

H2O-DC

Water Budget Over the DOME C Station

<http://www.cnrm-game-meteo.fr/spip.php?article961&lang=en> (HAMSTRAD) and
<http://lidarmax.altervista.org/lidar/Antarctic%20LIDAR.php> (LIDAR)



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Areas of contribution

Polar atmospheric processes

Modelling and forecasting

Observations

Data assimilation

Data archiving

Summary

The aim of the project is to study the water budget over the Dome C (Concordia Station, Antarctica) by means of:

- 1) an aerosol LIDAR measuring Depolarization and Extinction Coefficient tropospheric vertical profiles,
- 2) the global Numerical Weather Prediction (NWP) model of Météo-France (ARPEGE) to provide hourly vertical profile of Water Vapour, Cloud Water and Ice Content, Precipitation Fluxes, Temperature, Nebulosity, etc. at Dome C.

We will particularly focus on the study of the presence of cloud and diamond dust episodes above the station, and will provide the data collected to the international scientific community.

Description

The WATER BUDGET OVER THE DOME C STATION (H2O-DC) YOPP Project intends to study the time evolution of water in its different forms (vapour, solid, liquid) over the Dome C (Concordia station, Antarctica, 75°06'S, 123°21'E, 3233 m amsl) during the timeframe of the YOPP mandate. By means of instrumentations installed at the station and of real-time weather forecasts and analyses performed at Météo-France, we intend to continue studying the presence and genesis of thick cloud and diamond dust (clouds constituted of suspended ice crystals) episodes over the station. We will use :

1) A tropospheric aerosol Lidar that will provide aerosol depolarization ratios along the vertical at Dome C on a one-hour integration time.

2) The global model ARPEGE, used for NWP, that will give the state of the atmosphere and relevant prognostics variables such as snow precipitation, ice cloud, temperature and water vapour budget.

Combining active measurements of aerosols with nebulosity calculations together with passive measurements of water vapor during few episodes in 2011 and 2013, thick cloud presences were detected during warm and wet periods from the surface to 5-7 km altitude associated with precipitation of ice particles and the presence of a supercooled liquid water (depolarization of about 10%) cloud. During the cold and dry periods, high depolarization ratios (greater than 30%) to a maximum altitude of 100-500 m were measured suggesting that the cloud is constituted of ice crystals with no trace of precipitation. These ice crystals in suspension in the air are named diamond dust.

Considering 5-day back trajectories from Dome C and global distributions of IWV over the Antarctic show that the thick-cloud episodes were attributed to air masses with an oceanic origin whilst diamond dust episodes were attributed to air masses with continental origins.

We would like to continue our analyses during the YOPP programme and provide the data collected to the international scientific community.

Timeline

2016-11-01 - 2020-02-25

Regional emphasis

Northern hemisphere: No

Southern hemisphere: Yes

Key project deliverables

Aerosol Extinction Coefficient vertical profiles measured by the LIDAR
Depolarization Ratio vertical profiles measured by the LIDAR
Water Vapour vertical profiles calculated by ARPEGE
Integrated Water Vapour calculated by ARPEGE
Ice Water Mixing Ratio calculated by ARPEGE
Liquid Water Mixing Ratio calculated by ARPEGE
Total Precipitation Flux calculated by ARPEGE
Nebulosity vertical profiles calculated by ARPEGE
Temperature vertical profiles calculated by ARPEGE

Data management

There will be three primary data archives.

1) The Lidar data will be stored in Italy at INO-CNR:

<http://lidarmax.altervista.org/lidar/Antarctic%20LIDAR.php>.

2) The ARPEGE data will also be stored in France at Météo-France in a web site accessible to the scientific and non-scientific communities.

Is data provided to WMO Global Telecommunication System

No

Real-time provision

The ARPEGE data will be provided in real-time.

The Lidar data will be provided with a time-lag less than 7 days.

Other information

Funding is provided on a yearly basis for HAMSTRAD (December) and the LIDAR by the French and the Italian Scientific Committees through IPEV and PNRA, respectively.

Timelines

Location	Latitude	Longitude	Start date	End date	Activity
Dome C			2016-11-01	2020-02-25	Aerosol Lidar, project funded on a yearly basis by the Italian PNRA program. Initially installed at Dome C in January 2008, running automatically from January 2013 to date.

Location	Latitude	Longitude	Start date	End date	Activity
Dome C			2016-11-01	2020-02-25	ARPEGE, operational NWP with an output in the vicinity of the Dome C station.