Conferenza nazionale sulla ricerca in Antartide - 20-21 ottobre 2015
Roma - Accademia Nazionale dei Lincei

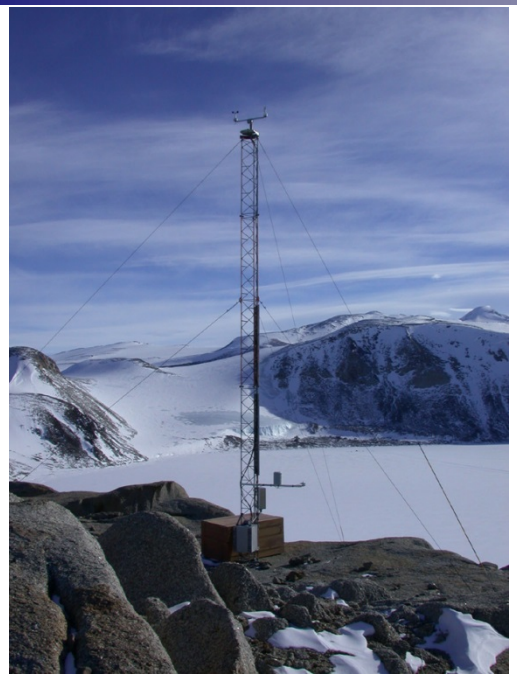
Workshop 1: Antarctic atmosphere and global connections

Giovanni Macelloni – IFAC CNR - Firenze
Alcide Giorgio Di Sarra, Christian Lanconelli, Laura Selbmann, Roberto Udisti, Angelo Viola, Antonio Meloni

g.macelloni@ifac.cnr.it

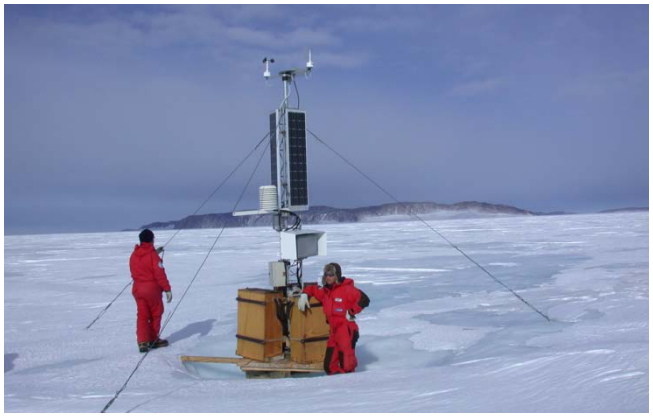
Outline

- **Le attività italiane del passato e del presente**
- **Le tematiche attuali**
- **Le comunità di riferimento e le iniziative in corso**
- **Spunti ed idee per organizzare il futuro!**

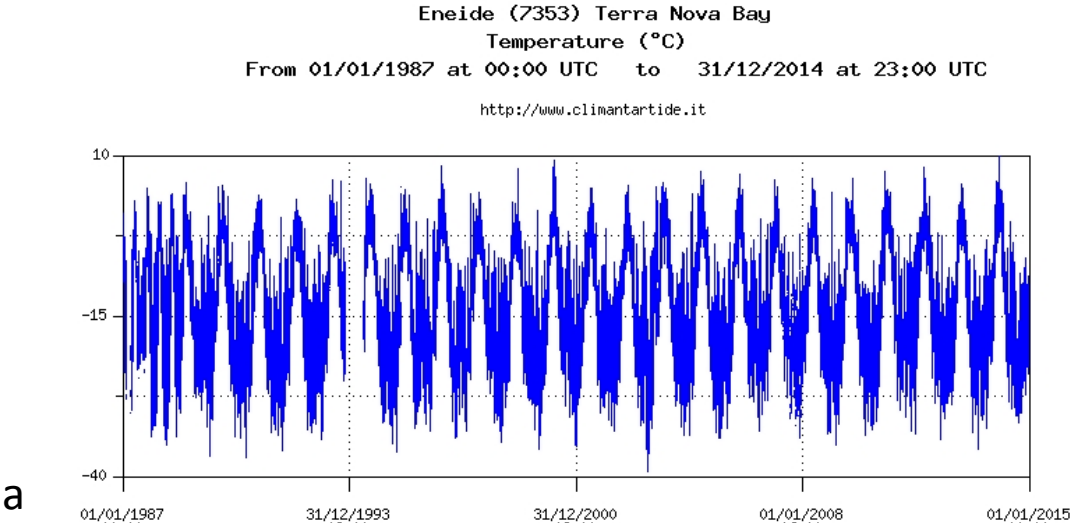


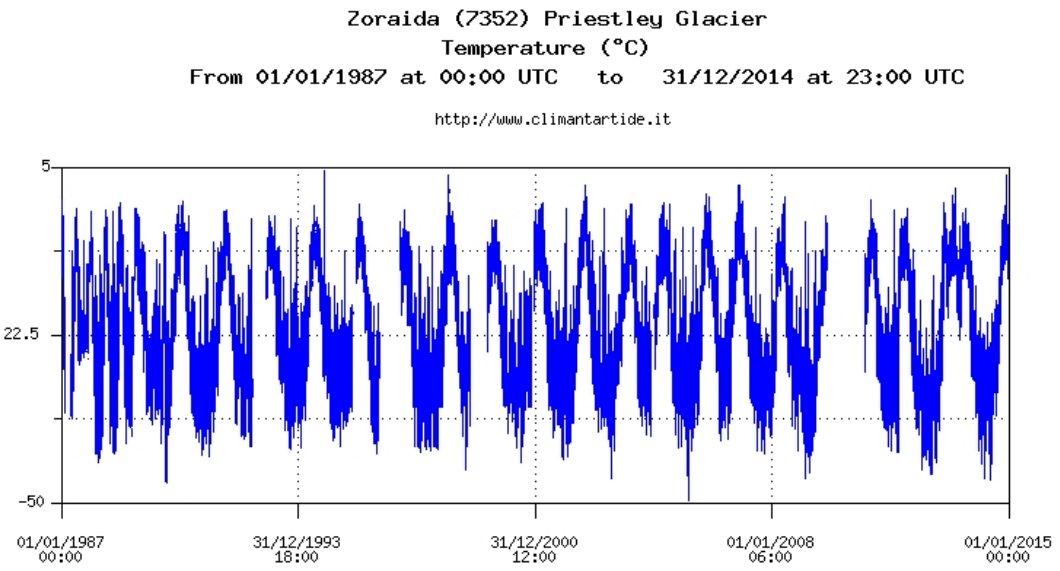
Misure dei parametri di base dell'atmosfera fin dalle prime spedizioni

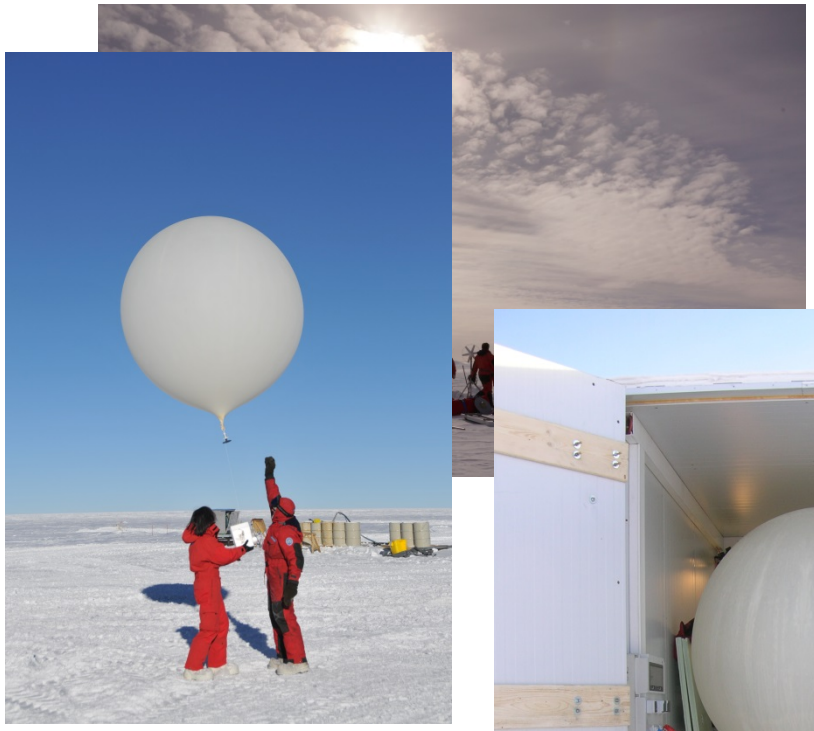
Serie ventennale di temperatura aria in varie stazioni

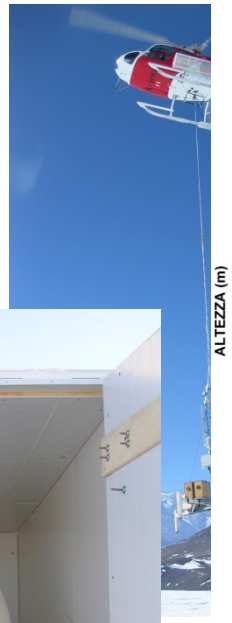


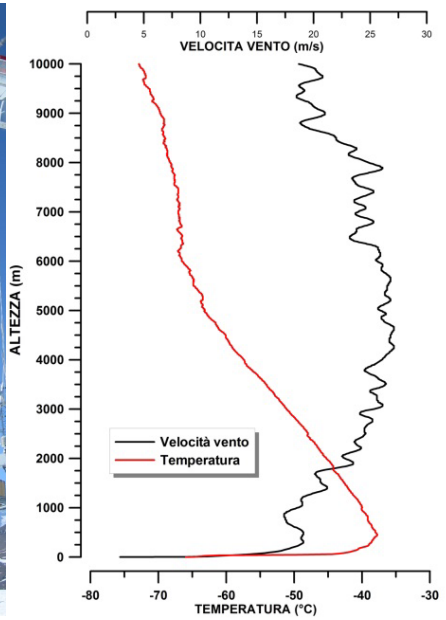
Dati dal 1987!

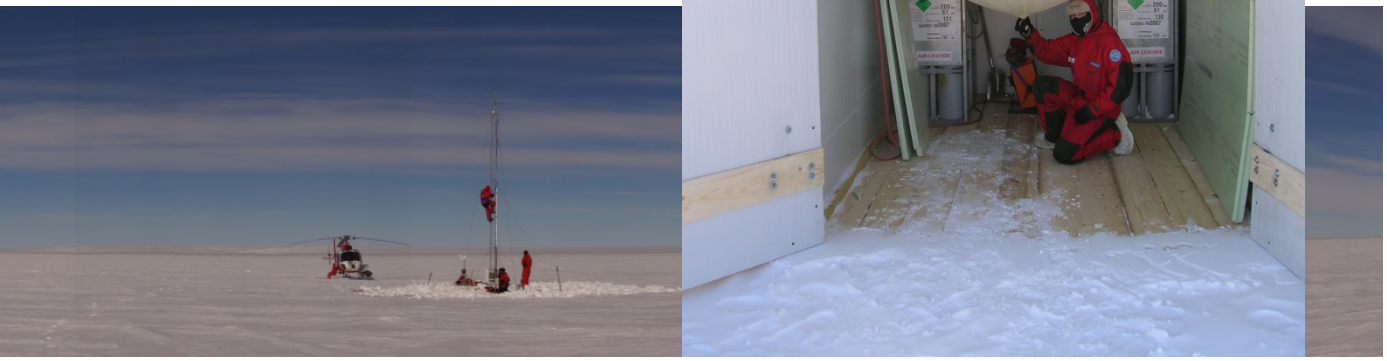






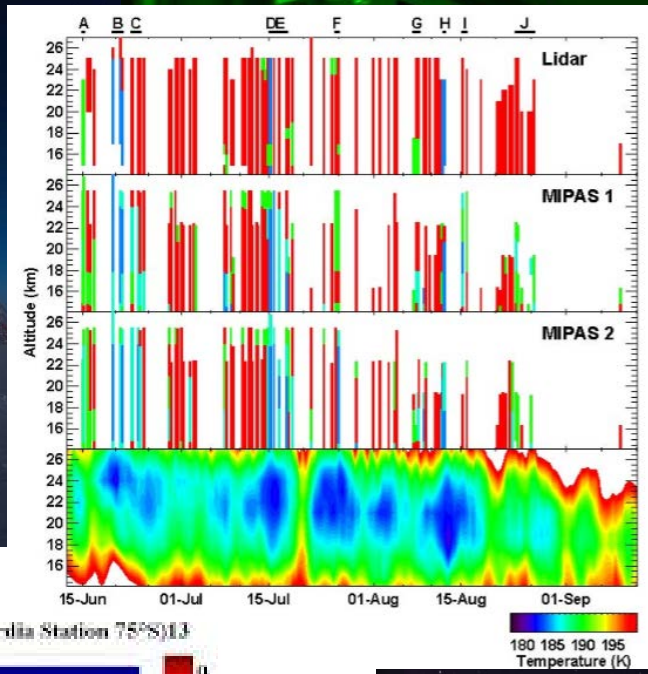


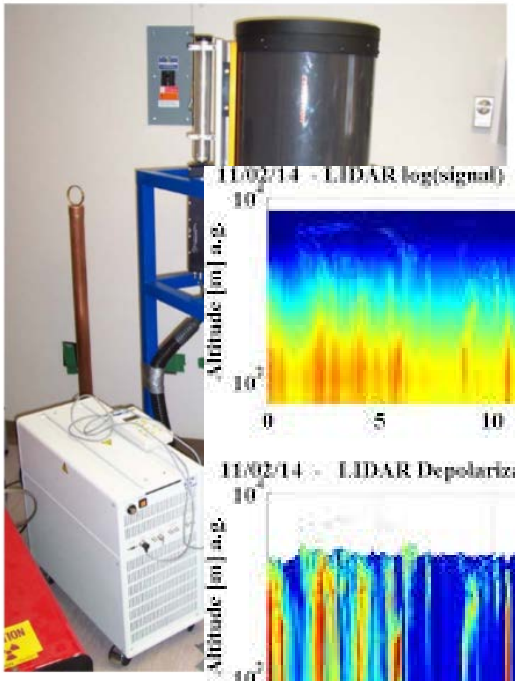


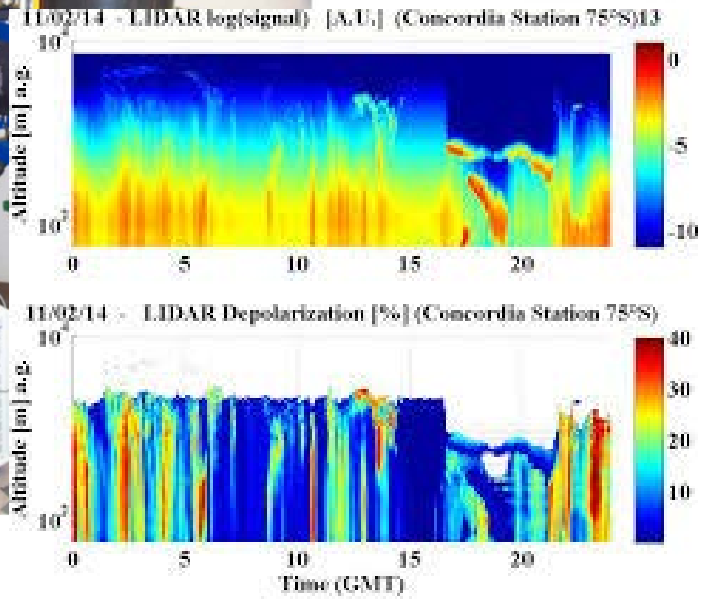


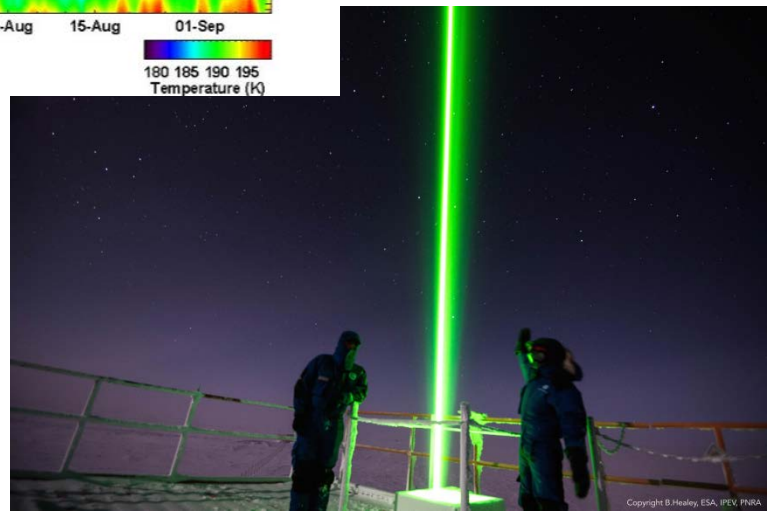
Misure arricchite negli anni; Profili di parametri atmosferici

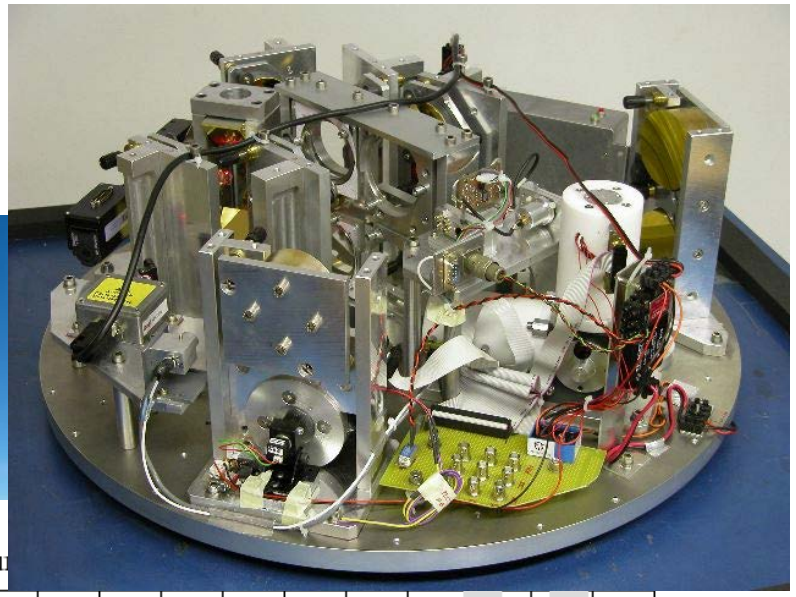
Misure con strumentazioni più sofisticate dei parametri atmosferici, studio delle nubi e degli areosol LIDAR in basi italiane e straniere

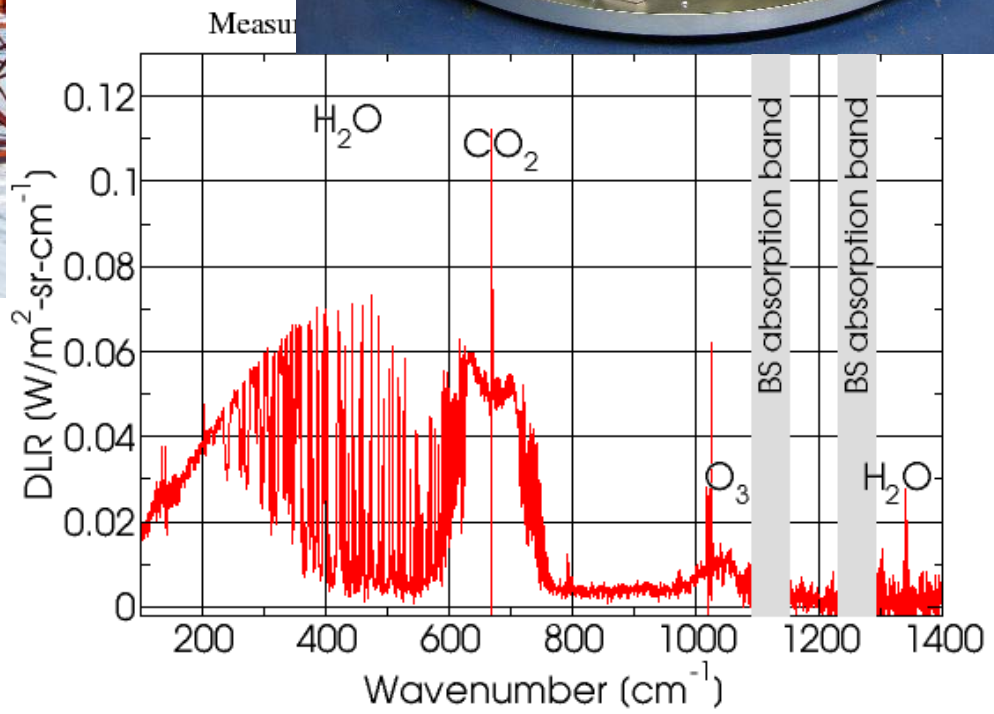






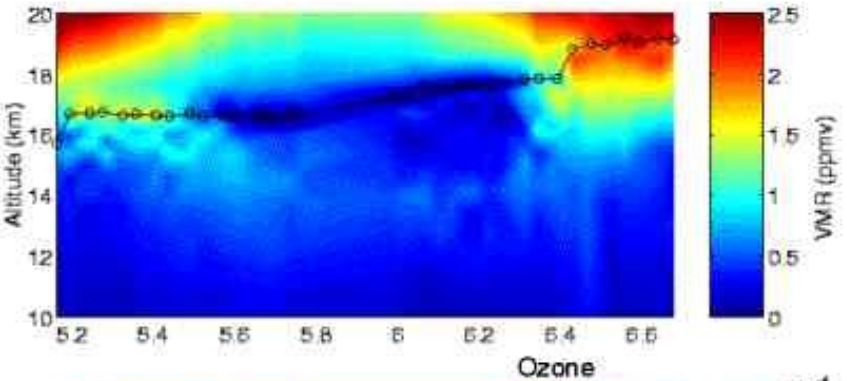


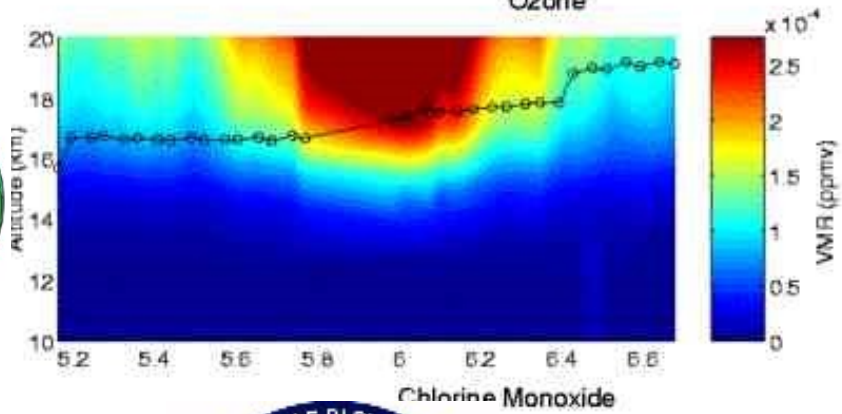


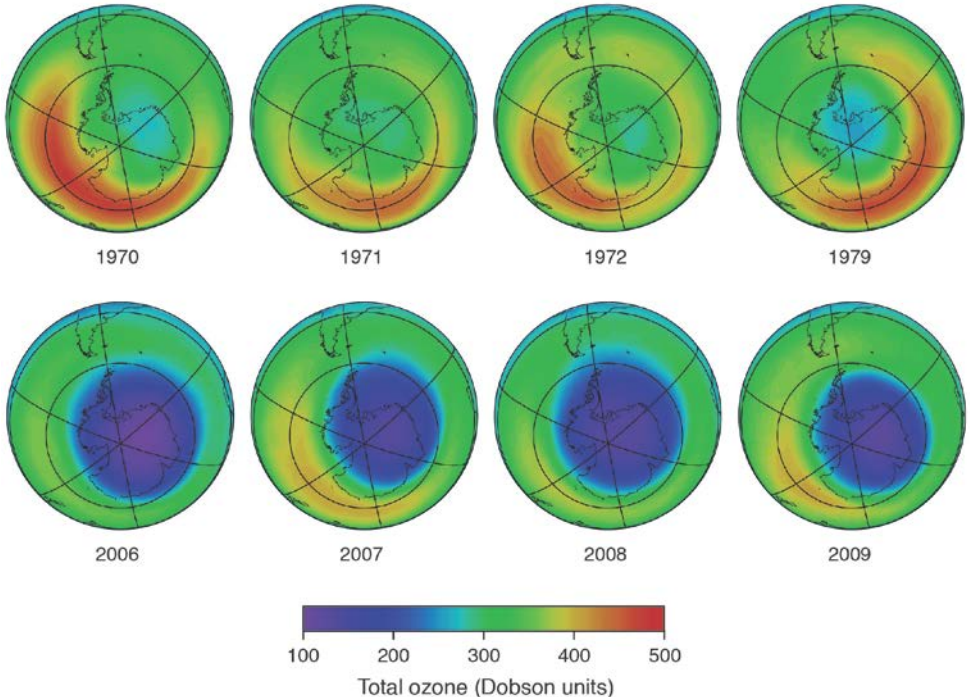


Misura delle componenti chimiche dell'atmosfera

Iniziative internazionali per la misura dell'ozono da aereo

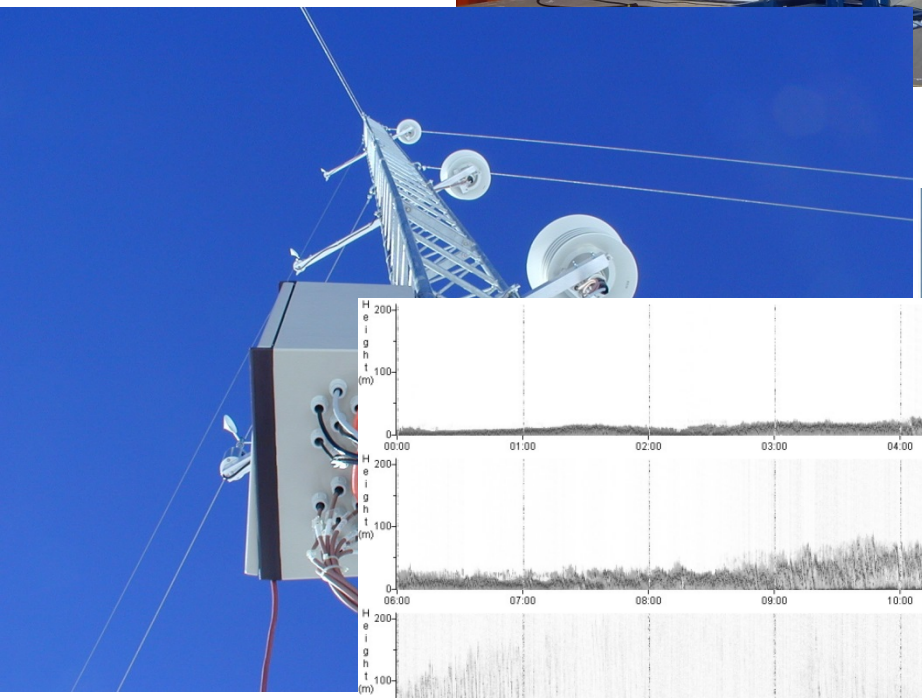


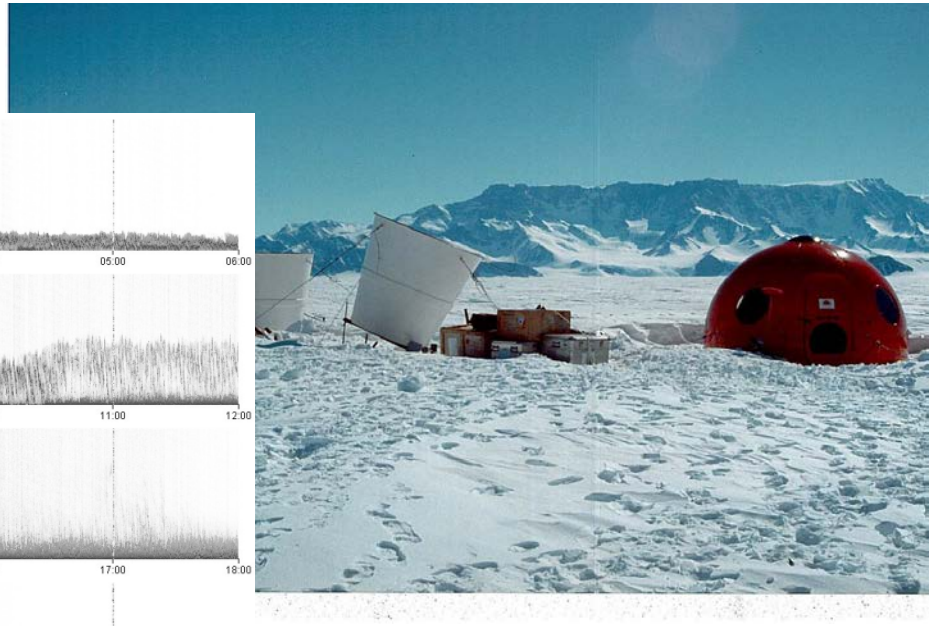


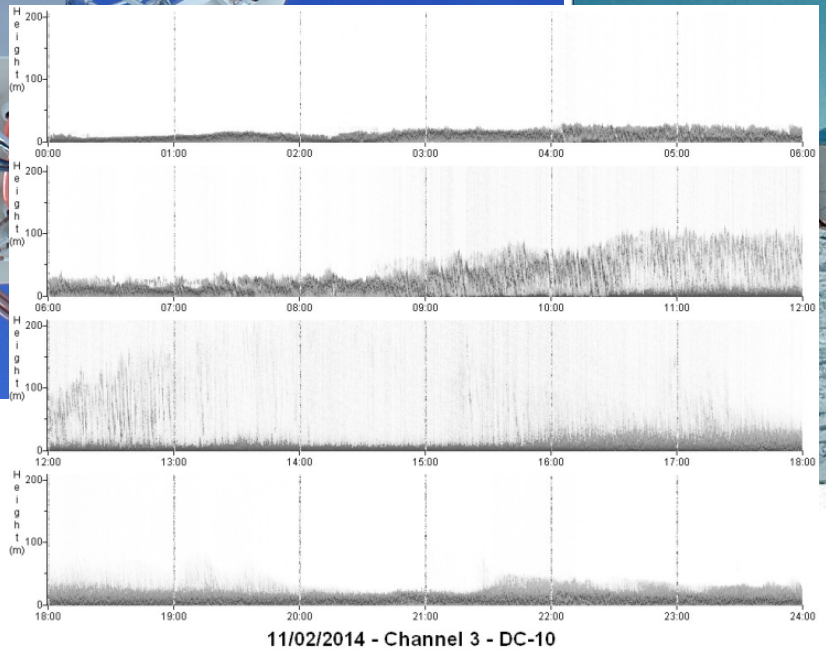


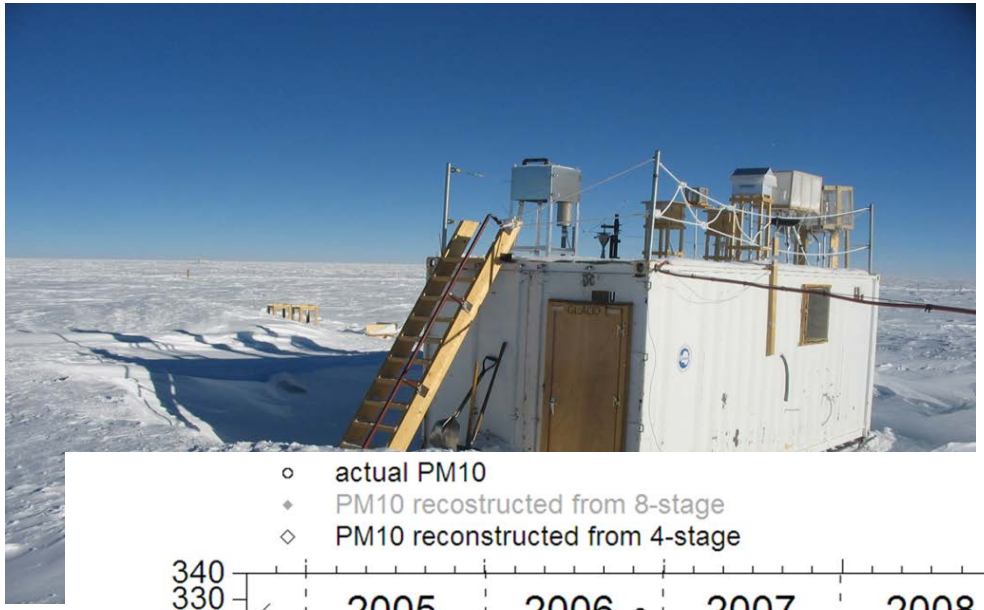
PROGRAMMA NAZIONALE DI RICERCHE IN ANTARTIDE
APE-GAIA
USHUAIA - ARGENTINA Sep-Oct 1988

Misure per lo studio delle proprietà fisico-chimiche del PBL

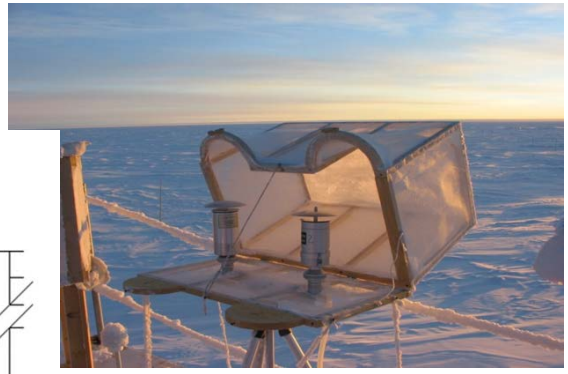


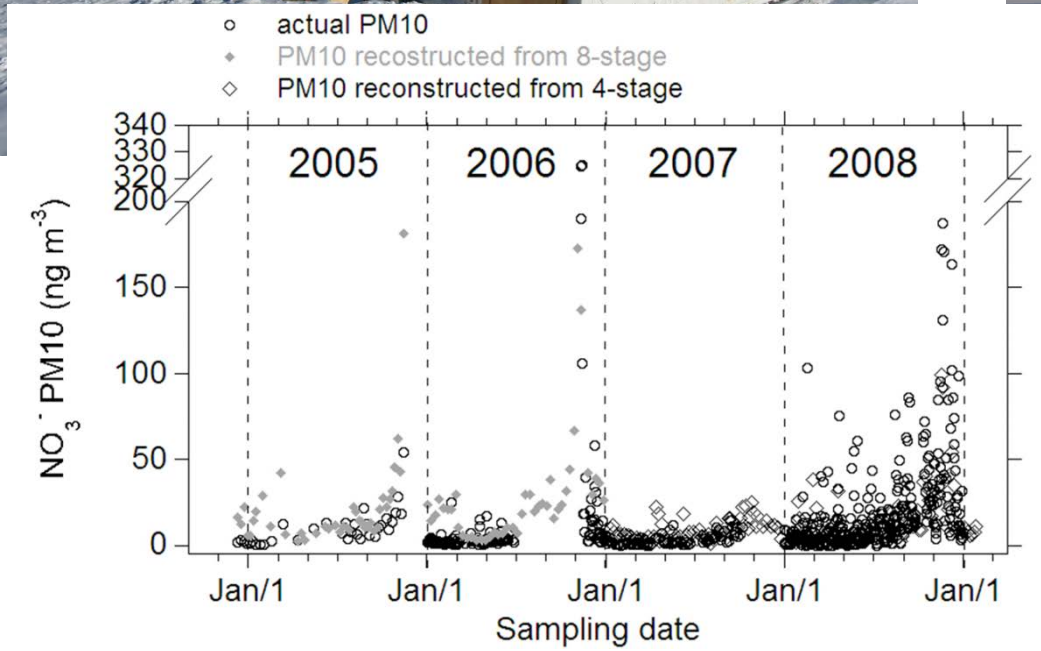




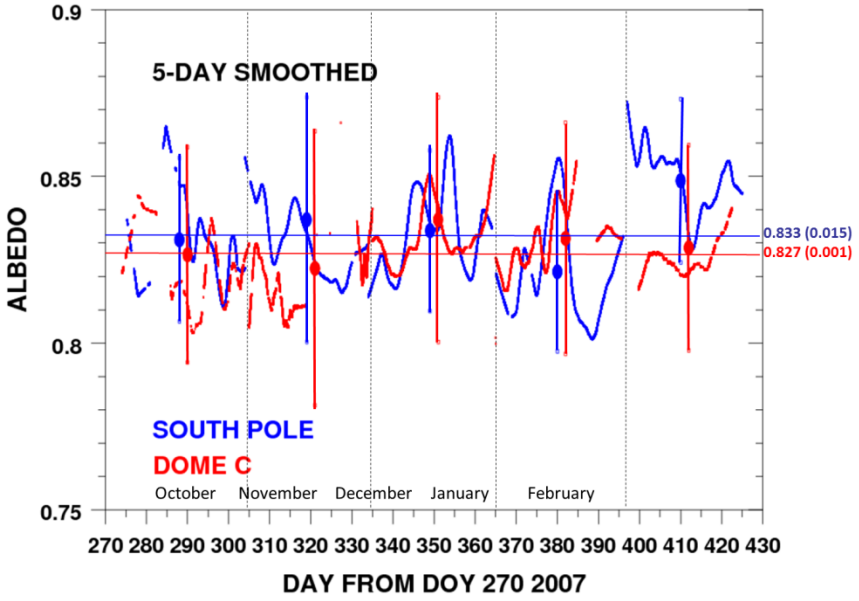


Misure per lo studio della composizione chimica dell'aerosol

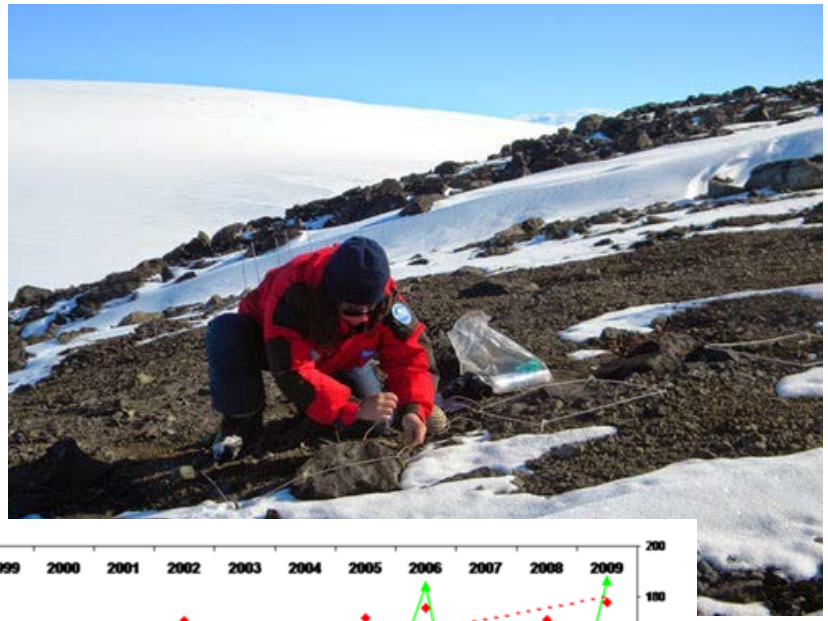




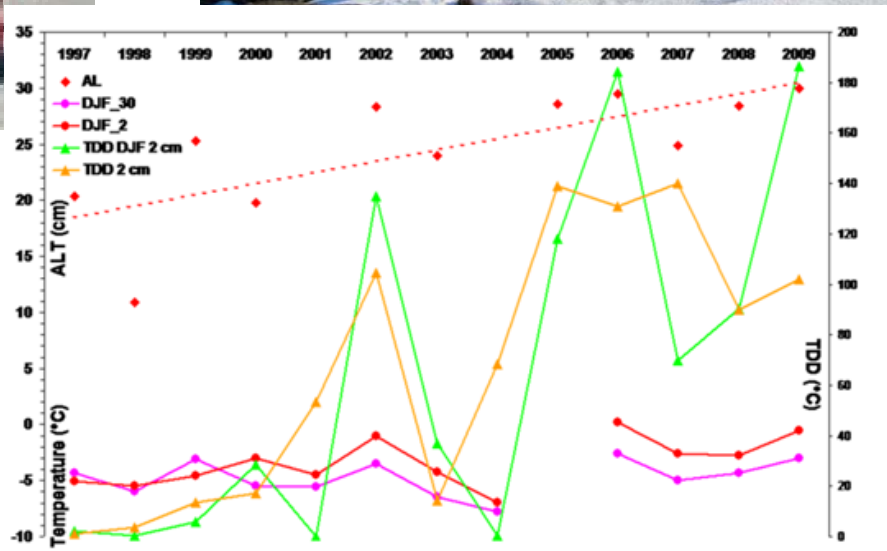
Austral summer 2007/2008 broadband albedo at Dome C and Pole are essentially equal, having a value of about **0.83 ± 0.03**



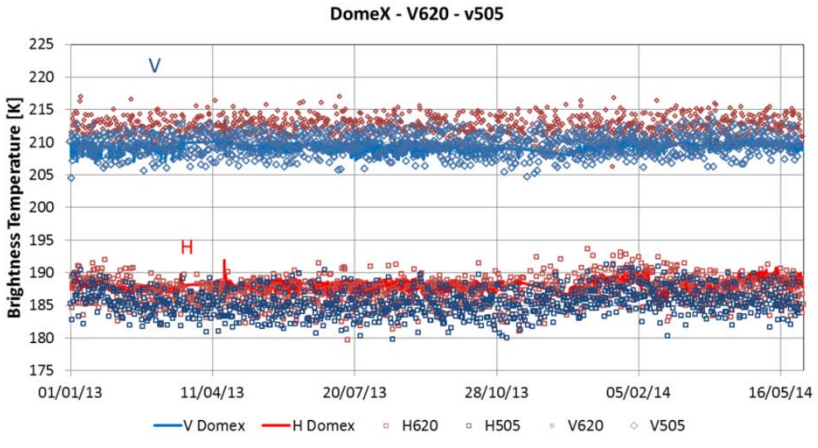
Misure di albedo; trasporto radiativo

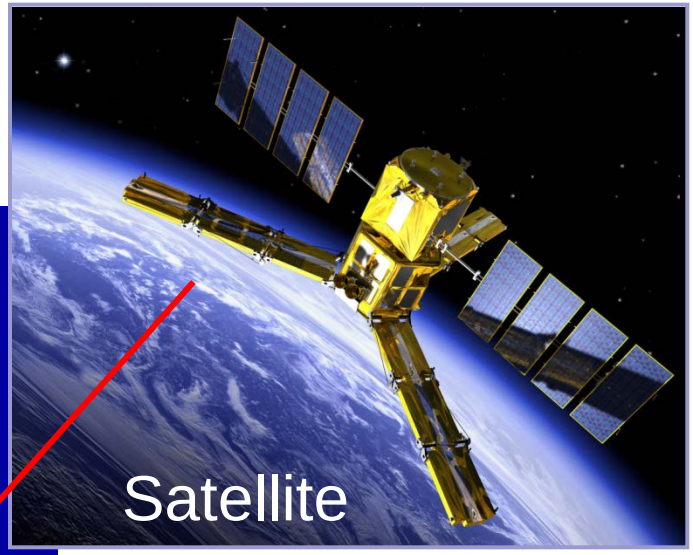


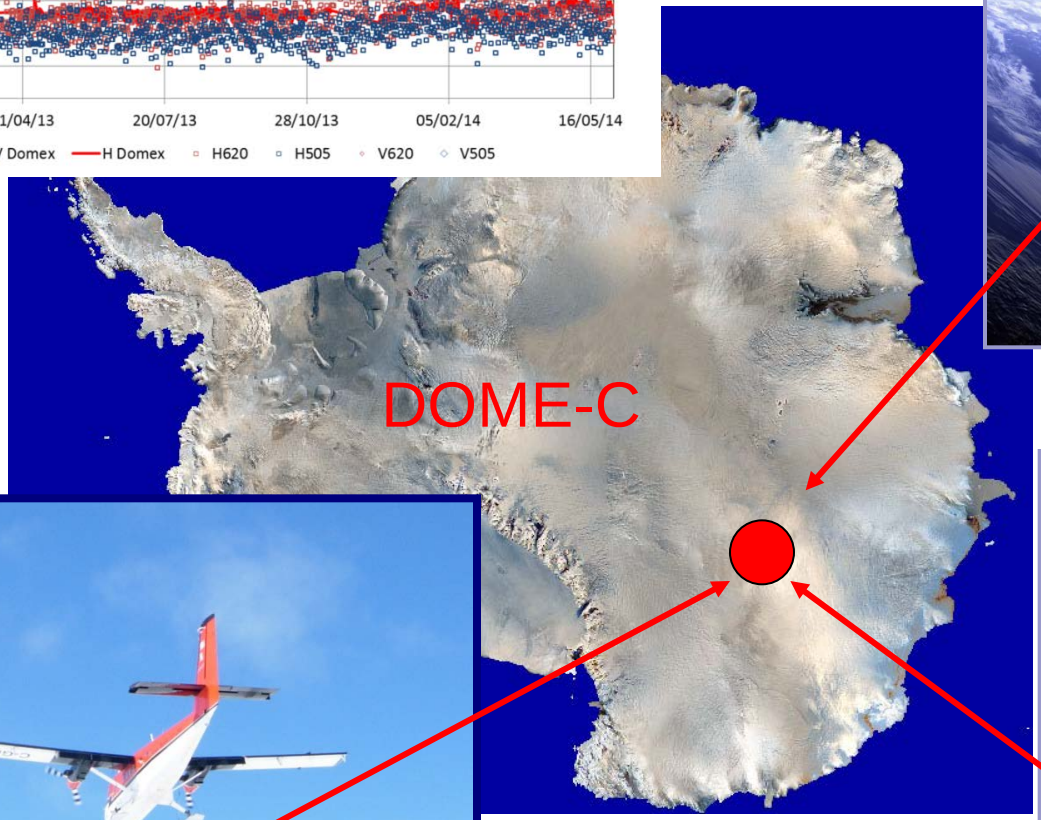
Relazioni fra parametri atmosferici e proprietà fisiche dei suoli e degli organismi



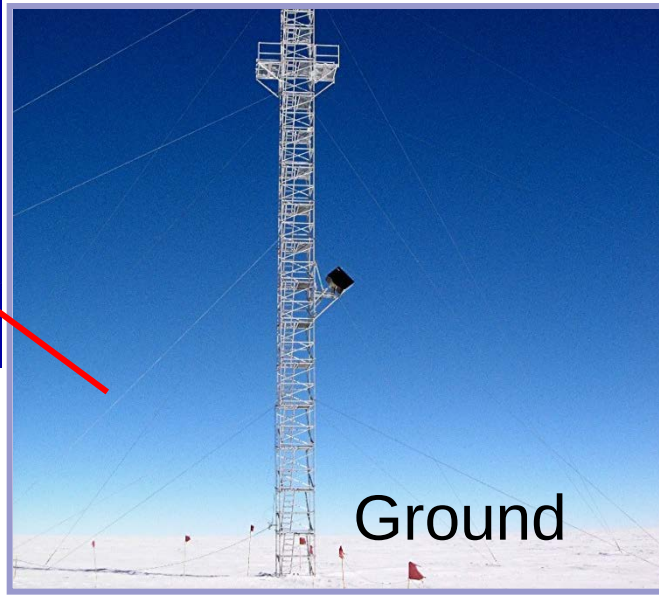
Active Layer (AL) changes at MZS since 1996 and related climatic parameters.







Calibrazione e validazione di dati satellitari



Prodotti della ricerca sull'argomento

WEB OF SCIENCE™

Search Return to Search Results

Citation Report: 2.026

(from All Databases)

You searched for: **TOPIC:** (antarctica atmosphere) ...More

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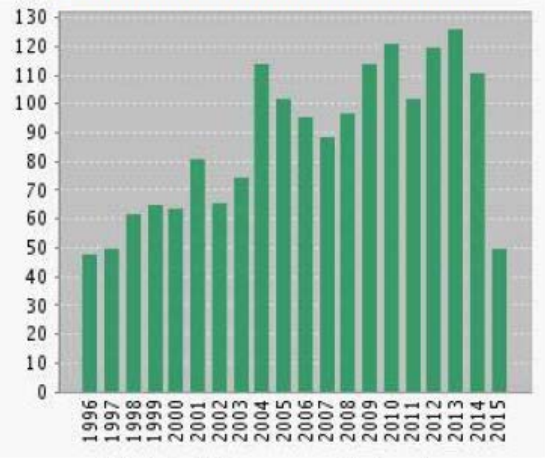
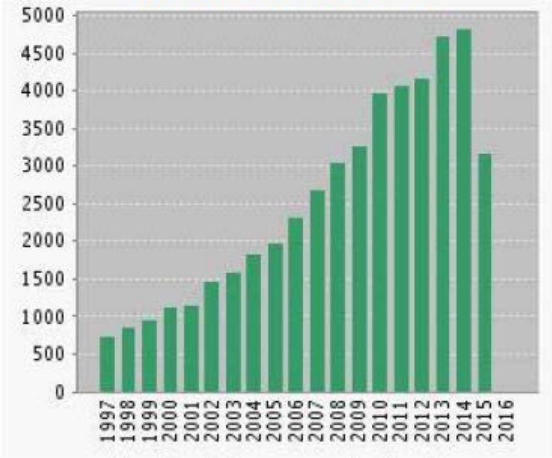
GLOBALE -ISI WEB OF SCIENCE : ATMOSPHERIC + ANTARCTICA

Published Items in Each Year



The latest 20 years are displayed.

Citations in Each Year



The latest 20 years are displayed.

Citation Report: 173

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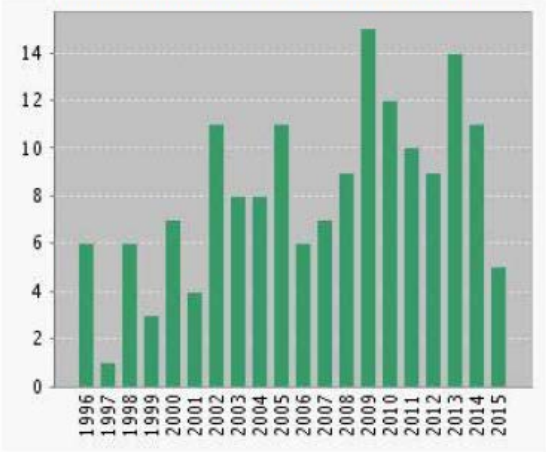
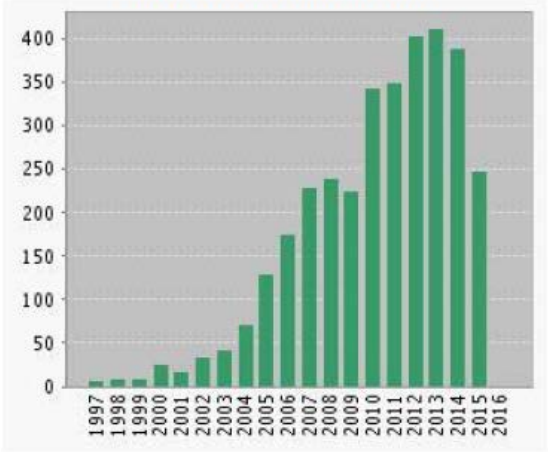
ISI WEB OF SCIENCE : ATMOSPHERIC + ANTARCTICA + ITALY

Published Items in Each Year



The latest 20 years are displayed.
View a graph with all years.

Citations in Each Year



The latest 20 years are displayed.
View a graph with all years.

ANTARCTIC ATMOSPHERE AND GLOBAL CONNECTIONS - SCAR Questions

1. How is climate change and variability in the high southern latitudes connected to lower latitudes including the Tropical Ocean and monsoon systems?

2. How do Antarctic processes affect mid-latitude weather and extreme events?

3. How have teleconnections, feedbacks, and thresholds in decadal and longer term climate variability affected ice sheet response since the Last Glacial Maximum, and how can this inform future climate projections?

4. What drives change in the strength and position of Westerly winds, and what are their effects on ocean circulation, carbon uptake and global teleconnections?

5. How did the climate and atmospheric composition vary prior to the oldest ice records?

ANTARCTIC ATMOSPHERE AND GLOBAL CONNECTIONS - SCAR Questions

6. What controls regional patterns of atmospheric and oceanic warming and cooling in the Antarctic and Southern Ocean? *(Cross-cuts "Southern Ocean")*

7. How can coupling and feedbacks between the atmosphere and the surface (land ice, sea ice and ocean) be better represented in weather and climate models? *(Cross-cuts "Southern Ocean" and "Antarctic Ice Sheet")*

8. Does past amplified warming of Antarctica provide insight into the effects of future warming on climate and ice sheets? *(Cross-cuts "Antarctica Ice Sheet")*

9. Are there CO2 equivalent thresholds that foretell collapse of all or part of the Antarctic Ice Sheet? *(Cross-cuts "Antarctic Ice Sheet")*

10. Will there be release of greenhouse gases stored in Antarctic and Southern Ocean clathrates, sediments, soils, and permafrost as climate changes? *(Cross-cuts "Dynamic Earth"*)

11. Is the recovery of the ozone hole proceeding as expected and how will its recovery affect regional and global atmospheric circulation, climate and ecosystems? *(Cross-cuts "Antarctic Life" and "Human")*

Quali gli strumenti e le iniziative a livello internazionale dove collocare le attività future ?

- YOPP: predictability in the polar regions
- WMO Global Cryosphere Watch (GCW)
- SCAR Science Themes: Antarctica and Climate; Observing Systems
- SCAR Standing Scientific Groups: ISMASS/OpMet/ACA/SPeCT/SnowAnt/PACT

(Aerosol and Clouds; Ice sheet mass balance; Snow in Antarctica; Operational meteorology; Atmospheric chemistry at the tropopause; Sea-ice processes)

- NDACC: long-term measurements of atmospheric composition changes
- BSRN: surface radiation measurements
- SPARC – Stratosphere-troposphere Processes And their Role in Climate
- Ant-ERA – Antarctic - Ecosystems Resilience and Adaptation

GCW Global Cryosphere Watch

SCAR AnT-ERA

SCAR

NDACC

WCRP SPARC Stratosphere-troposphere Processes And their Role in Climate

YOPP YEAR OF POLAR PREDICTION

WRMC-BSRN
World Radiation Monitoring Center- Baseline Surface Radiation Network

Alcune Tematiche di ricerca

Sviluppo e consolidamento delle reti osservative

Cambiamenti di lungo periodo nella stratosfera
Processi nella stratosfera ed ozono polare
Influenza della circolazione stratosferica sui processi meteorologici alle alte e medie latitudini

Predicibilità e meteorologia nelle regioni polari

Bilancio di massa

Ruolo di aerosol, vapor d'acqua e nubi sul bilancio della radiazione

YOPP YEAR OF POLAR PREDICTION

NDACC NETWORK FOR THE DETECTION OF ATMOSPHERIC COMPOSITION CHANGE

GCW Global Cryosphere Watch

WCRP SPARC Stratosphere-troposphere Processes And their Role in Climate

WRMC-BSRN World Radiation Monitoring Center- Baseline Surface Radiation Network

Reti osservative e Contenitori di dati:

- Quali sono?
- Come partecipare ?
- Quali gli strumenti e la maturità necessaria per qualificarli?
- Quali le azioni strategiche per garantire la presenza nel tempo?
- Interazione con progetti e/o altre agenzie polari (e.g. Concordia)

Esempio di reti: la rete CryoNet – del GCW Network

- the last WMO congress (May 2016) approve a resolution where they agreed that Polar and High Mountain Regions became one of the seven WMO Priorities for 2016-2019, especially to "Improve operational meteorological and hydrological monitoring, prediction and services in polar, high mountain regions and beyond by: (a) operationalizing the Global Cryosphere Watch (GCW); (b) better understanding the implications of changes in these regions on the global weather and climate patters; and (c) advancing the polar prediction under the Global Integrated Polar Prediction System (GIPPS)".

- Establish the core network of GCW surface measurement sites – CryoNet.

- CryoNet is one part of the whole GCW observing system, which is, in turn, a component observing system of the WMO Integrated Global Obs

- CryoNet is initially comprised of existing stations/site

World Meteorological Organization
Weather • Climate • Water

Rete di dati e/o esperimenti dedicati → Possibile Contributo alla Calibrazione e Validazione dati Earth Observation ?

CEOS Committee on Earth Observation Satellites

The CEOS **Working Group on Calibration & Validation** (WGCV) Mission is to ensure long-term confidence in the accuracy and quality of Earth Observation data and products and provide a forum for the exchange of information about calibration and validation, coordination, and cooperative activities.

Dalla Pagina delle attività del Gruppo :

"**DOME C Experiment:"**

Conduct a multi-sensor comparison to evaluate the size of any biases using the Dome C site as a reference standard. This will serve as a pilot for future regular CEOS comparisons over this and other reference sites to ensure data interoperability and to underpin the LSI constellation. The results of the comparison will allow an assessment to be made of the site's suitability for climate quality calibration.

….al momento non molto esplorato → connessione con GCW

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YOPP
YEAR OF POLAR PREDICTION

NETWORK FOR THE DETECTION OF ATMOSPHERIC COMPOSITION CHANGE
NDACC

SPARC
Stratosphere-troposphere Processes And their Role in Climate

SPARC
Stratosphere-troposphere
Processes And their Role in Climate

Stratosphere-troposphere Processes And their Role in Climate

A core project of the World Climate Research Programme which coordinates international efforts to bring knowledge of the stratosphere to bear on relevant issues in climate variability and prediction.

WCRP
World Climate Research Programme

Themes and activities address areas of societal concern:

- Climate variability and change
- Ozone
- Atmospheric chemistry and aerosols
- Polar processes

ICSU
International Council for Science

UNESCO
United Nations
Educational, Scientific and
Cultural Organization

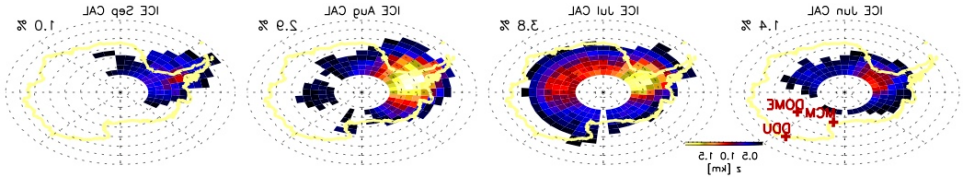
Intergovernmental
Oceanographic
Commission

Are Polar stratospheric clouds in Chemistry Climate models reliable ?

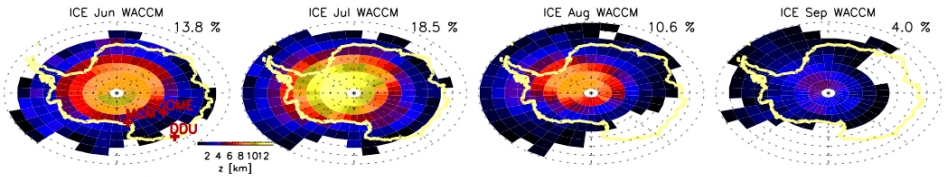
- Problem: Stratospheric temperature biases are a major problem in CCMs and can generate an unrealistic PSC distribution - microphysics can be also unrealistic
- CCMs are used in climate prediction (next CMIP6)
- → Need to have a realistic stratosphere (has a great impact on trop SH circulation & ozone recovery)

Example: PSC seasonal Volume evaluation

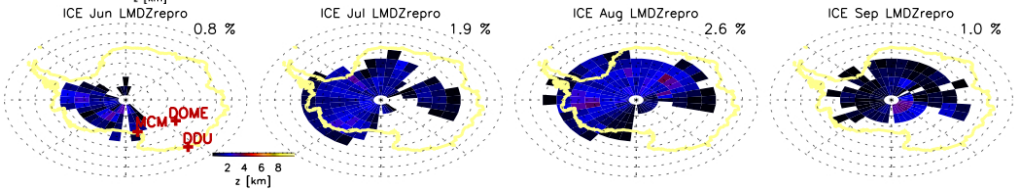
CALIOP Lidar



WACCM NCAR model



LMDZ IPSL model



Tematiche di ricerca

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YOPP YEAR OF POLAR PREDICTION

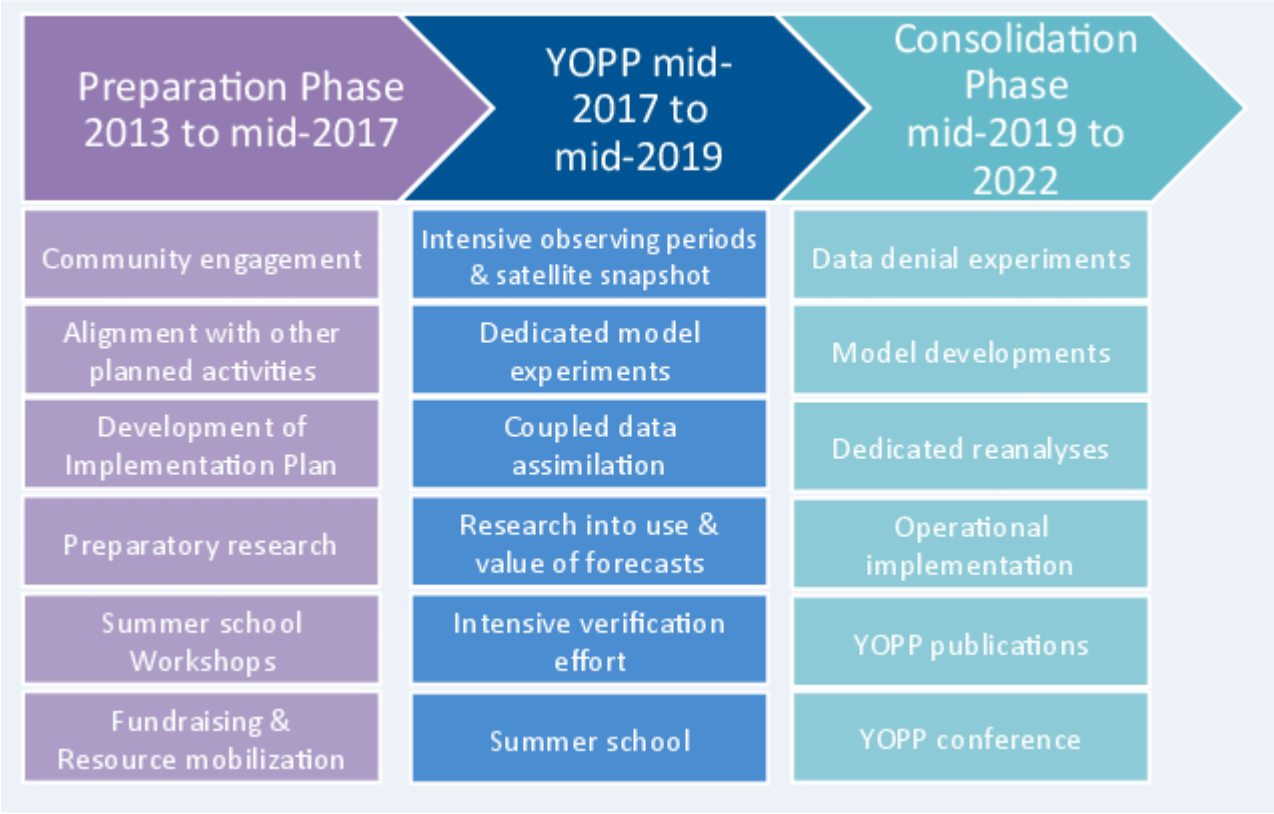
SCAR

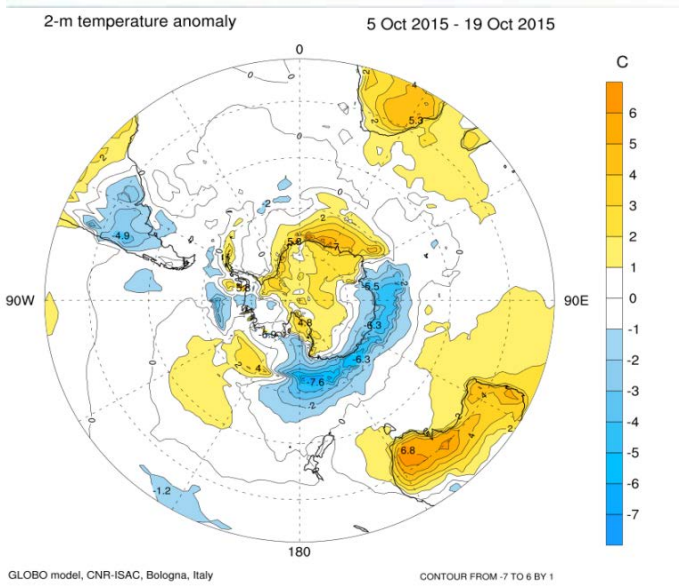
Subseasonal-to-Seasonal S2S Prediction Project

YOPP
YEAR OF POLAR PREDICTION

MISSION

Enable a significant improvement in environmental prediction capabilities for the polar regions and beyond, by coordinating a period of intensive observing, modelling, verification, user-engagement and education activities.





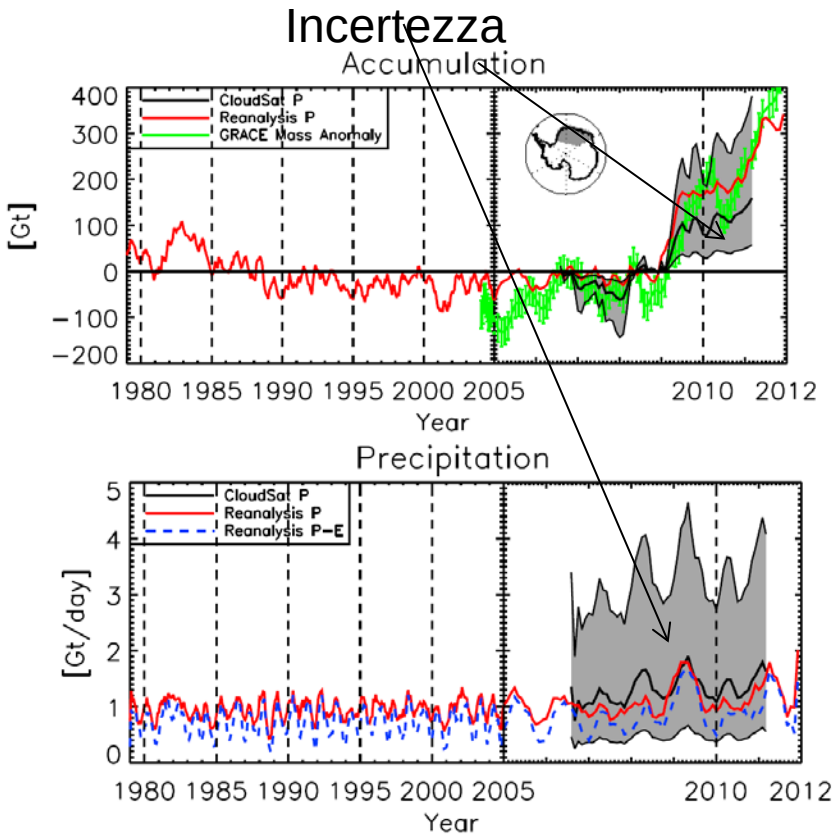
Esempio di previsione di anomalia bisettimanale di T2m
sull' emisfero sud

subseasonal-to-seasonal prediction (http://s2sprediction.net/) promosso dal WWRP/WCRP

Alcuni Temi di interesse attivi da svolgere in area polare:

- Previsione di nebbie in aree marine polari mediante modellistica numerica (Belmont Forum 2014)
- Parametrizzazione di processi sotto-griglia in modelli meteorologici
- Diagnostica di cicloni esplosivi e variabilita' interannuale (da ERA-Interim)
- Energetica di cicloni extratropicali – conversione baroclina, effetti di vapor d'acqua, migrazione verso le alte latitudini
- Influenza del gradiente latitudinale di temperatura sulla dinamica delle medie e basse latitudini in una gerarchia di modelli e ruolo delle onde planetarie nella circolazione generale

Stima delle Precipitazioni in regioni polari



The Global Precipitation Measurement mission is an An international satellite mission (NASA/JAXA) that sets new standards for precipitation measurements worldwide using a network of satellites united by the GPM Core Observatory.

Tematiche di ricerca

Sviluppo e consolidamento delle reti osservative

Cambiamenti di lungo periodo nella stratosfera
Processi nella stratosfera ed ozono polare
Influenza della circolazione stratosferica sui processi meteorologici alle alte e medie latitudini

Predicibilità e meteorologia nelle regioni polari

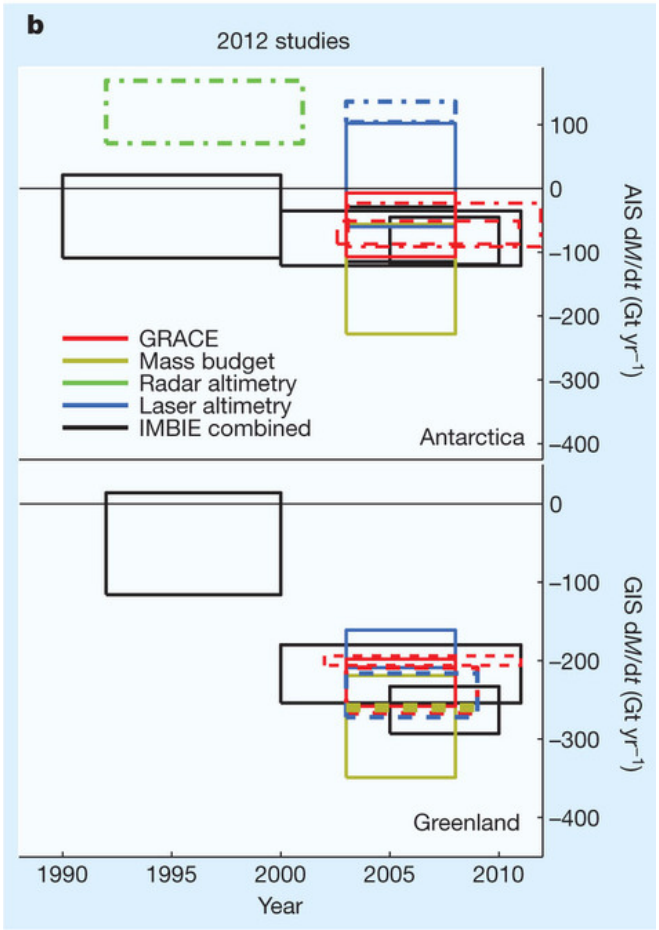
Bilancio di massa

Ruolo di aerosol, vapor d'acqiua e nubi sul bilancio della radiazione

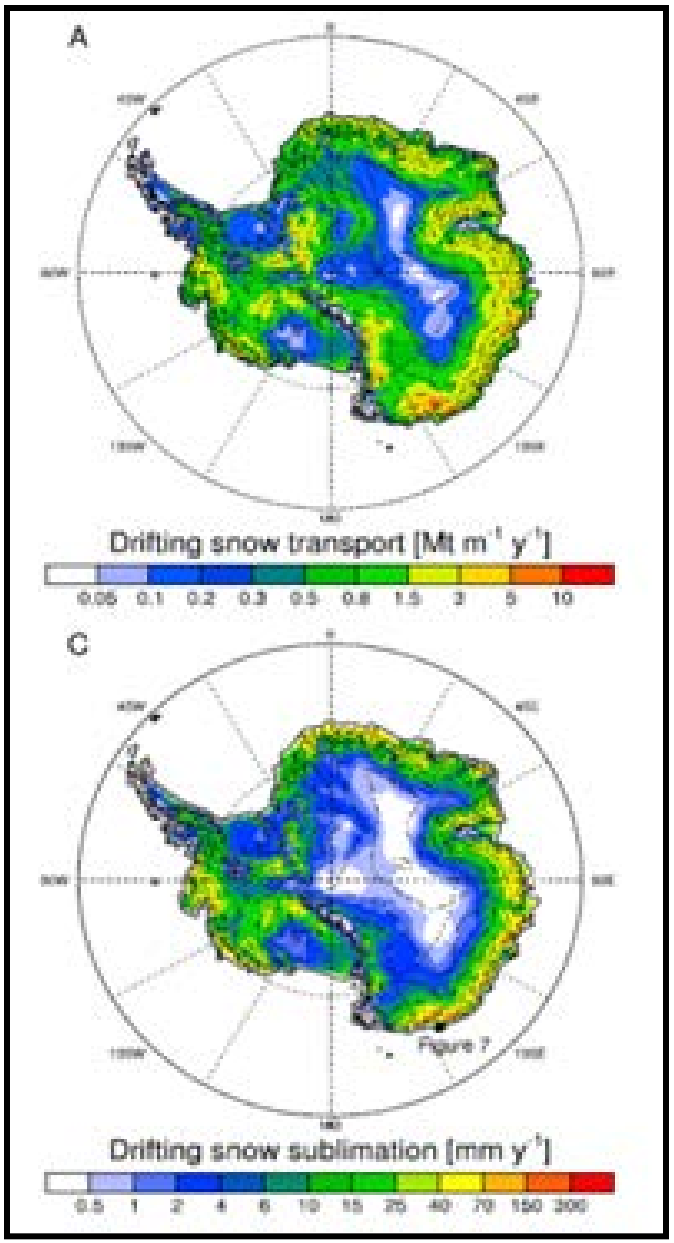
Misura *drifting snow* (*drifting e blowing snow*) quale contributo al miglioramento dell'accuratezza della stima della perdita di massa della calotta antartica.
Attualmente stimata in ~ 30-200Gt yr^{-1} con un'incertezza ~ 40%, dovuta all'incertezza su SMB e sull'impatto del

Antarctica

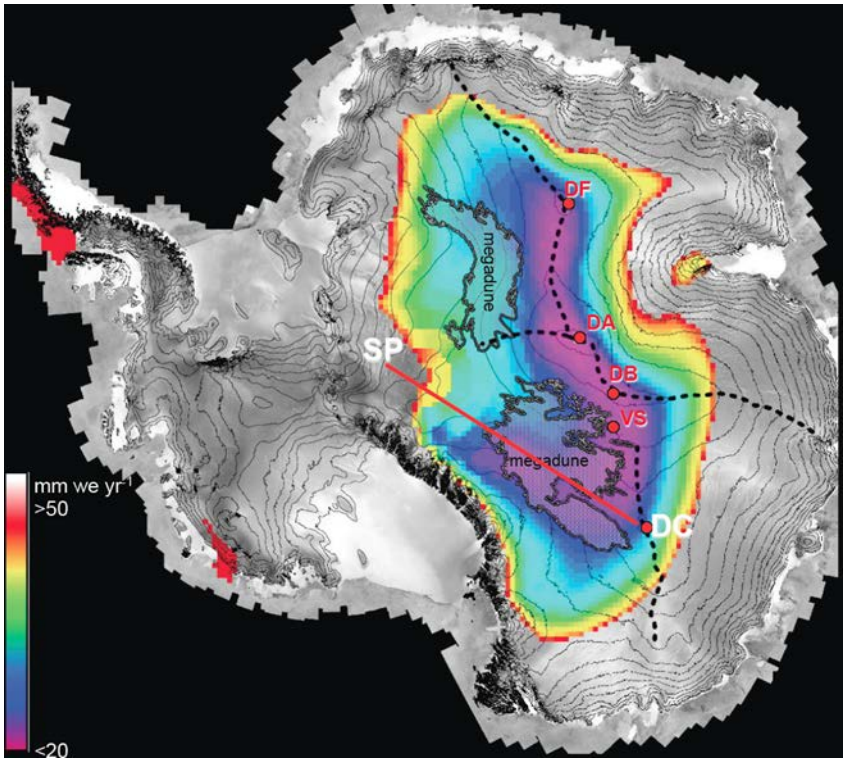
Greenland



Perdits di Massa della calotta (Gt Yr^{-1})



East Antarctic International Ice Sheet Traverse (EAIIST)



A French-Italian-American project for a Dome C – South Pole traverse

Key Atmospheric Questions:

1. How do Dome C and South Pole compare in representing the atmospheric chemistry of the remote, clean Antarctic atmosphere?
2. What are common and different features in atmospheric chemistry and snow-atmospheric exchanges?
3. What forcings are exhibited through diurnal radiation and boundary layer dynamics cycles at Dome C and how does the absence of a diurnal cycle affect snow and atmospheric chemistry at South Pole?

Tematiche di ricerca

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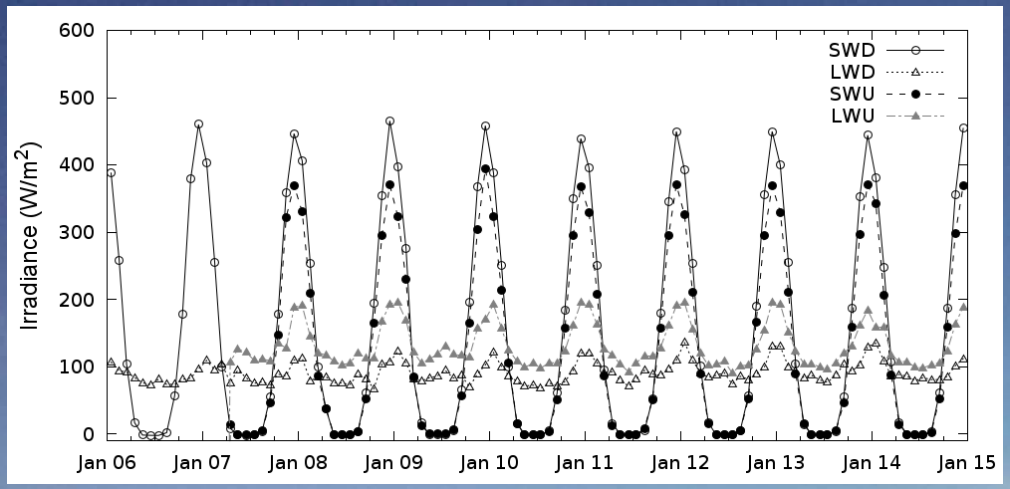
Ruolo di aerosol, vapor d'acqua e nubi sul bilancio della radiazione

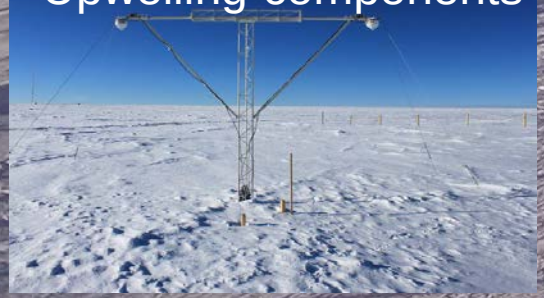
Baseline Surface Radiation Network

(osservatorio 2009/B.04)

- Surface radiation balance
- Albedo, Spectral albedo (Strrap-b)
- Atmospheric transparency
- Cloud radiative forcing
- Columnar gas contets wv, ozone
- Columnar Aerosol Content
- UVA, UVB, erithemal doses
- Chemical processes at snow interface



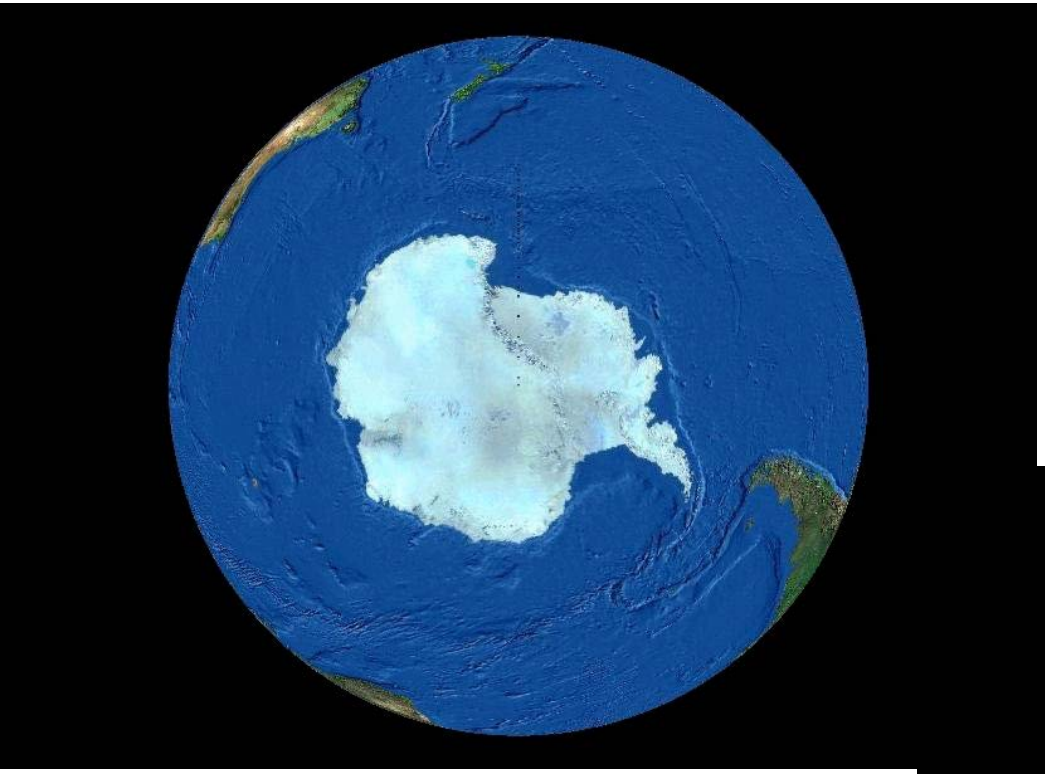
Platform B: albedo rack
Upwelling components



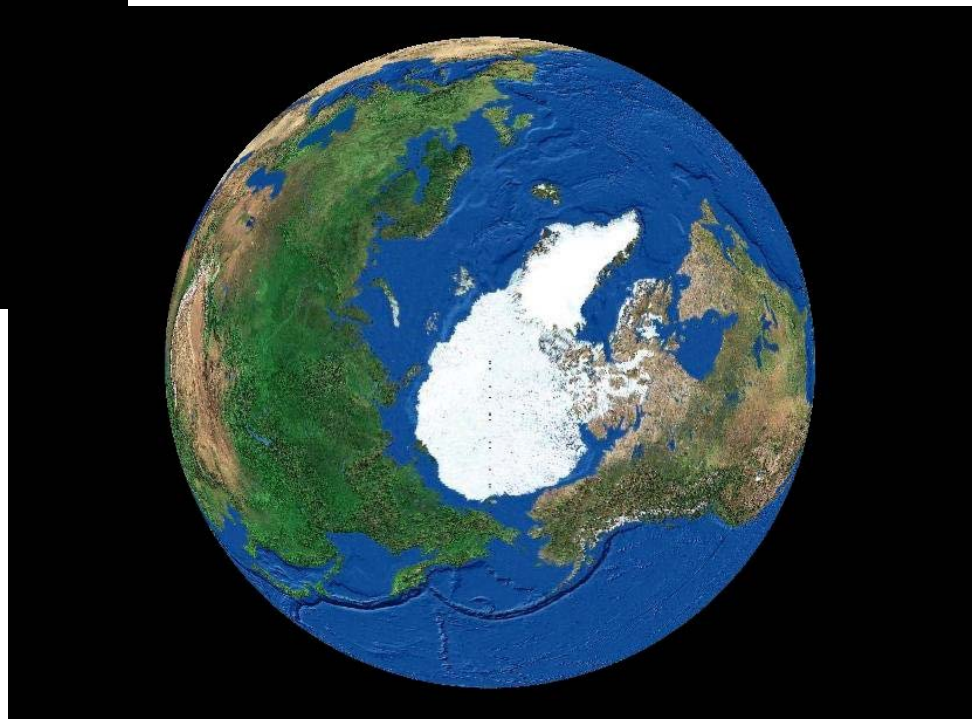
Platform A: tracker
Shortwave and longwave broadband incoming radiations

Platform C: tower
Upwelling SW (larger footprint)

Arctic and Antarctica – Bi-Polar view!



Necessità di integrare e coordinare le attività fra i due poli



Esempi di attività in Artico

Base CNR Ny-Ålesund, Svalbard

Base di Thule - Groenlandia

Sviluppo di sinergie e connessioni fra i due poli

Alcuni spunti per la discussione …..

GENERALI:

Quali sono le richieste della comunità internazionale ?

Quali le collaborazioni in atto e quali quelle da intraprendere?

Sviluppo di idee e strategie per il rafforzamento della presenza internazionale del programma.

Obiettivi:

Aumento delle capacità osservative

Contributo alla validazione di prodotti satellitari e modelli climatici

Miglioramento dei modelli di previsione e meteo-climatici

Strumenti :

Programma nazionale e adesione a opportunità Europee ed internazionali (EC, ESA, WMO, etc.)

Basi Italiane Esistenti e presenza in basi Internazionali

Sviluppo di Sensori e misure

Gestione dati esistenti e futuri presenza in network di distribuzione


Grazie per l’attenzione !!