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## The French contribution to the atmospheric and cryospheric component of an Arctic Observatory

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## Long-term observations



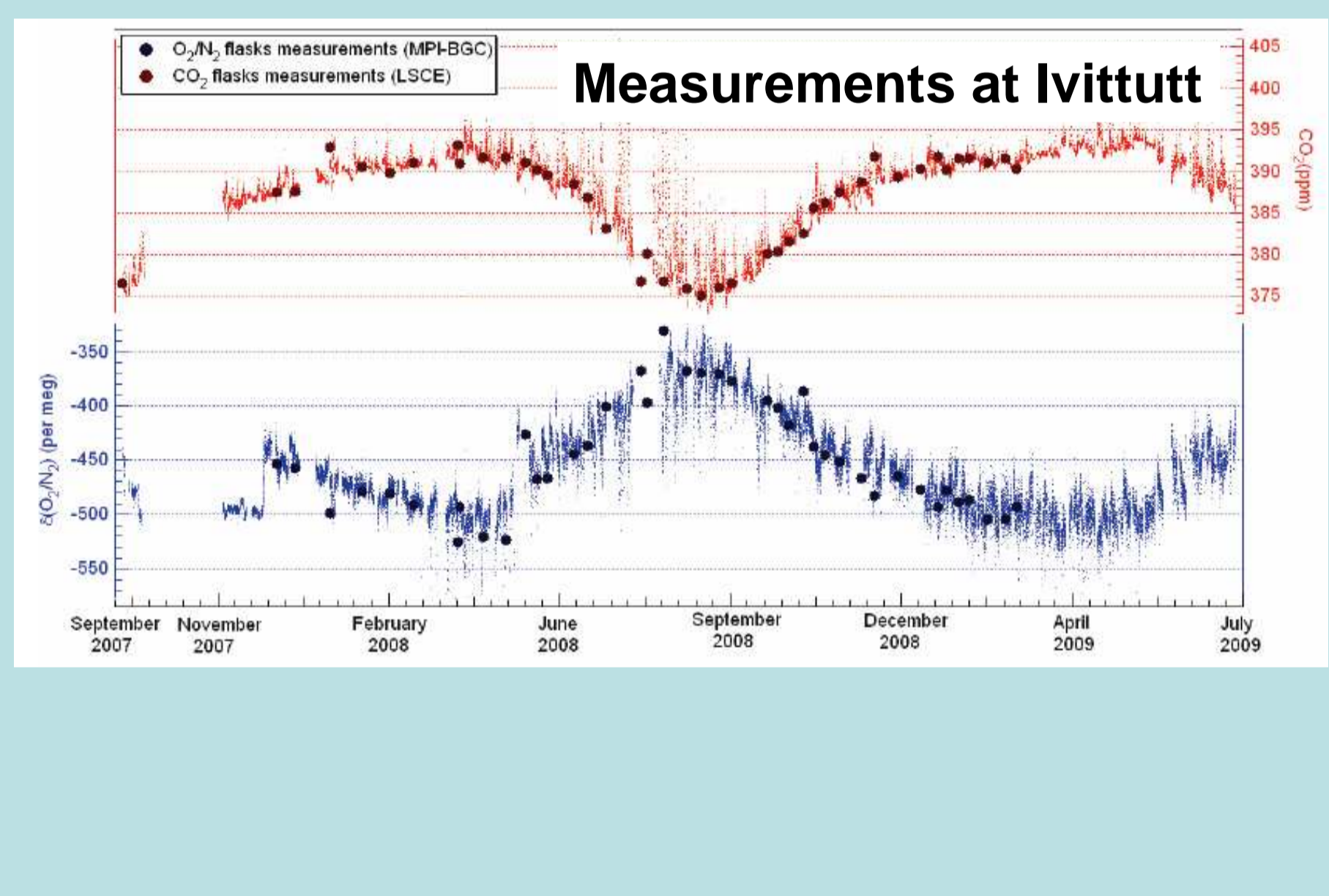
European monitoring network for better understanding of the regional carbon cycle and quantification of emissions

### Atmosphere

- Core parameters - continuous (CO<sub>2</sub>, CH<sub>4</sub>, CO, PBL height, meteorology)
- Core parameters - periodic (flask samples, concentrations and isotopes)
- Additional parameters (N<sub>2</sub>O, SF<sub>6</sub>, O<sub>2</sub>/N<sub>2</sub>, Rn-222)

<http://www.icos-infrastructure.eu/>

Cooperation with international partners to extend the network to Siberia and Greenland (Station Nord and Ivittutt)



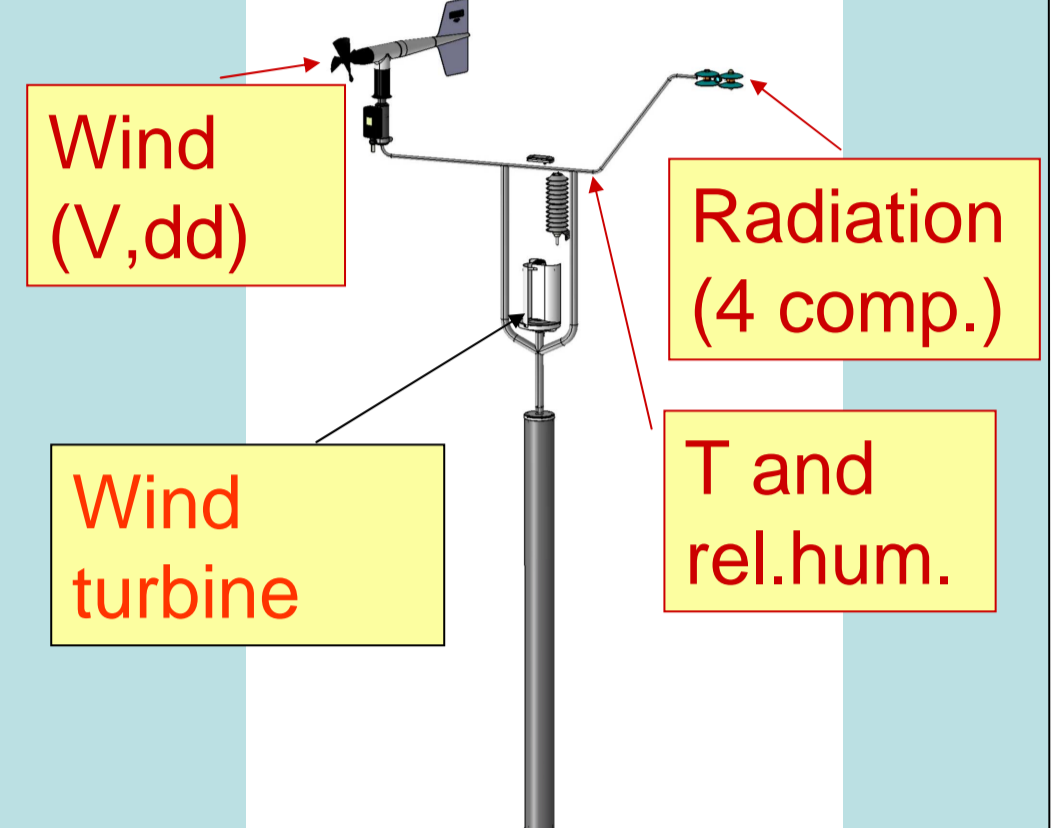
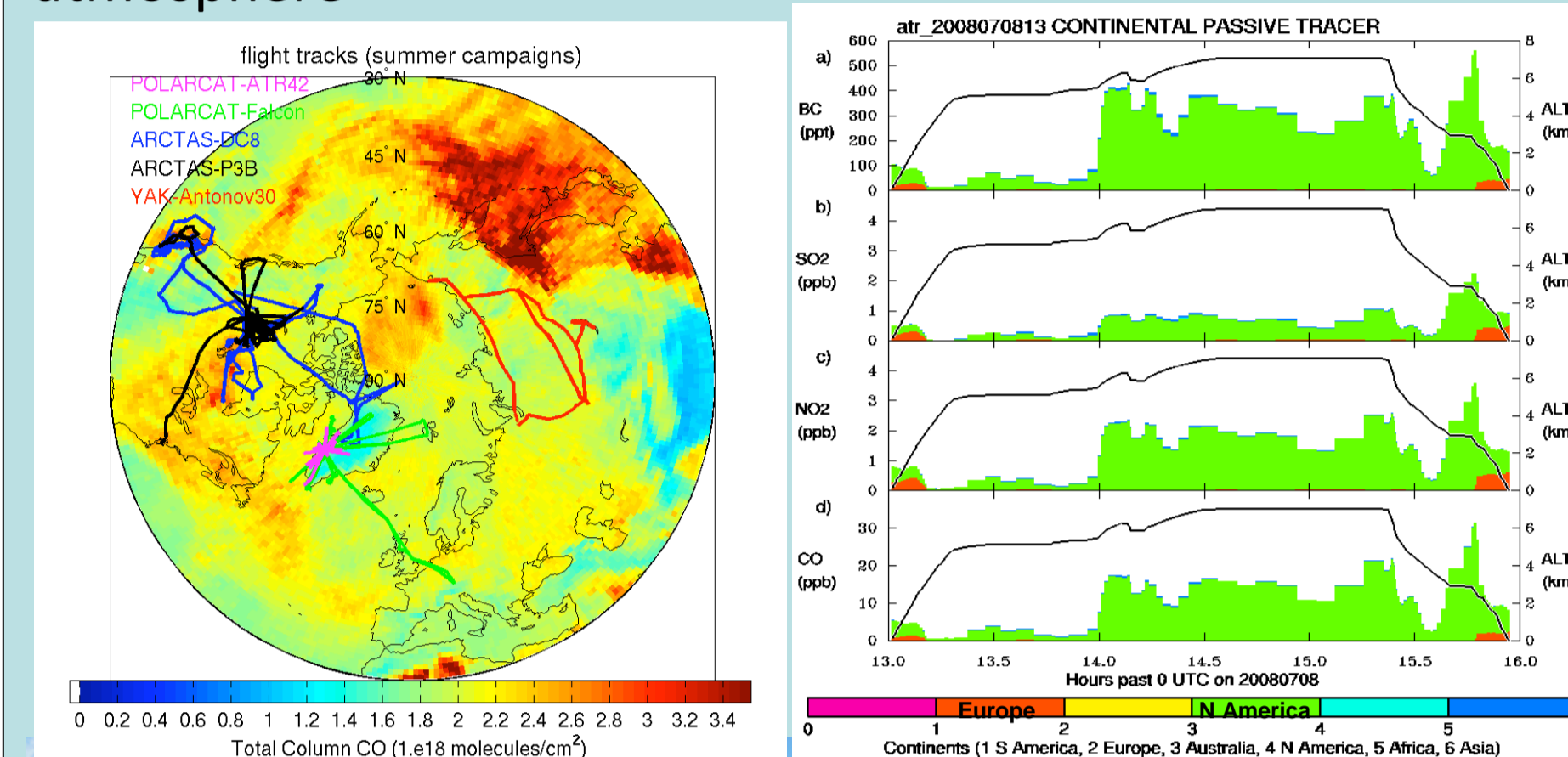
## Process studies in the troposphere

Investigation of long-range transport of pollutants to the Arctic, chemical processing in the atmosphere

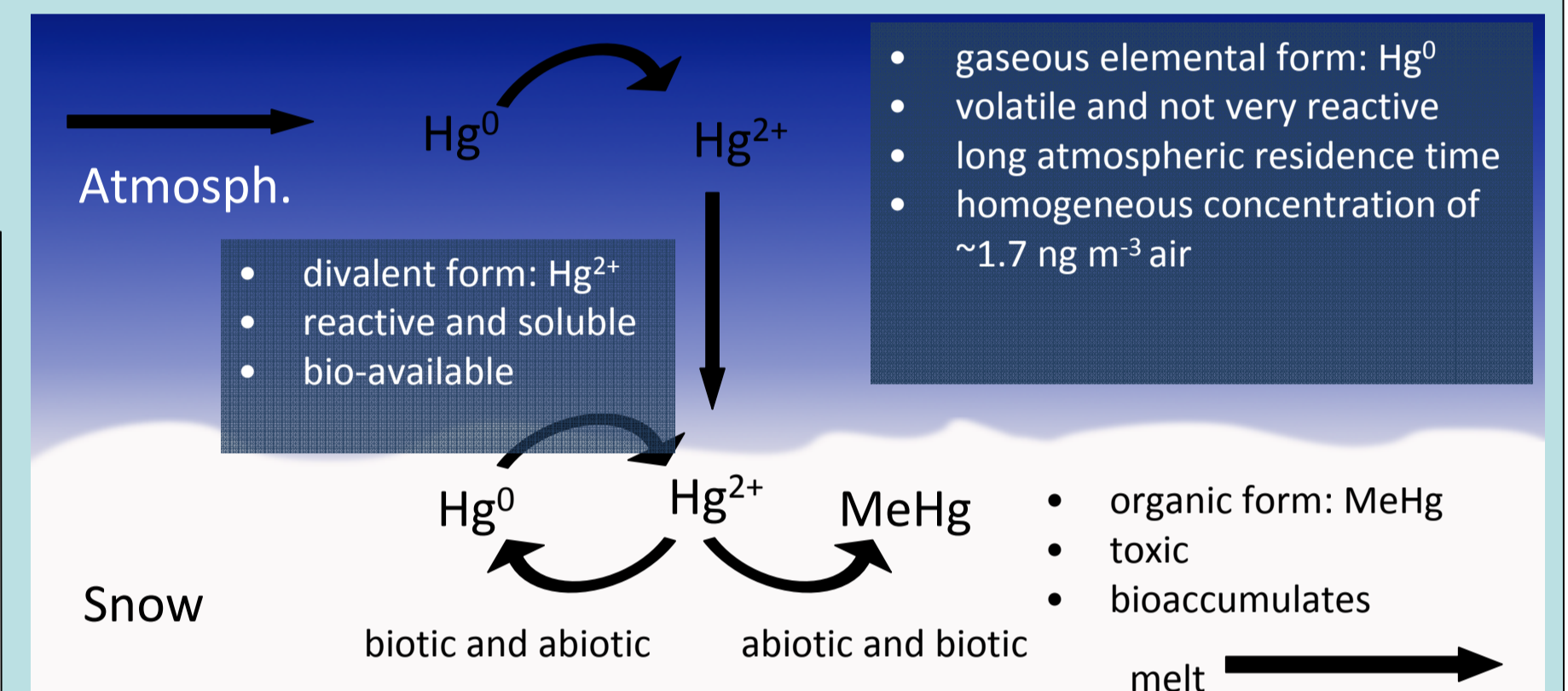
Summer campaign 12 flights over Greenland (30 June to 14 July 2008)



**OPTIMISM: the system BEAR** for autonomous flux measurements over the Arctic Ocean



### Chemical processing of pollutants in the snow

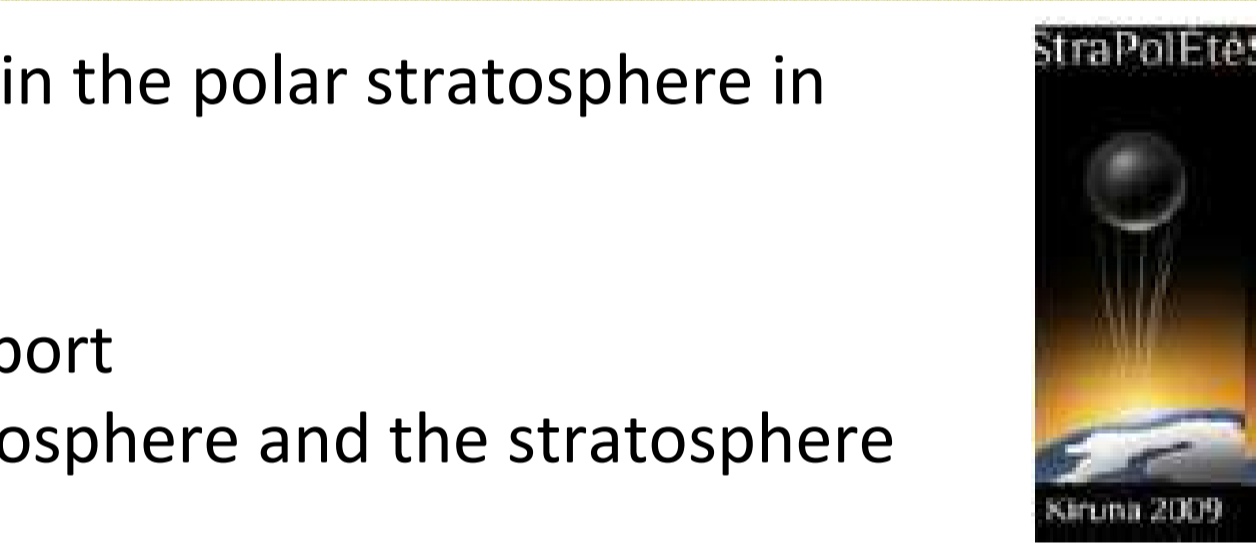


## Process studies in the stratosphere

Dynamics, aerosol and bromine in the polar stratosphere in summer

- Investigation of
- the change in large scale transport
- the coupling between the troposphere and the stratosphere
- the aerosol content and the impact on the radiative budget
- bromine species in the stratosphere

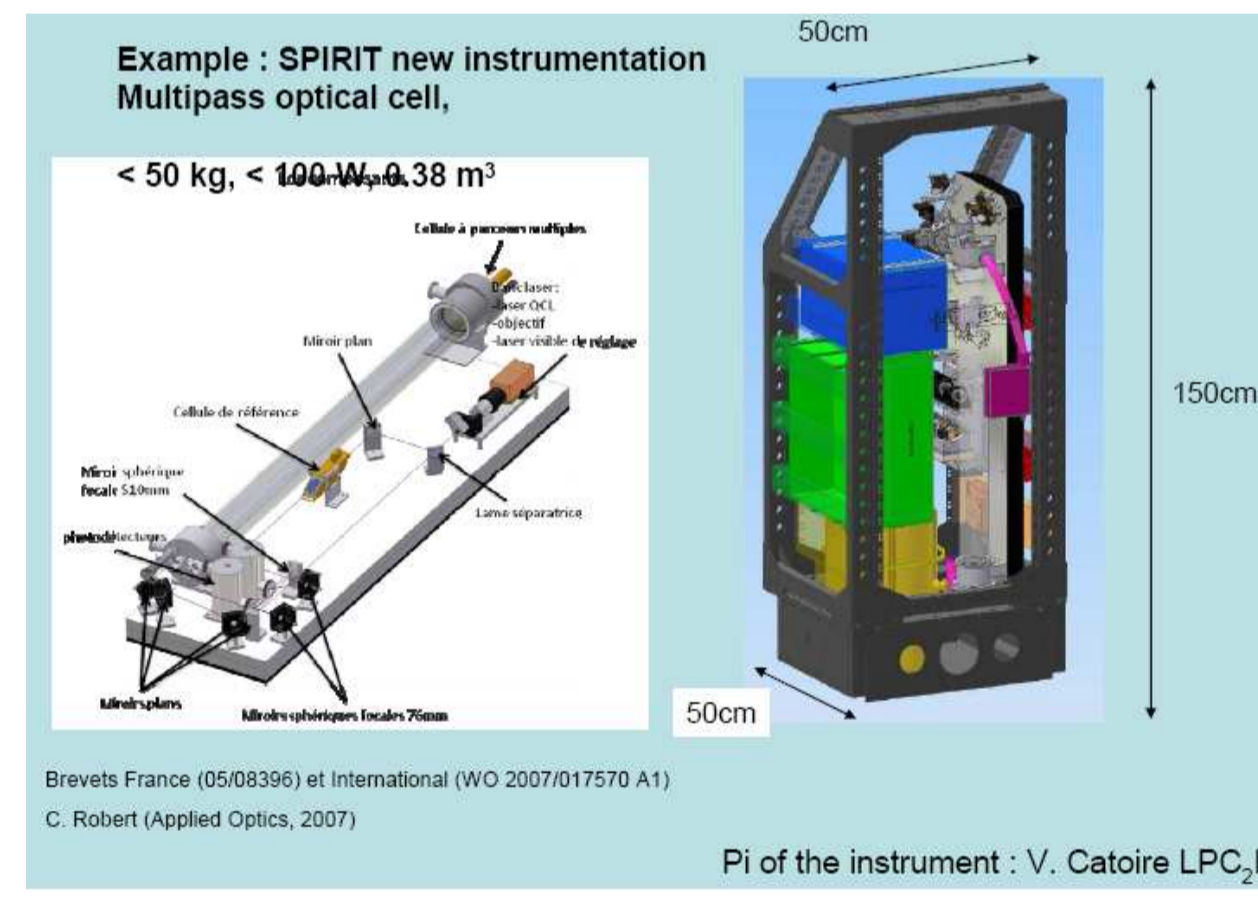
payload, SWIR-Balloon : 500kg



### Balloon-borne instruments involved in the project

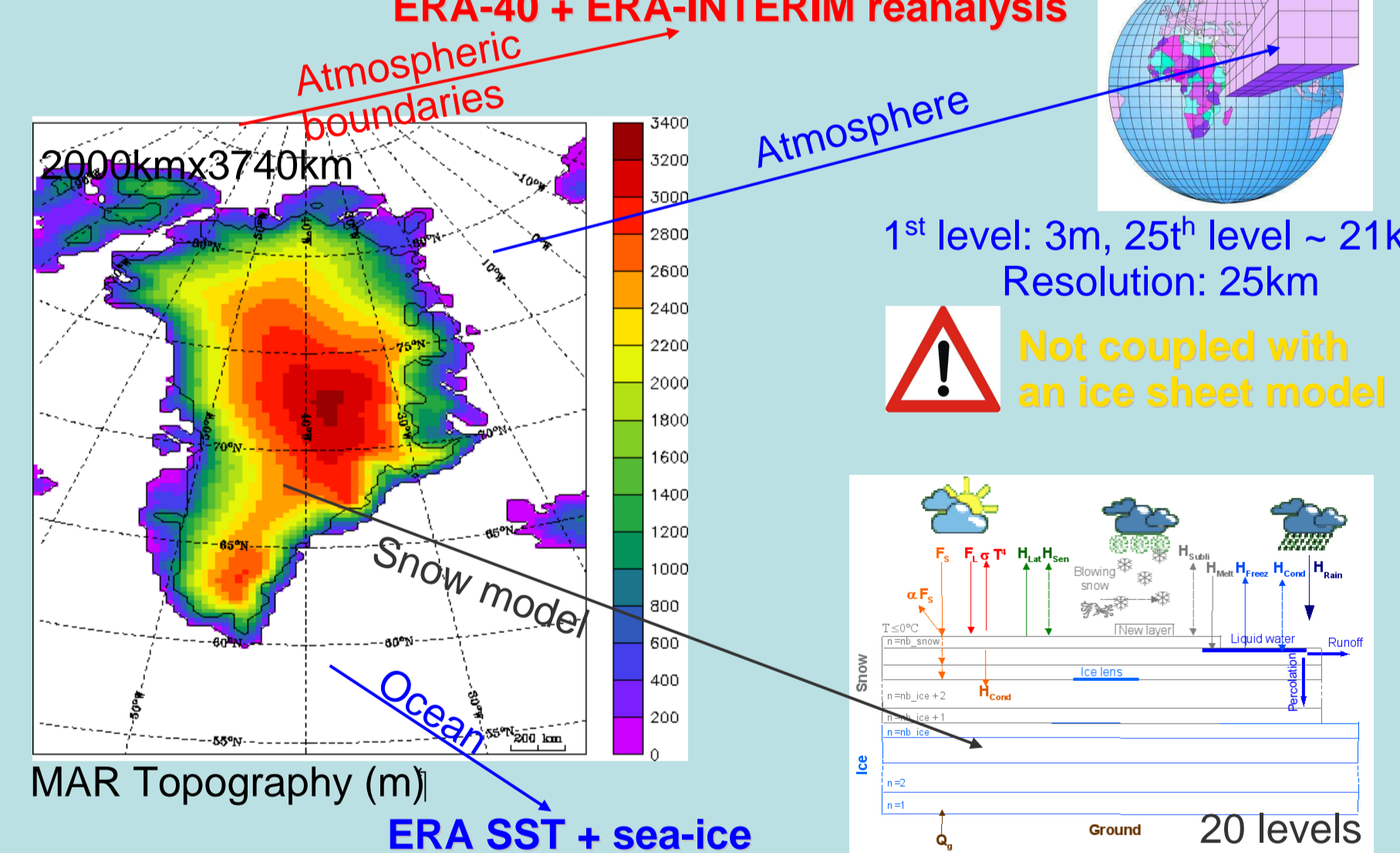
Instrument	Measurement technique	Measurements used	Retrieval altitudes provided & vertical resolution
SPIRALE (LPCZE)	In situ Direct infrared absorption	O <sub>3</sub> , CH <sub>4</sub> , H <sub>2</sub> O, HCl, CO, HNO <sub>2</sub> , NO <sub>2</sub> , OCS	9km - 35km 5m
SWIR Balloon (LPCZE)	Remote sensing Infrared radiance and ratio	CO <sub>2</sub> , CH <sub>4</sub> , CO, OCS	Partial columns
LPM (LPCZE)	Remote sensing Infrared solar Doublon	O <sub>3</sub> , HNO <sub>2</sub> , NO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HCl	15km - 25km 1km
DOAS Univ Heidelberg	Remote sensing UV Solar irradiance	SO <sub>2</sub>	15km - 25km 1km
SALOMONZ (LPCZE)	Remote sensing UV-visible solar scattering	O <sub>3</sub> , NO <sub>2</sub> , BrO, Aerosol extinction	15km - 35km 1 km
STAC (LPCZE)	In situ aerosol counter	Size distribution of aerosols	10km - 25km 10m
MicroRADICAL (LPCZE)	Remote sensing Scattering and polarization by photometry	Nature (liquid, solid), size distribution of aerosols	15km - 25km 1km

balloon deployment provides : In situ and remote sensing measurements vertical profiles from UT to stratosphere partial column in the troposphere

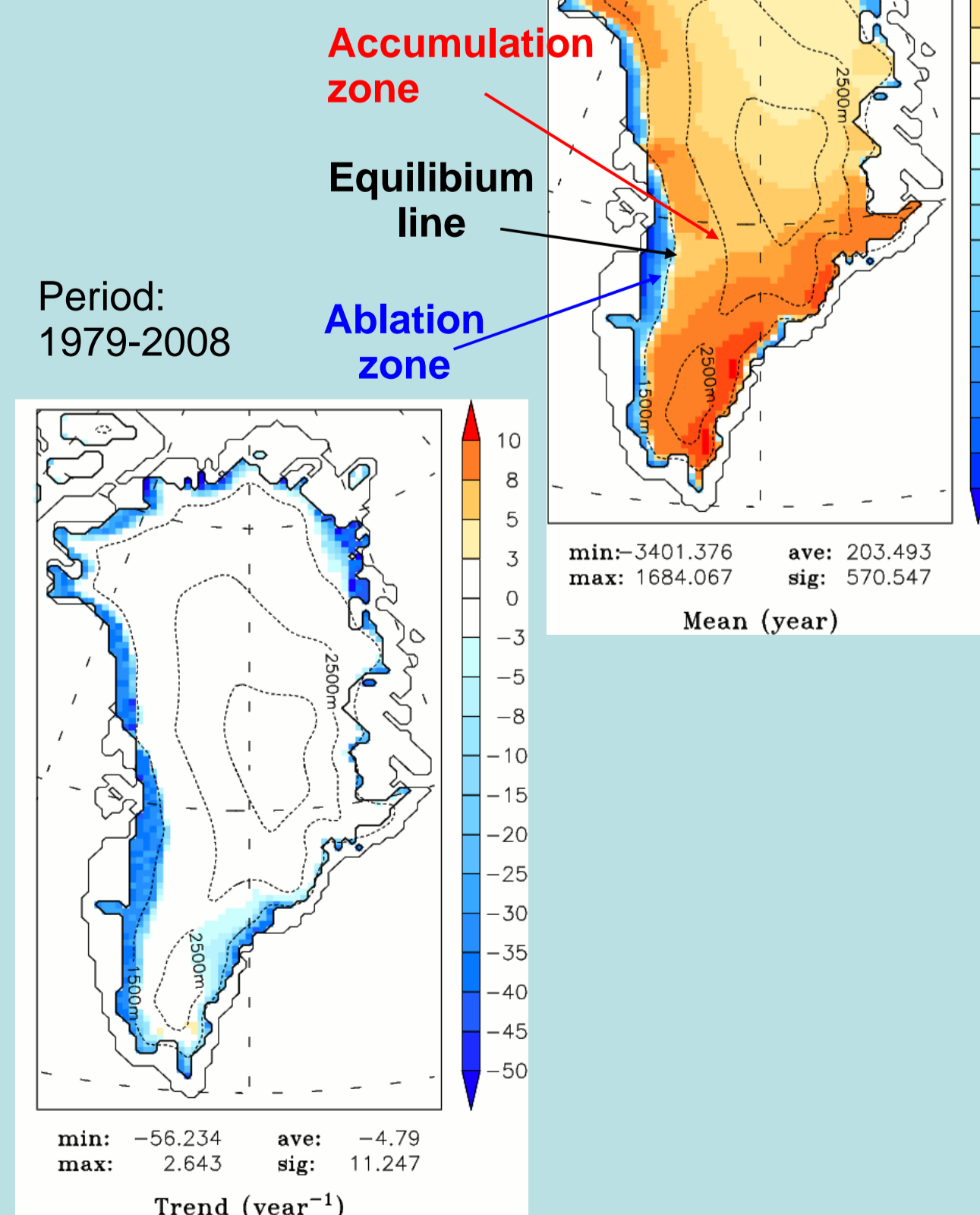


## Modeling

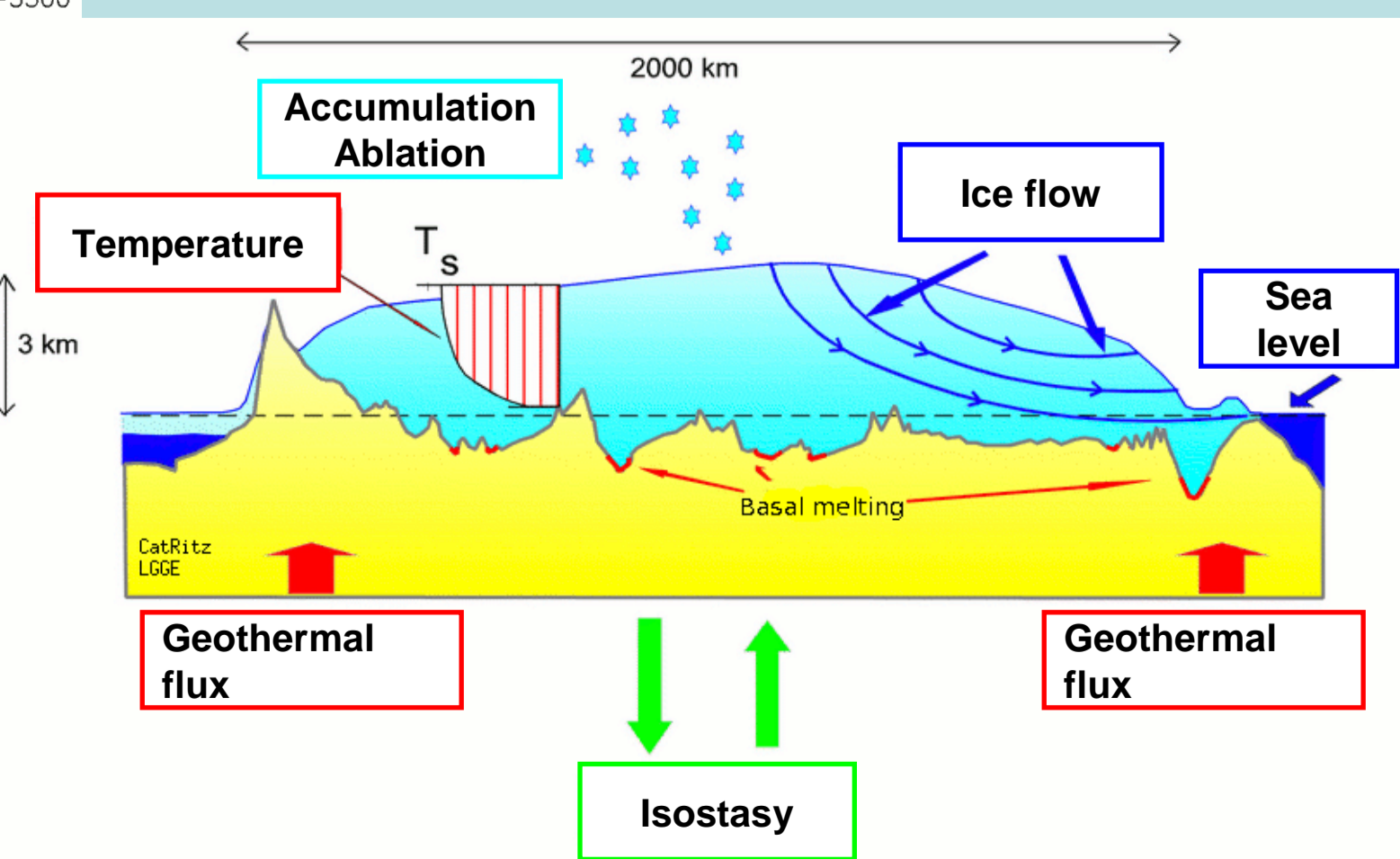
### Ice sheet modeling with the regional climate model MAR



### Greenland ice sheet surface mass balance



Ice sheet modeling New approach with a high-resolution model including adjusted grid sizes

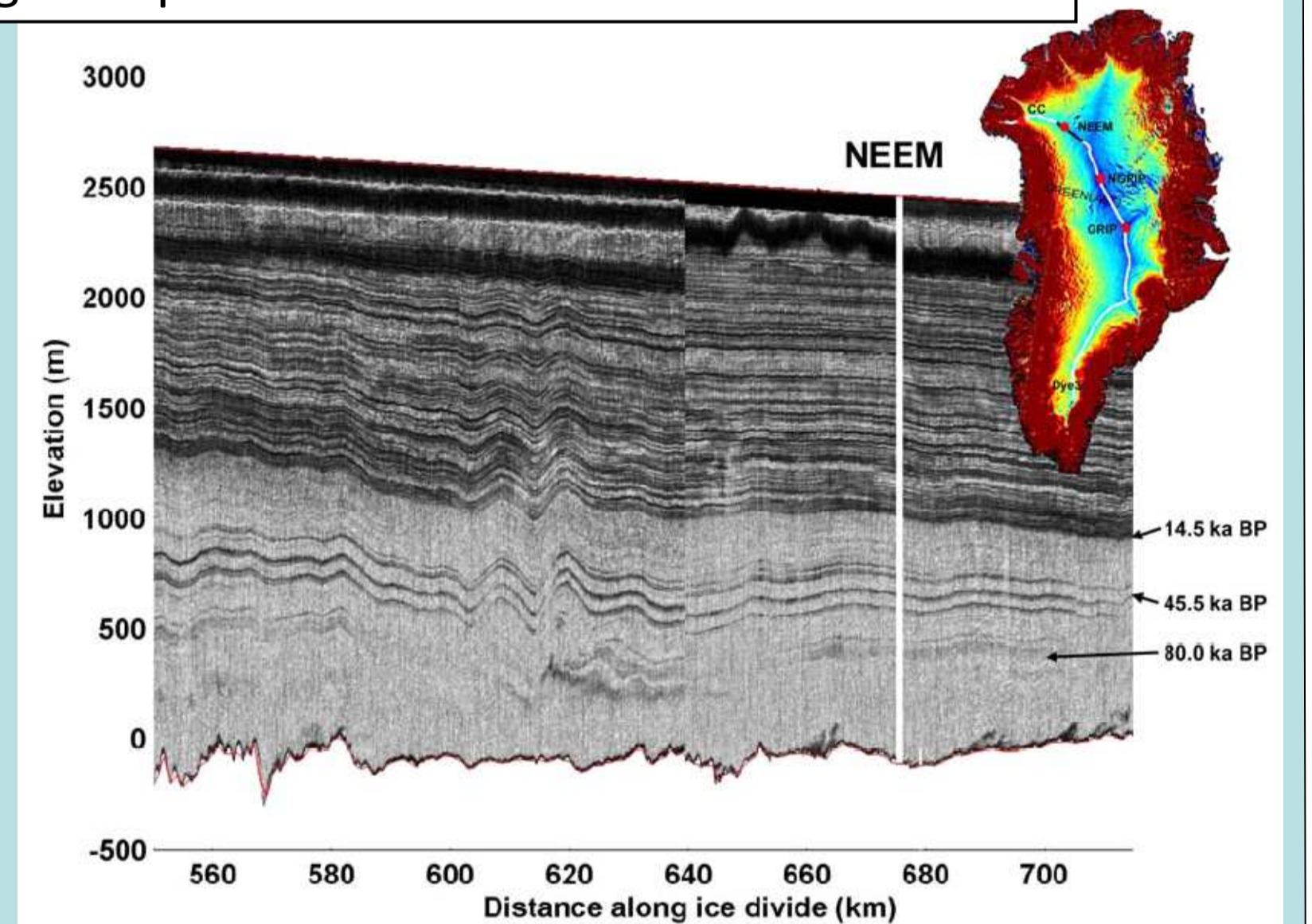


Development of new instrumentation

## Paleoclimate

### Ice core project NEEM

Objective: Go back more than 130000 years to the last interglacial period



- Depth reached in 2009: 1757.84 m
- covering past 38000 years
- average temperature -28 °C
- accumulation 20 cm WE year<sup>-1</sup>
- most fresh snow in summer

