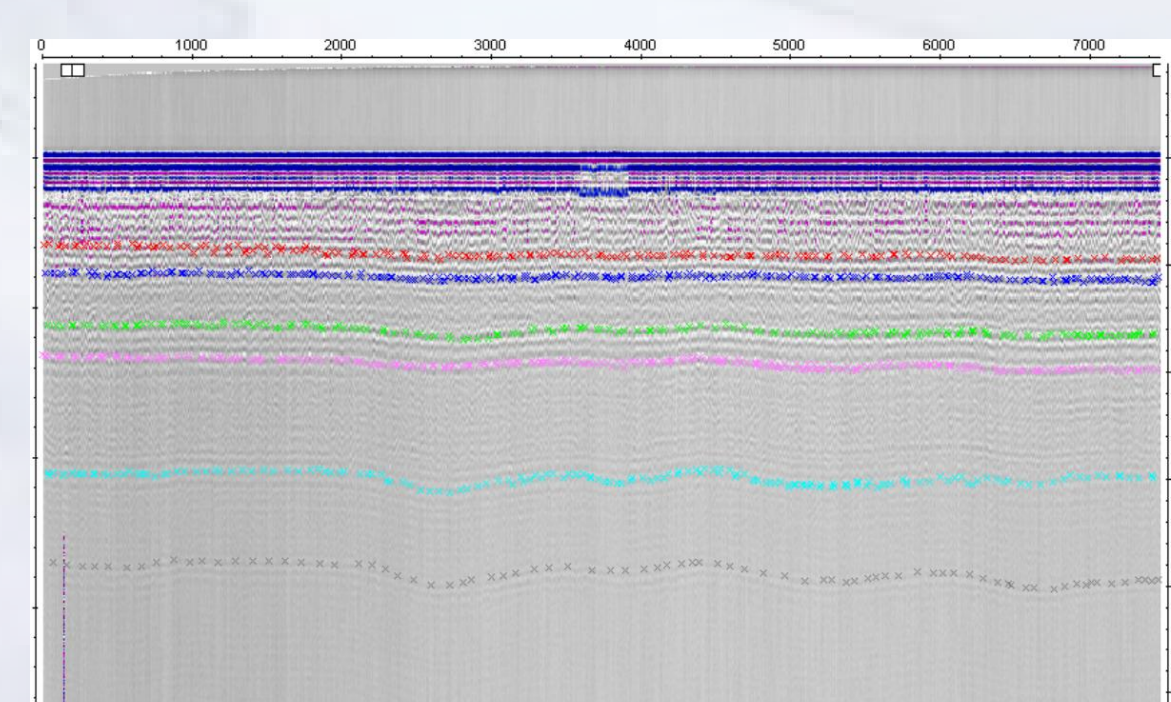


Snow temperature measurements at S2

Example of radargram (S0-DMC, see map).

Several isochrons are observable due to partial reflection of the wave on acidic volcanic horizons. From preliminary comparison with chemistry along the DC core, some known volcanoes can be identified which provides a means of dating isochrons leading to an age-depth relationship for mass balance purpose.

e.g: Tambora (1815) and Jorullo-Tall (1758) volcanoes can be almost certainly associated to the emphasized blue and green isochrons.



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