

H.-W. Jacobi¹ (jacobi@lgge.obs.ujf-grenoble.fr), P. Ciais², Jean Claude Gascard³, Kathy Law⁴, Valerie Masson-Delmotte², J.-D. Paris², M. Delmotte², J.V. Lavric², G. Ancellet⁴, C. Ritz¹, H. Gallée¹, A. Dommergue¹, F. Vivier⁵, A. Weill⁴, N. Huret⁶, S. Payan³,

¹CNRS / University Joseph Fourier – Grenoble 1, LGGE, France; ²LSCE, CEA-CNRS, Paris, France; ³University Pierre et Marie Curie – Paris 6, France; ⁴CNRS / University Versailles, LATMOS, France; ⁵CNRS / University Versailles, LOCEAN, France; ⁶CNRS / University Orléans, LPCE, France; MPI for Biogeochemistry, Jena, Germany

Long-term observations



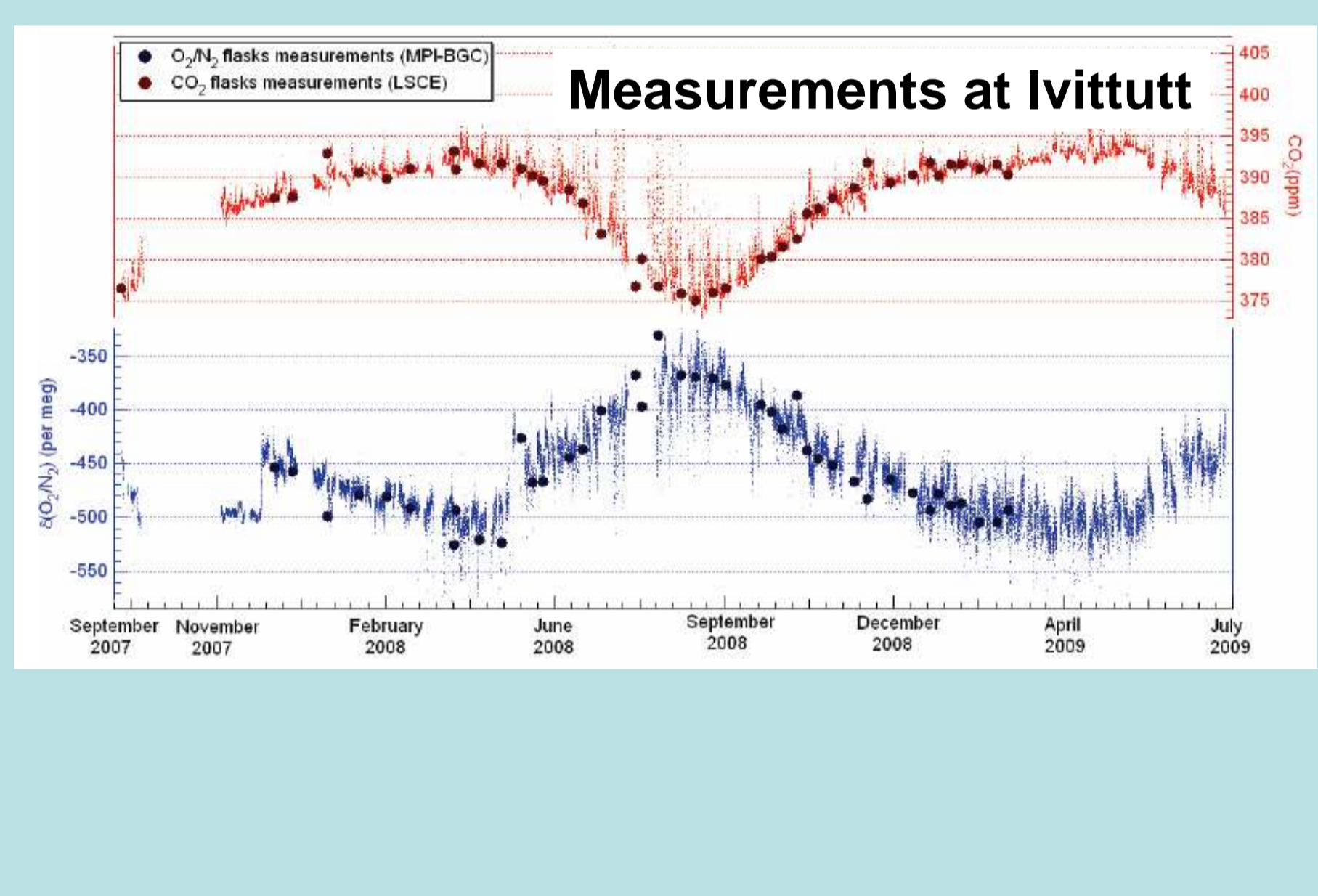
European monitoring network for better understanding of the regional carbon cycle and quantification of emissions

Atmosphere

- Core parameters - continuous (CO₂, CH₄, CO, PBL height, meteorology)
- Core parameters - periodic (flask samples, concentrations and isotopes)
- Additional parameters (N₂O, SF₆, O₂/N₂, Rn-222)

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

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



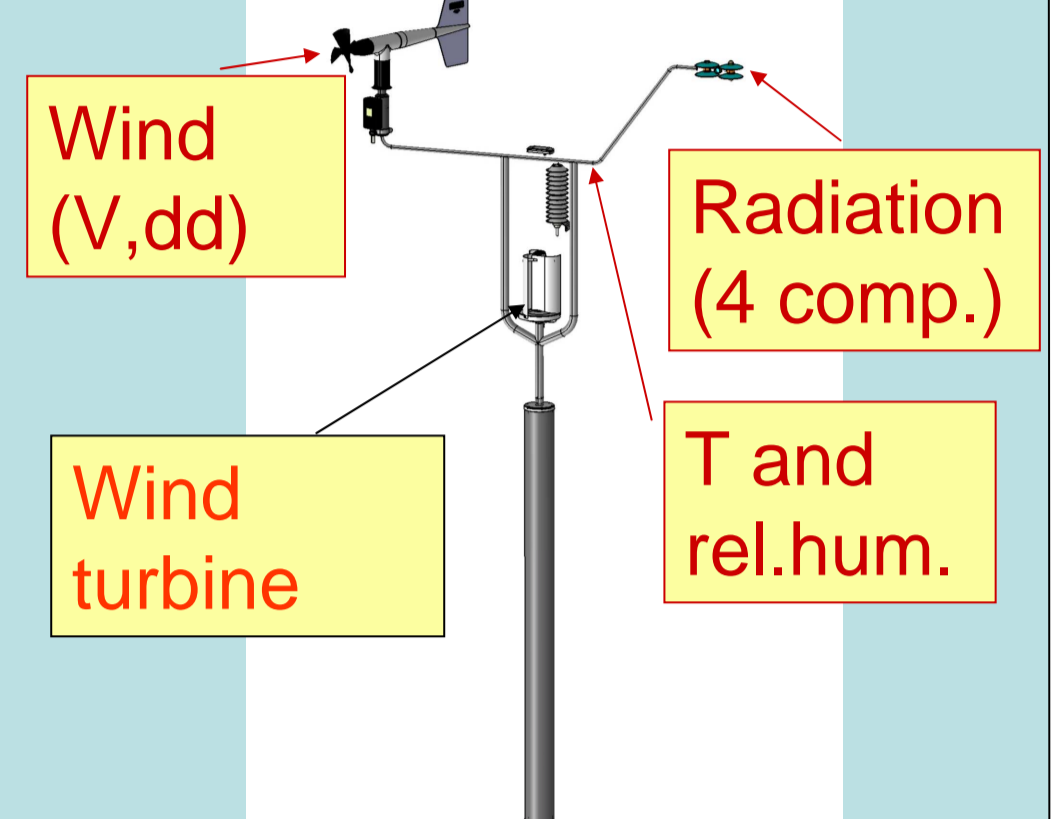
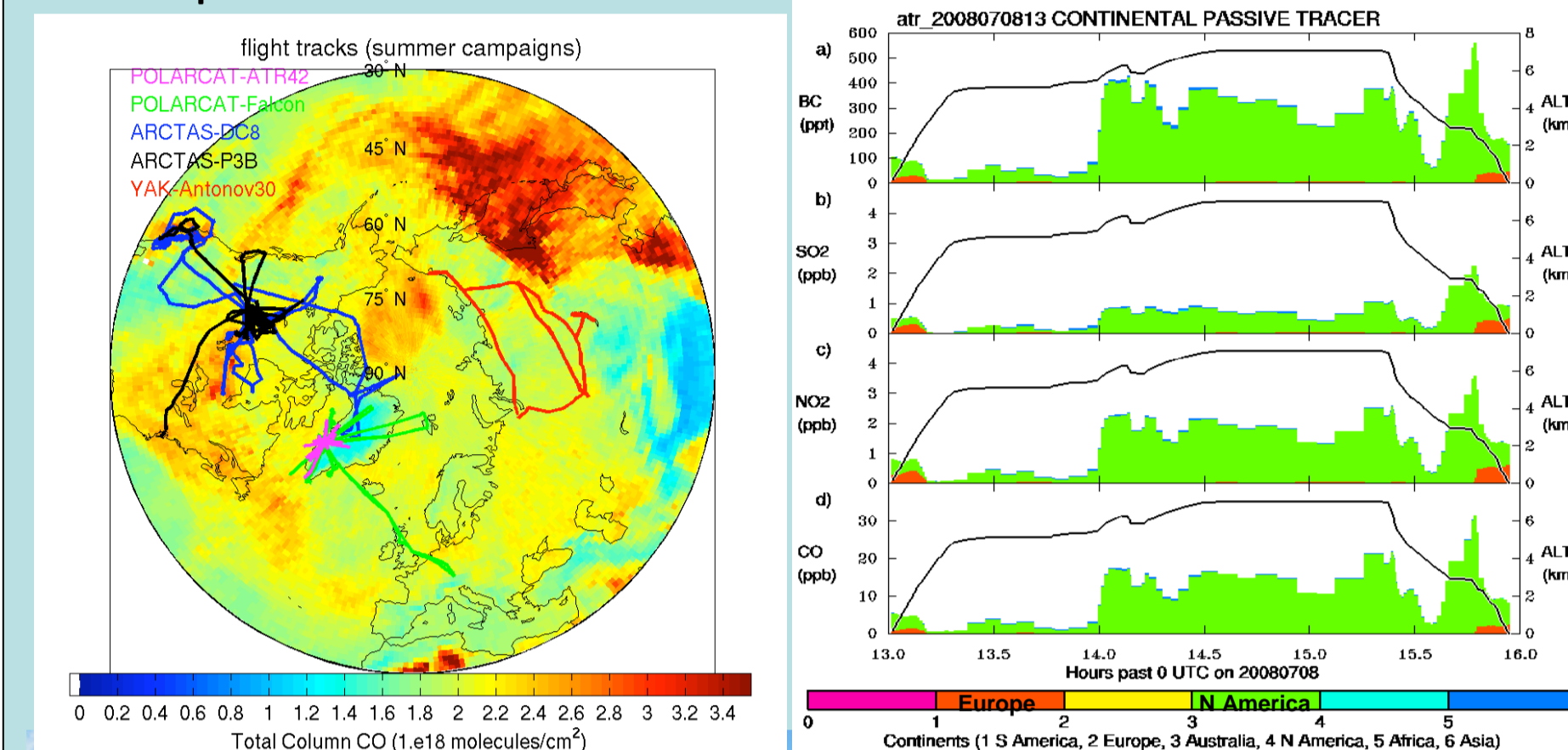
Process studies in the troposphere

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

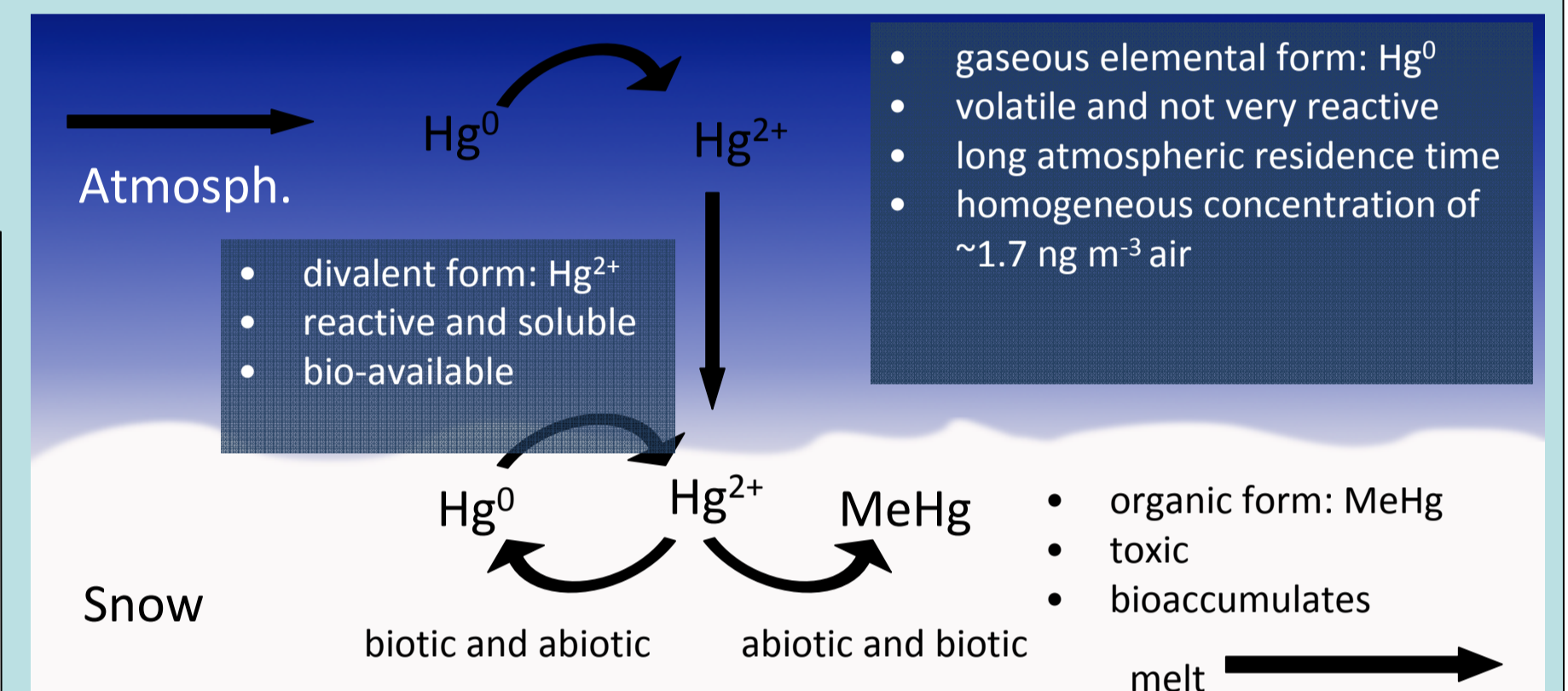
Summer campaign 12 flights over Greenland (30 June to 14 July 2008)



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



Chemical processing of pollutants in the snow



Process studies in the stratosphere

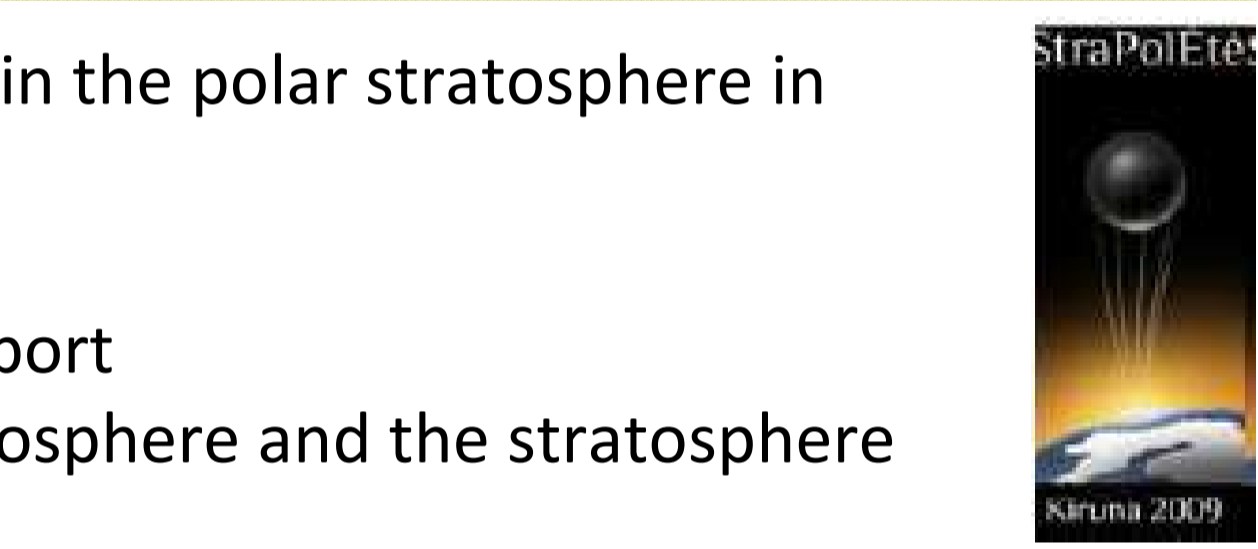
Dynamics, aerosol and bromine in the polar stratosphere in summer

- 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



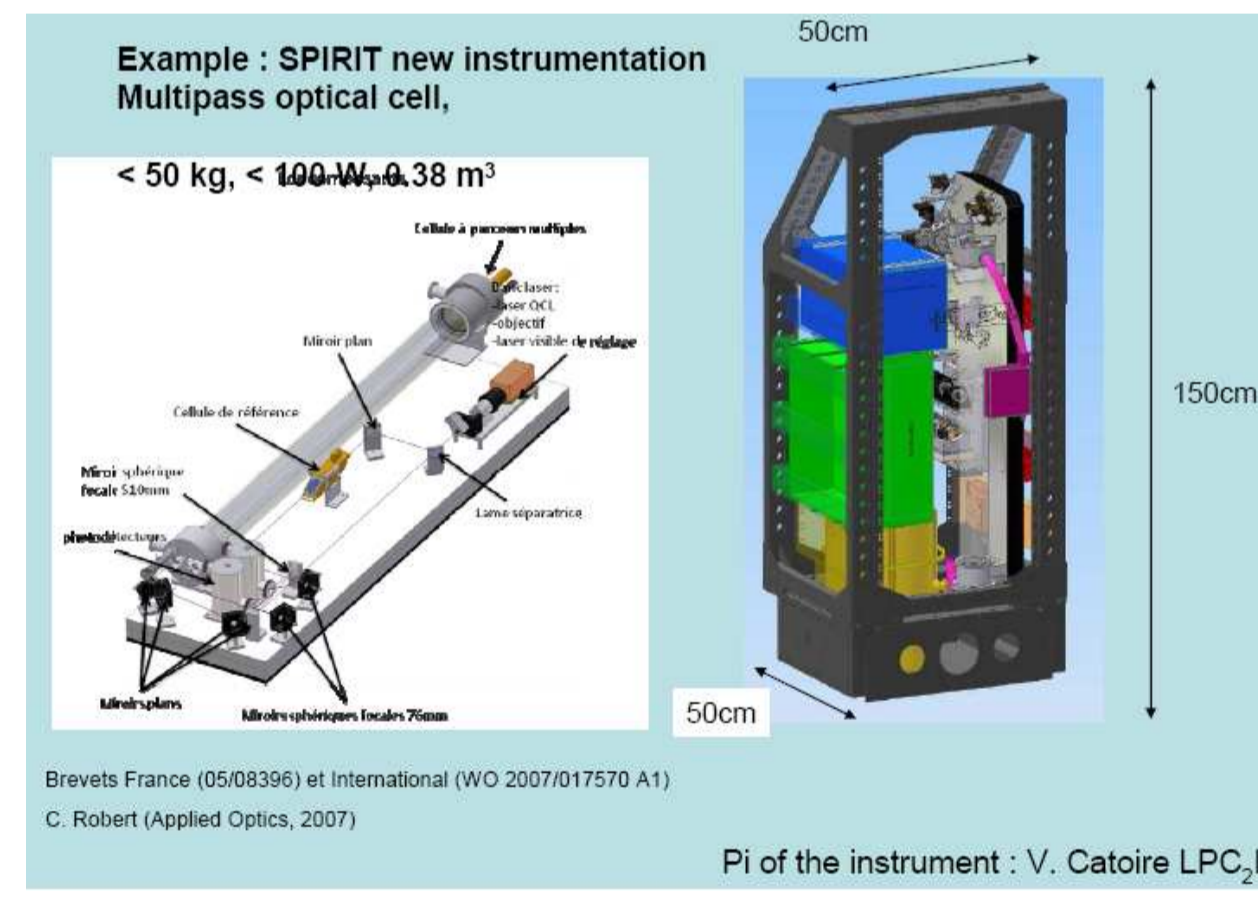
Development of new instrumentation



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 ₃ , CH ₄ , H ₂ O, HCl, CO, HNO ₂ , NO ₂ , OCS	9km - 35km 5m
SWIR Balloon (LPCZE)	Remote sensing Infrared radiance and ratio	CO ₂ , CH ₄ , CO, OCS	Partial columns
LPM (LPCZE)	Remote sensing Infrared solar Doublon	O ₃ , HNO ₂ , NO ₂ , CH ₄ , N ₂ O, HCl	15km - 25km 1km
DOAS Univ Heidelberg	Remote sensing UV Solar irradiance	SO ₂	15km - 25km 1km
SALOMONZ (LPCZE)	Remote sensing UV-radiance solar scattering	O ₃ , NO ₂ , BrO, Aerosol extinction	15km - 35km 1 km
STAC (LPCZE)	In situ aerosol counter	Size distribution of aerosols	10km - 25km 10m
MicroRADICAL (LDA)	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

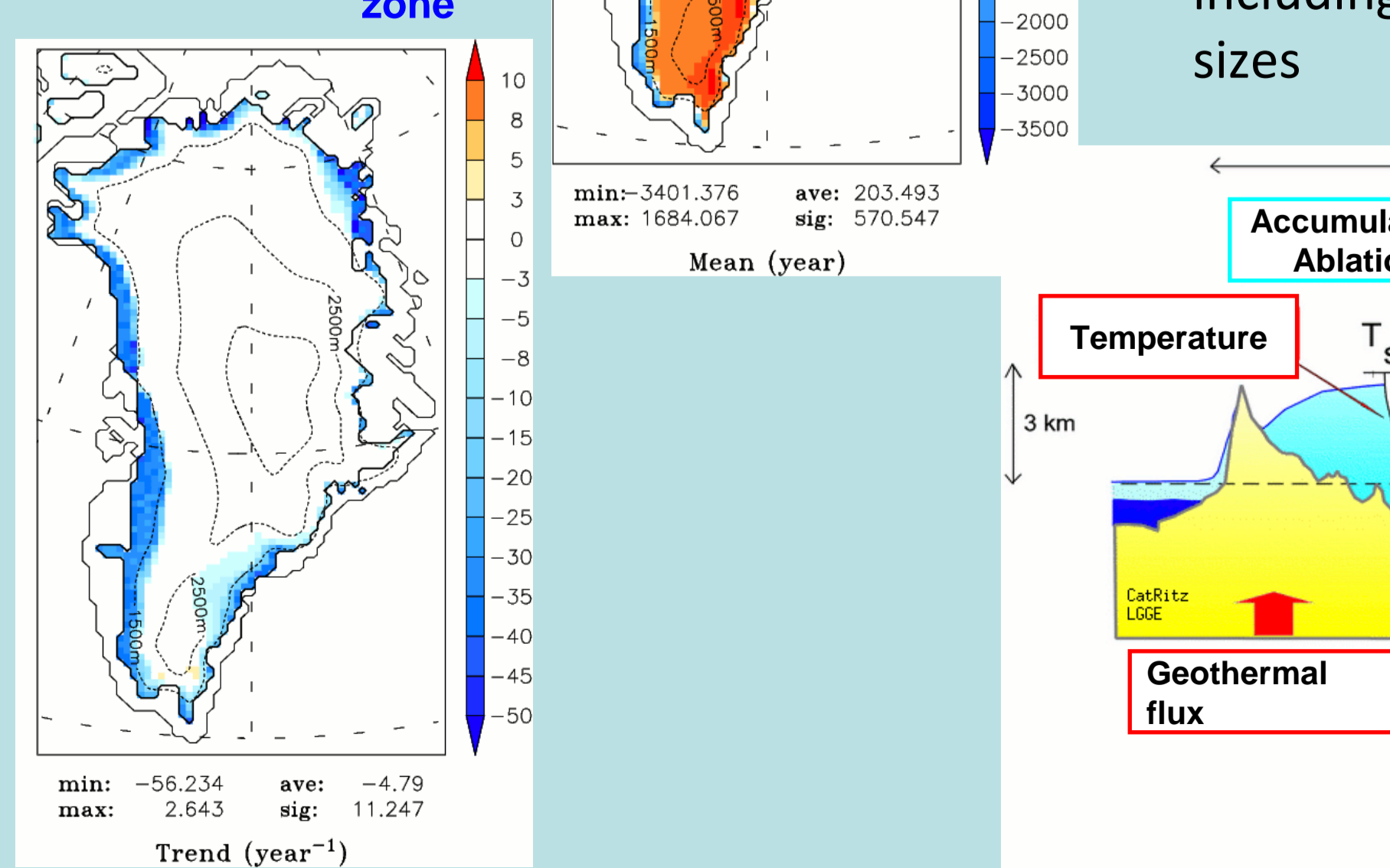
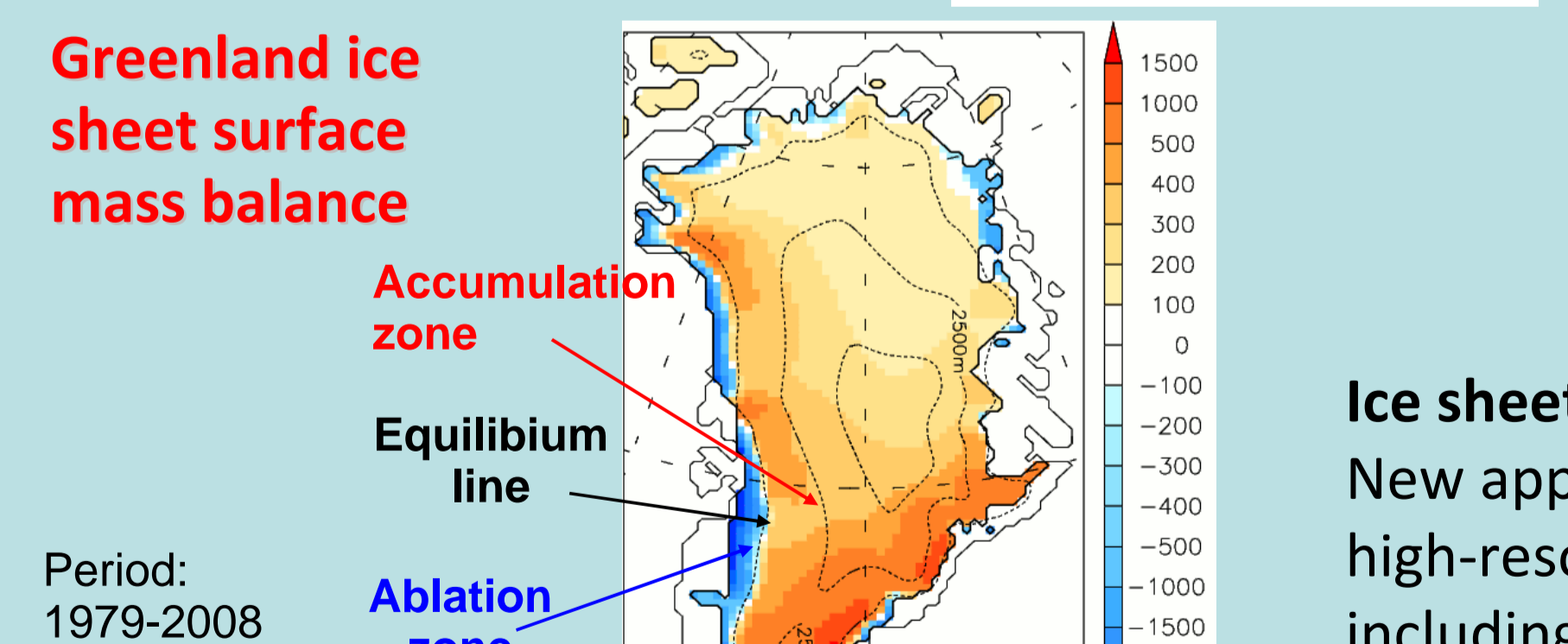
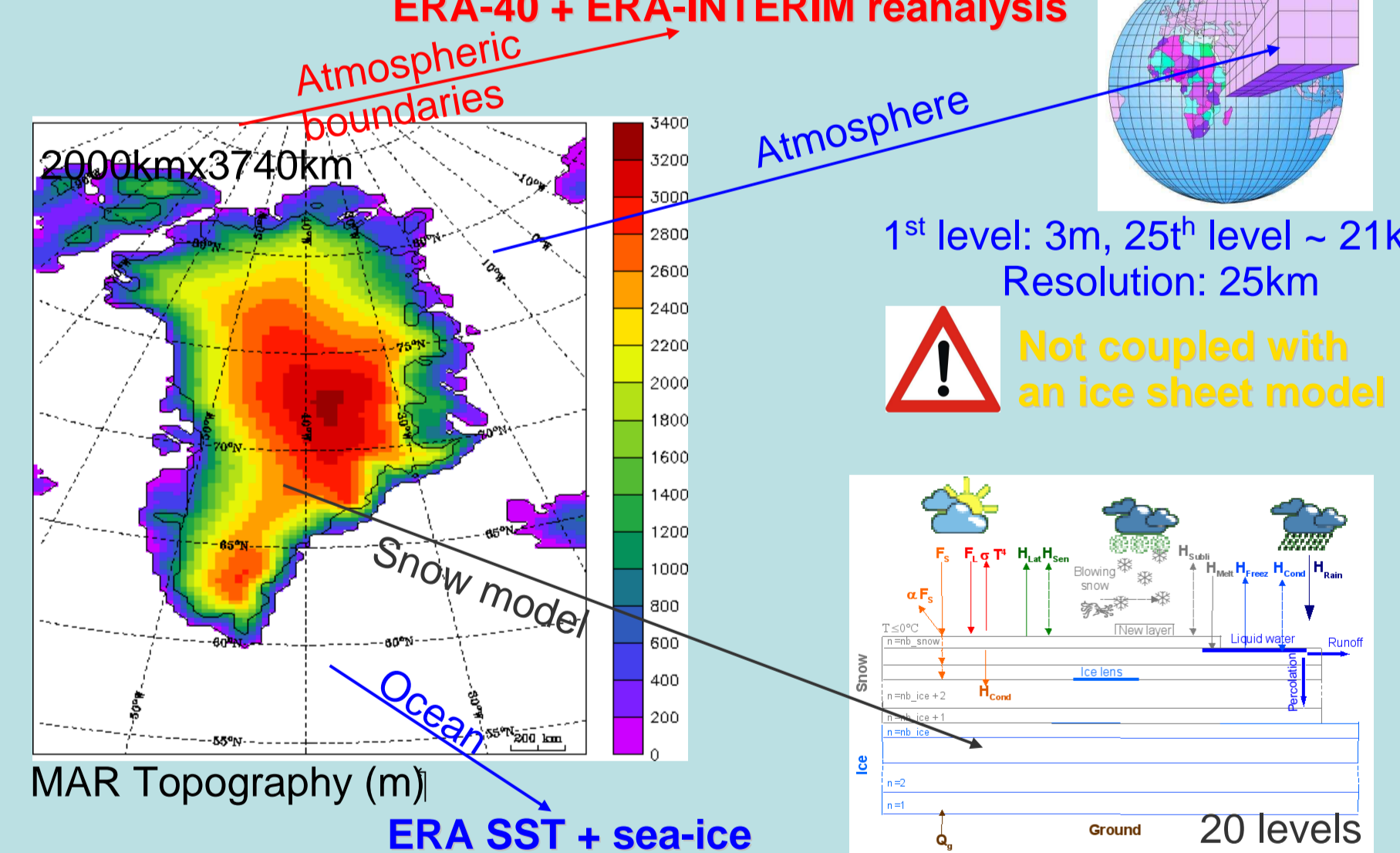


Example : SPIRIT new instrumentation Multipass optical cell, < 50 kg, < 100 W, 0.38 m³

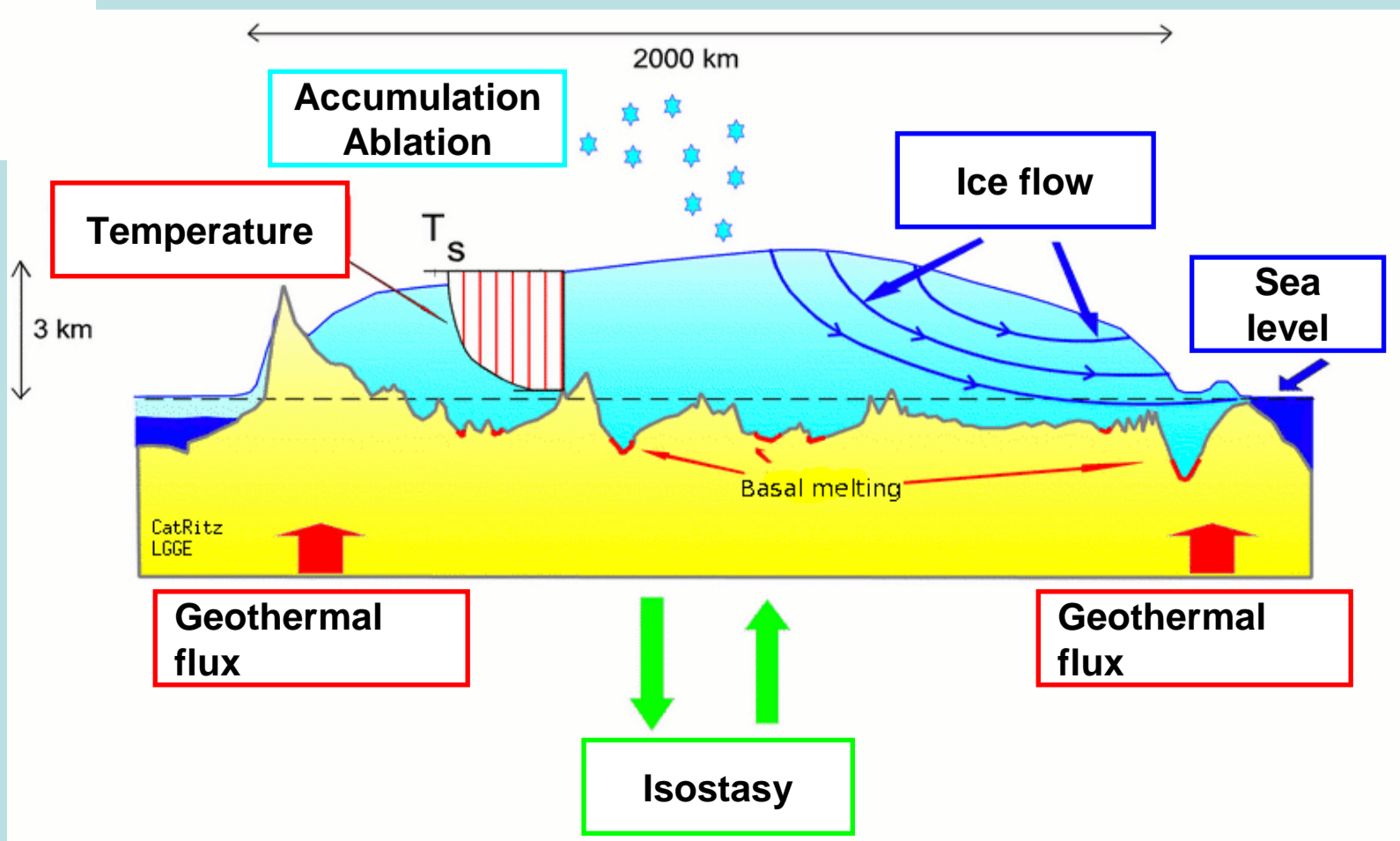
Brevets France (5058395) et International (WO 2007/017570 A1) C. Robert (Applied Optics, 2007) Pi of the instrument : V. Catoire LPCZE

Modeling

Ice sheet modeling with the regional climate model MAR



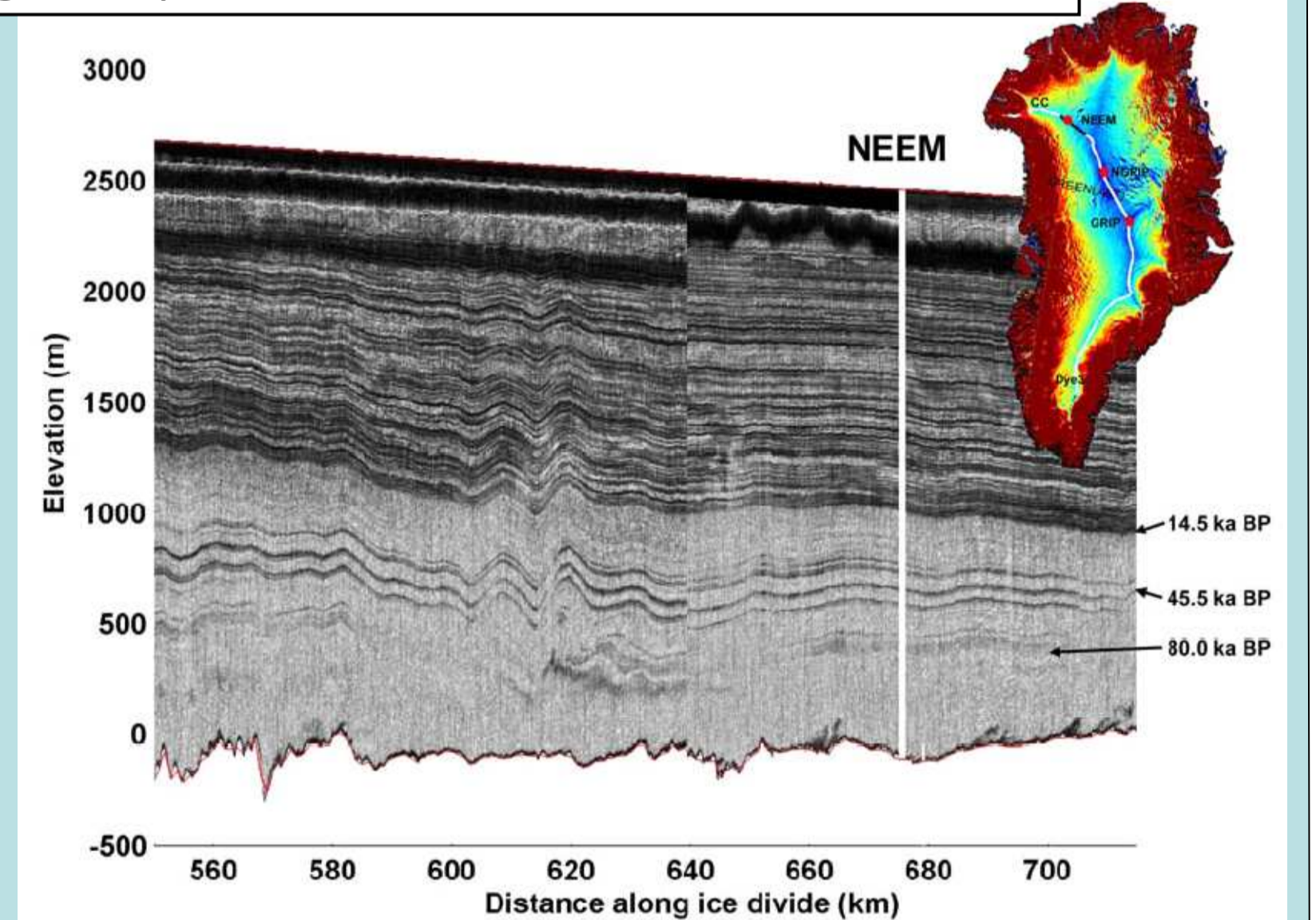
Ice sheet modeling New approach with a high-resolution model including adjusted grid sizes



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⁻¹
- most fresh snow in summer

