

## The Concordiasi project over Antarctica

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Concordiasi is an international effort organized around several observation campaigns in Antarctica, and its main scientific objectives are: to improve the assimilation in numerical weather prediction (NWP) models of infrared radiances provided by IASI-like hyperspectral spaceborne sounders over icy surfaces; to enhance the representation of polar processes in numerical models, and in particular to improve the simulation of precipitations, clouds, so as to better describe the mass budget of ice sheets; to advance our knowledge of microphysical and dynamical processes involved in stratospheric ozone loss, and to better understand the interactions between them.

To this end, a campaign of enhanced radiosoundings and surface measurements has taken place in 2008 and 2009 at Concordia, the French-Italian station on the Antarctic plateau. Radiosoundings were performed at Concordia, phased with the passage of the MetOp satellite (carrying IASI) over the station. It was found that the French NWP model was lacking in accuracy in its simulation of the surface temperature. Conversely, the combination of IASI and the model showed a positive impact, the combined values being much closer to those made in situ (figure 1).

The second part of the project is a long-duration balloon campaign which took place above Antarctica from September 2010 to early 2011. During this campaign, 19 12-m diameter superpressure balloons have been released in the stratospheric polar vortex from McMurdo station by the French space agency (CNES). The balloons flew around 17 km and carried up to 60 kg of instrumentation and flight devices. All balloons carried a small in-situ meteorological package. 13 balloons furthermore carried the driftsonde gondolas developed at NCAR. Each driftsonde gondola contained about 50 miniaturized dropsondes, which could be released individually on demand during the stratospheric balloon flight to provide high-resolution profiles of thermo-dynamic variables below the balloon. During the campaign, the dropsondes were mainly phased with the MetOp passage above the balloons, in order to provide an in-situ truth that can be compared with the temperature profile retrieved from IASI observations. Some were also deployed in the so-called "sensitive regions" of numerical forecasts. The remaining 6 balloons carried scientific payloads devoted to tackle scientific issues linked to stratospheric dynamics and chemistry. This equipment included in-situ observation of ozone (with two instruments developed at LMD, France and at the University of Colorado), as well as particles with a particle counter developed by the University of Wyoming. These in-situ observations, performed on quasi-Lagrangian tracers of the flow, enabled us to follow the depletion of ozone during the spring season, and to assess the potential effect of mesoscale waves in triggering the formation of polar stratospheric clouds. In particular, the role of waves generated above the Antarctic Peninsula, which seems to be important for the formation of PSC leeward of the mountains, were monitored during the campaign. Furthermore, two of the balloons carried a GPS radio-occultation system developed by the University of Purdue to retrieve the temperature profile below the balloon several times per day. These observations, together with the in-situ meteorological measurements, will be used to diagnose the stratospheric wave activity globally over Antarctica.

### References :

Rabier F., et al., The Concordiasi project in Antarctica, *Bull. Am. Meteorol. Soc.*, **91**, 69-86, doi: 10.1175/2009BAMS2764.1, 2010.

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Colorado, the Alfred Wegener Institute, the Met Office and ECMWF. Concordiasi also benefits from logistic or financial support of the operational polar agencies IPEV, PNRA, USAP and BAS, and from BSRN measurements at Concordia. Concordiasi is part of the THORPEX-IPY cluster within the International Polar Year effort. **Website:** <http://www.cnrm.meteo.fr/concordiasi/>

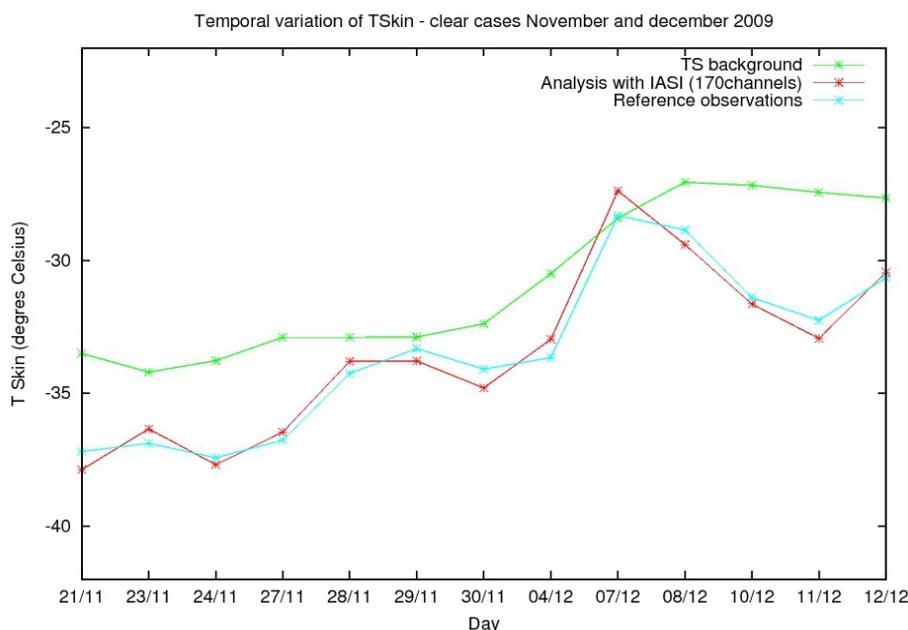


Figure 1 : Temporal series of surface temperature at Concordia. The model is drawn in red, with added IASI data in blue, in situ observations in black. In this figure, one can see a slight discrepancy between predictions from the model and data from in situ observations. Once the model is adjusted with IASI data, the combined estimations are much closer to those made in situ.

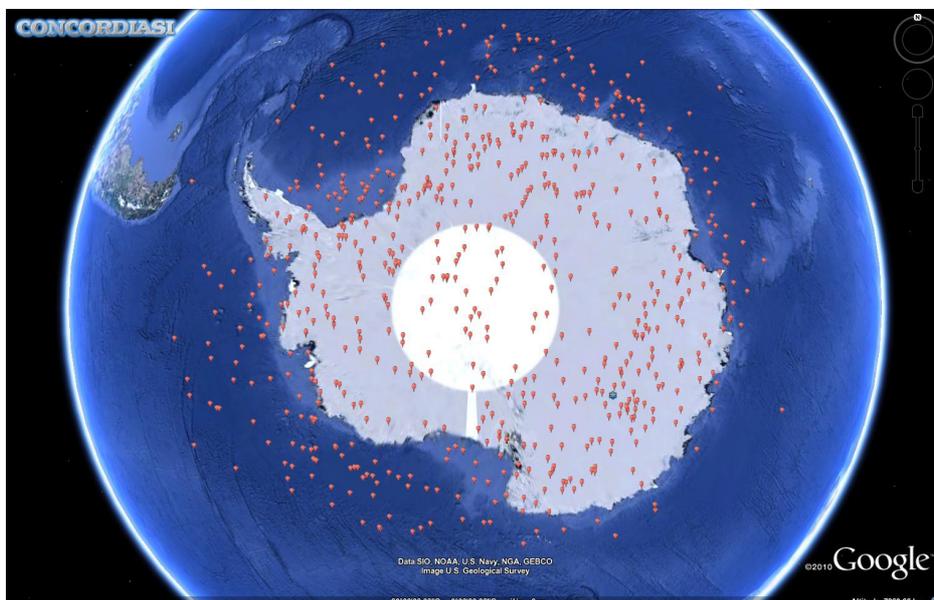


Figure 2: Location of the 275 dro sondes launched between the 23d of September and the 30<sup>th</sup> of November 2010.

**References :**

Rabier F., et al., The Concordiasi project in Antarctica, *Bull. Am. Meteorol. Soc.*, **91**, 69-86, doi: 10.1175/2009BAMS2764.1, 2010.