

Extremely stable boundary layer and fast-warming events on the Antarctic plateau, austral winter 2009

**Christophe Genthon, Delphine Six, Vincent Favier, LGGE France
Andrea Pellegrini, Laura Genoni, ENEA, Italy
Cyprien Pouzenc, SIRENE, France**



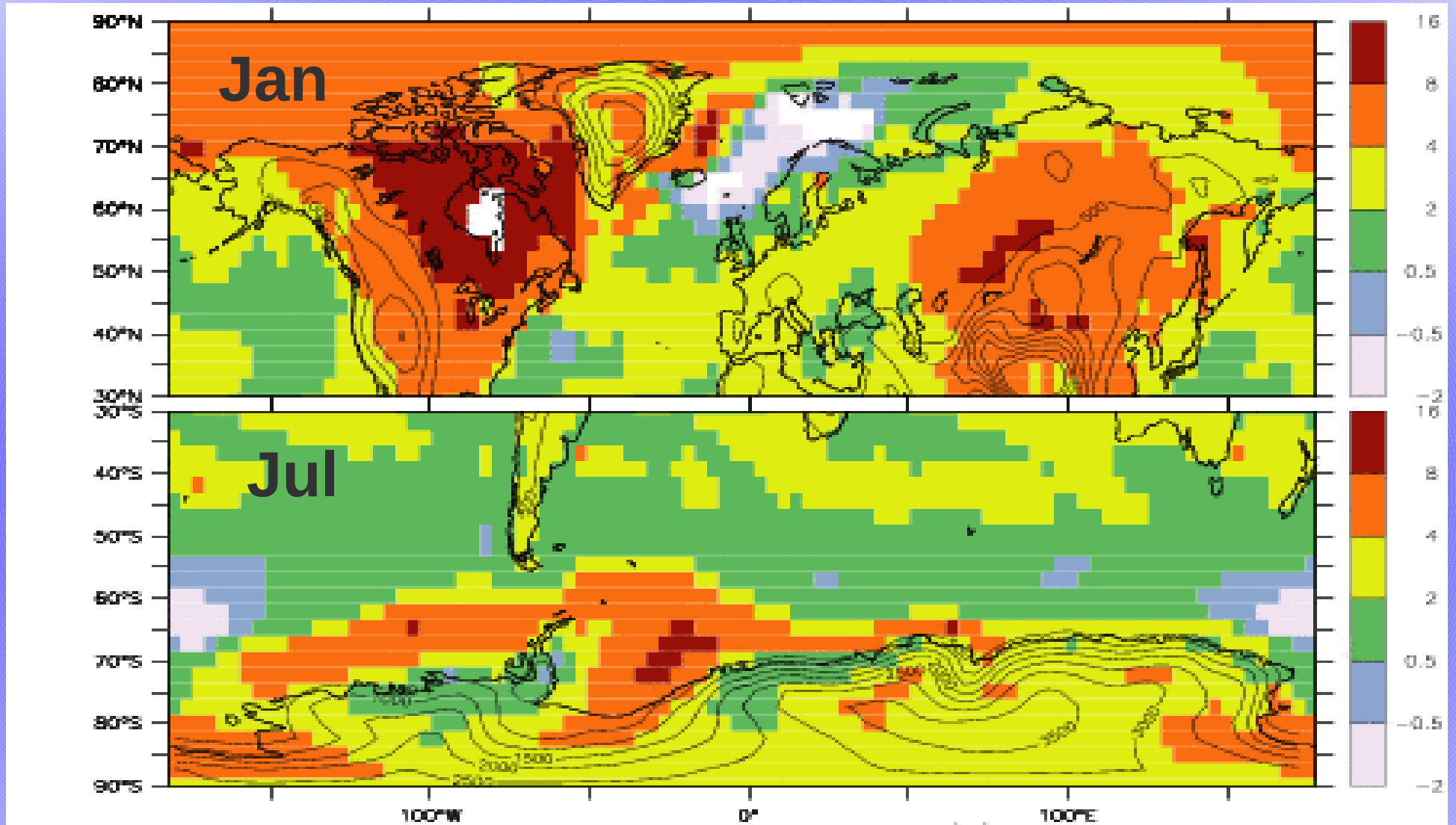
Climate Change 2007: Working Group I: The Physical Science Basis

Chapter 11: Regional Climate Projections

11.8 Polar Regions

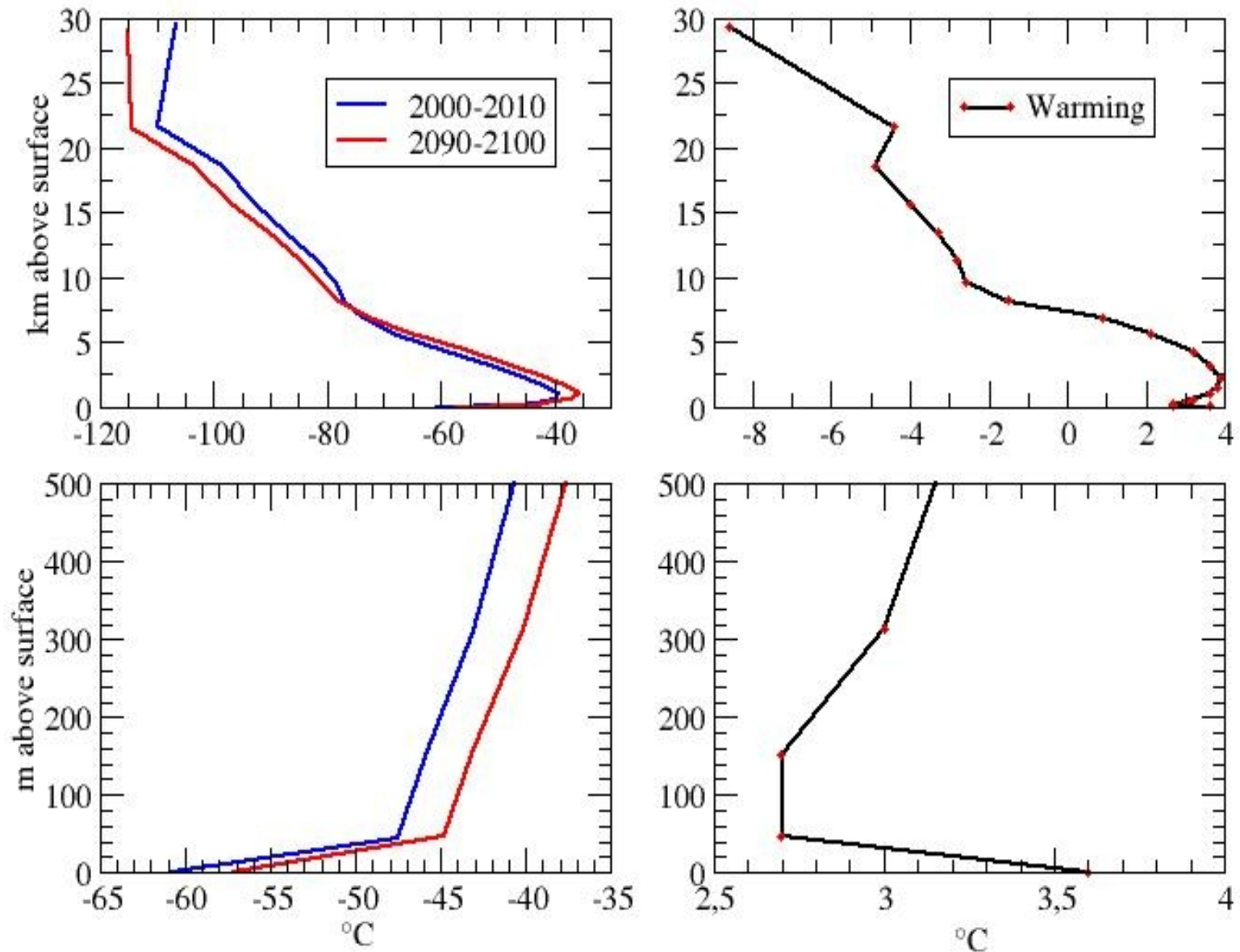


« ... Processes that are not particularly well represented in the models are clouds, *planetary boundary layer processes* and sea ice... »

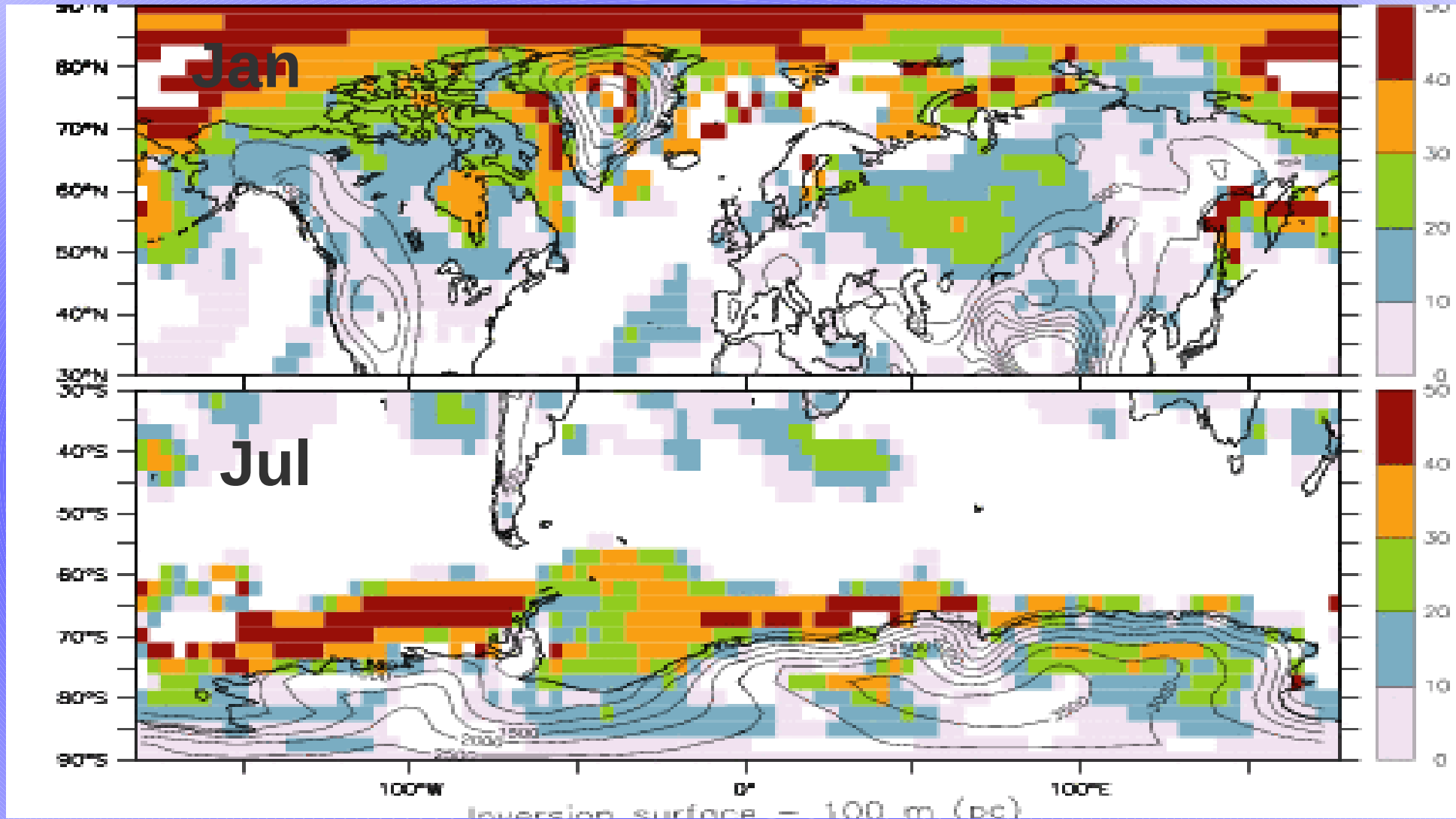


Predicted surface warming, 2090/2100 – 2000/2010, IPSLCM4 IPCC
(°C)

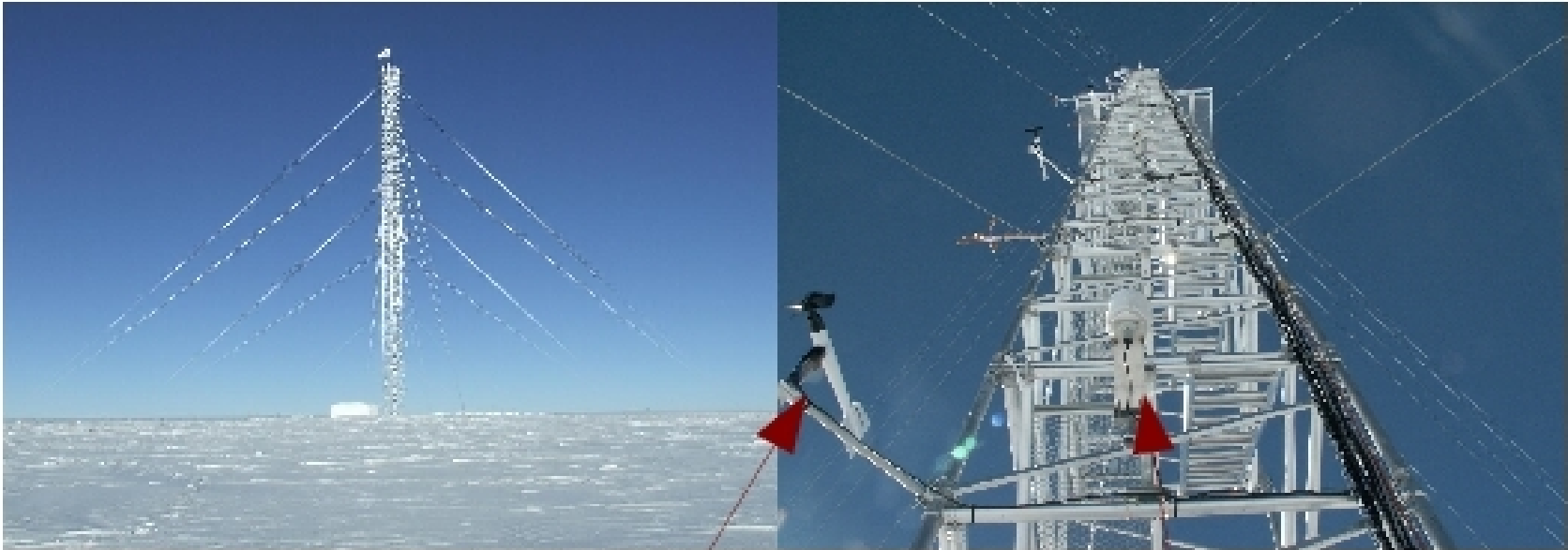
Dome C, Antarctica. IPSL-CM4 Climate Model.



July



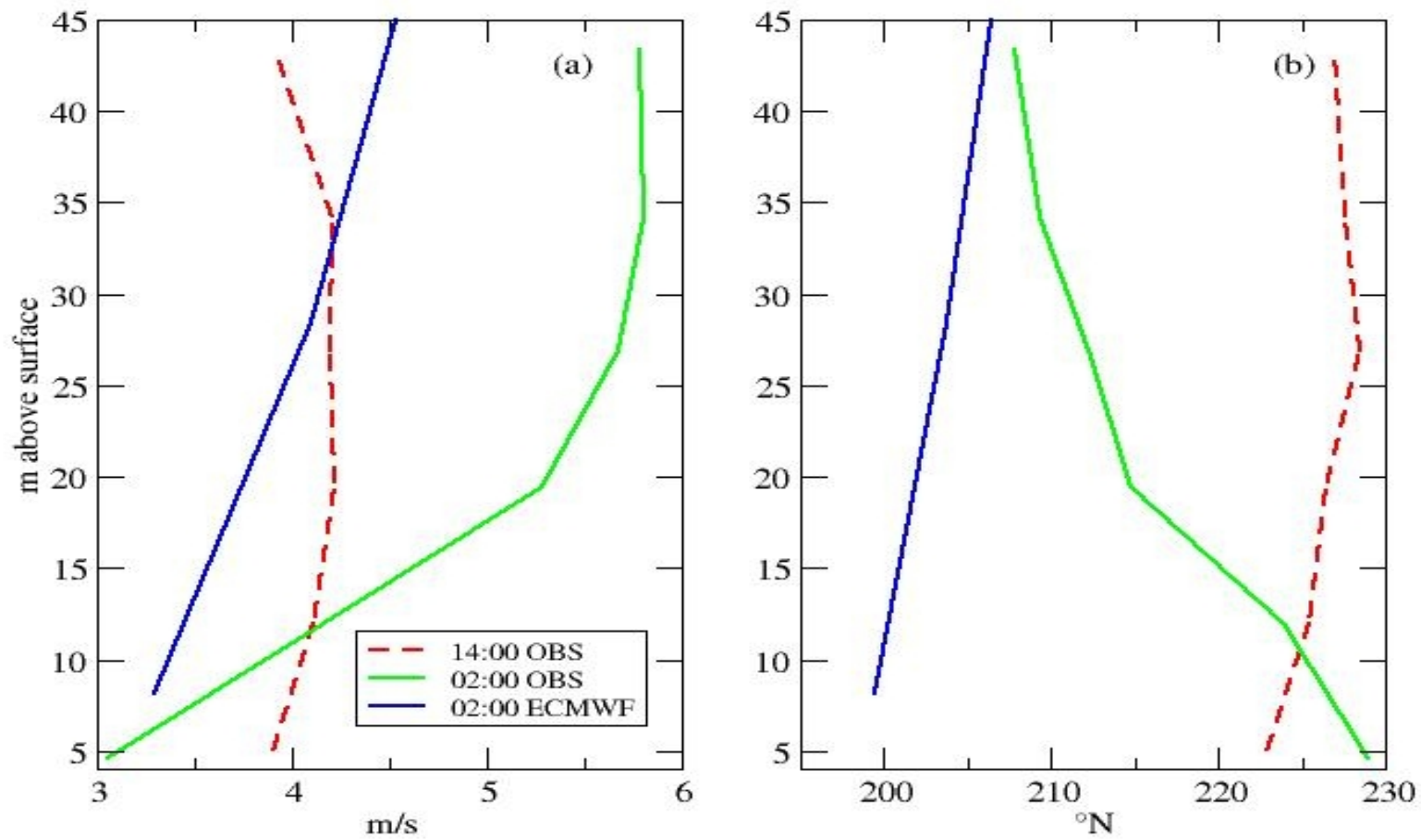
Fraction of surface warming associated with inversion strength weakening between 0 et 100 m



Aerovane

Radiation shielded
Thermo-hygrometer

A continuous lower boundary layer profiling system, 4-44 m, at
Dôme C



Mean wind profile, janv 2008, observed and ECMWF-analyzed

Early winter 2008

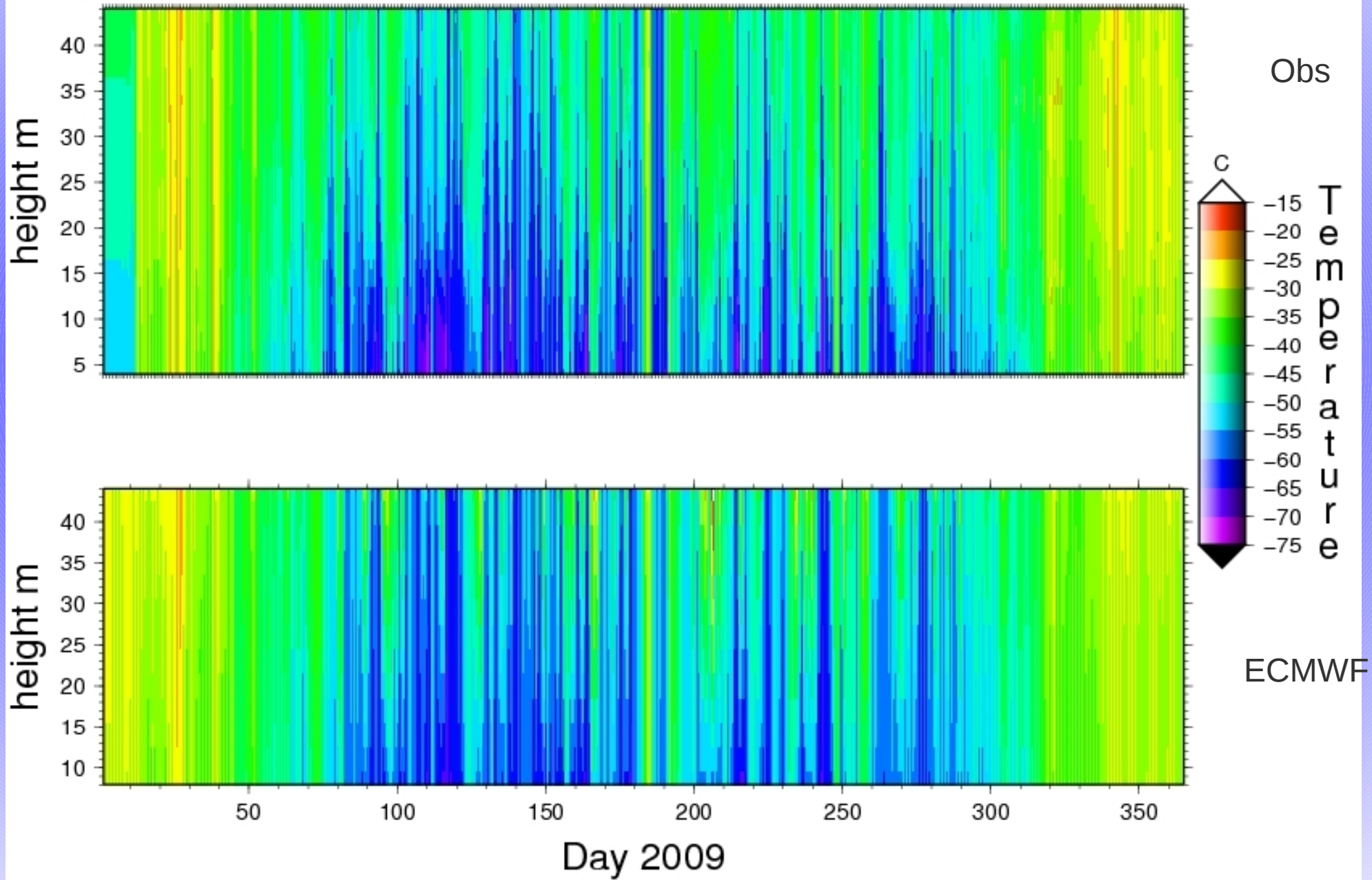


Spring 2009

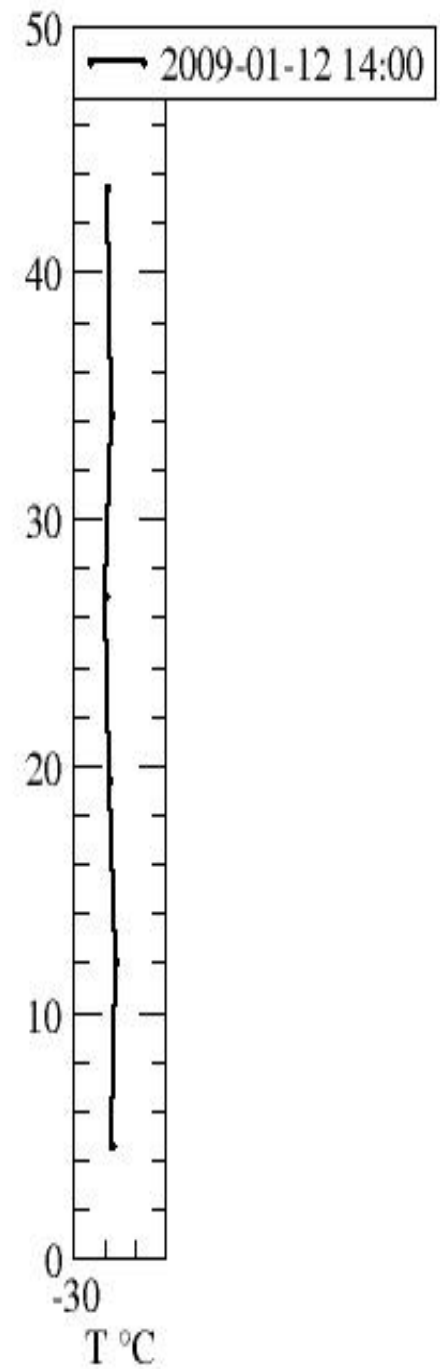
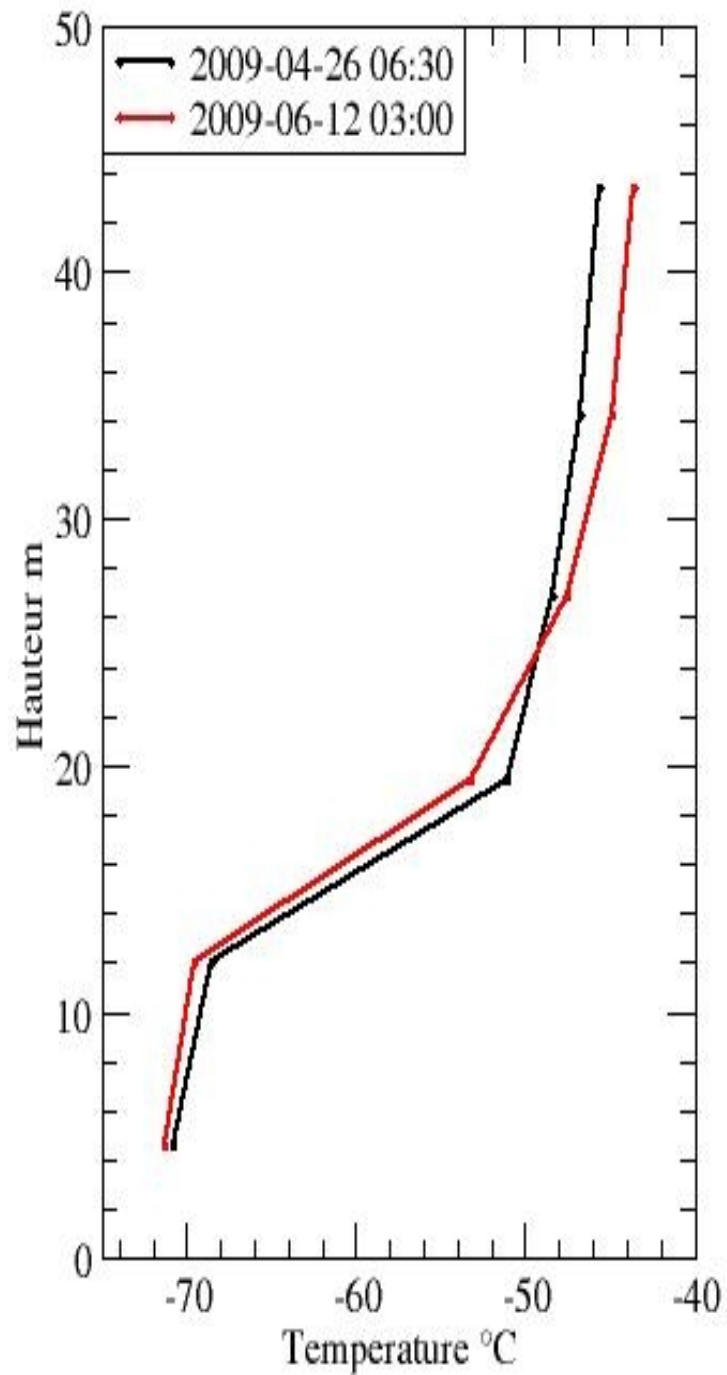


Tough life for instruments (cold, frost)

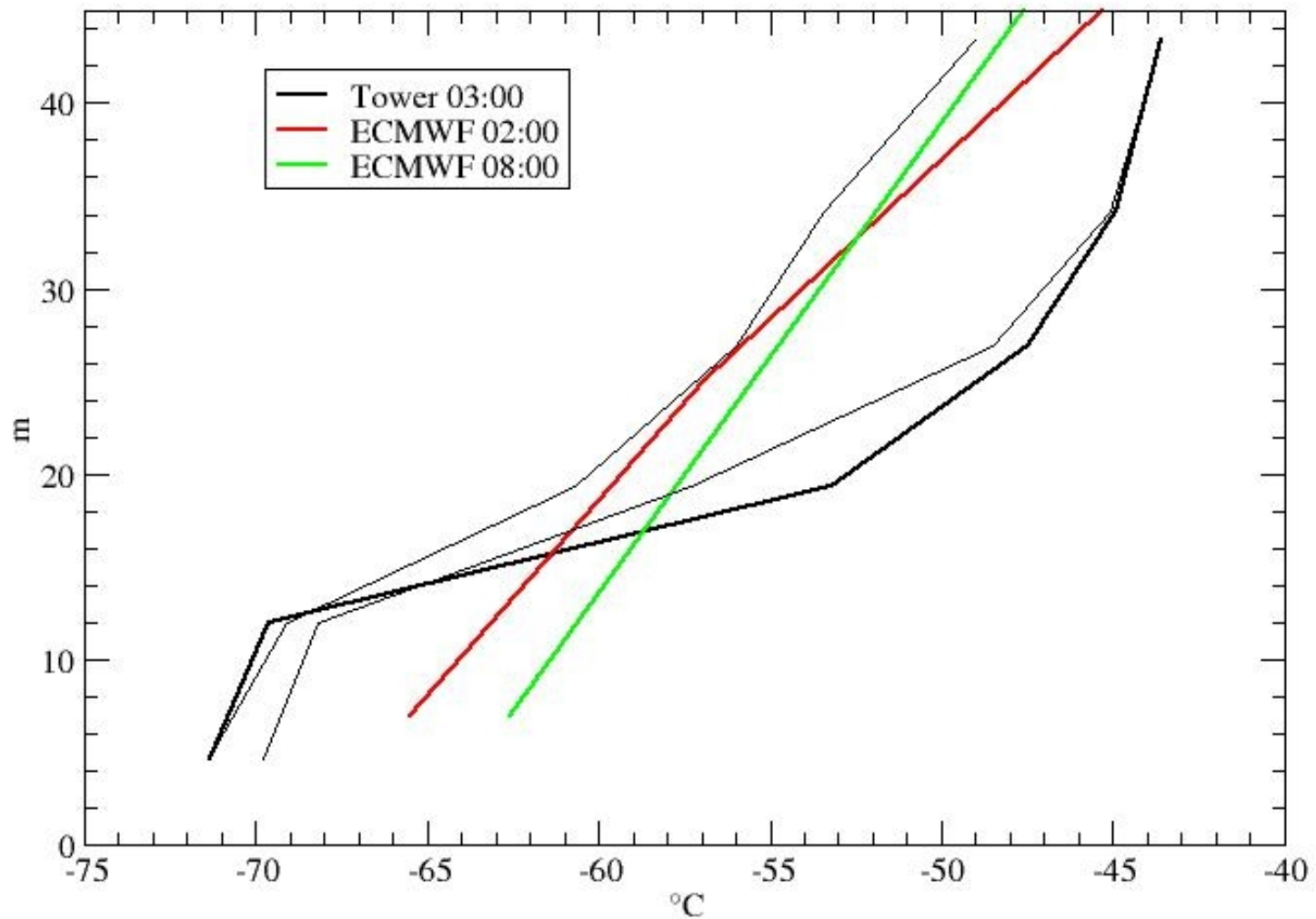
A full austral winter in 2009



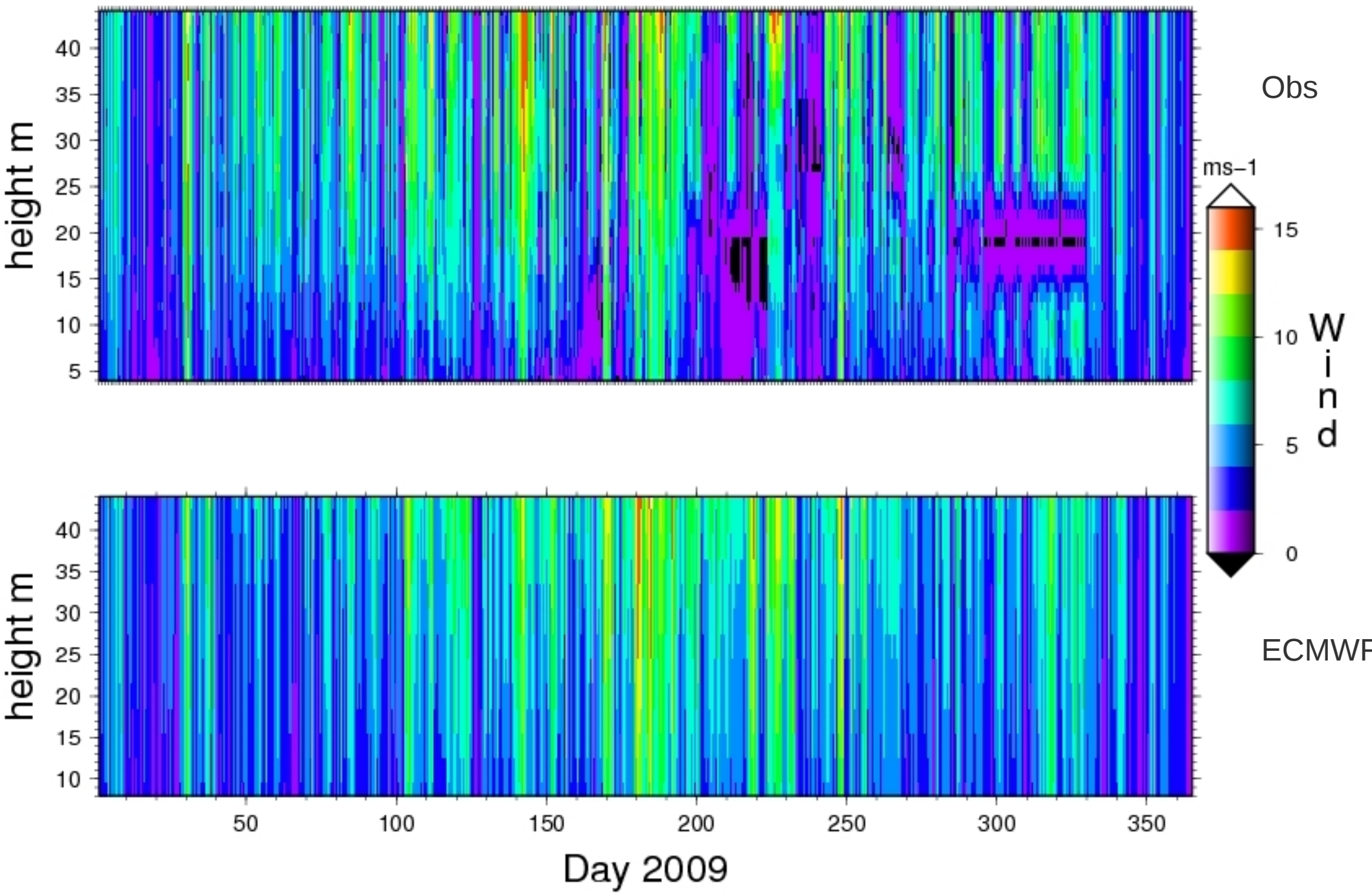
Selected vertical profiles of temperature

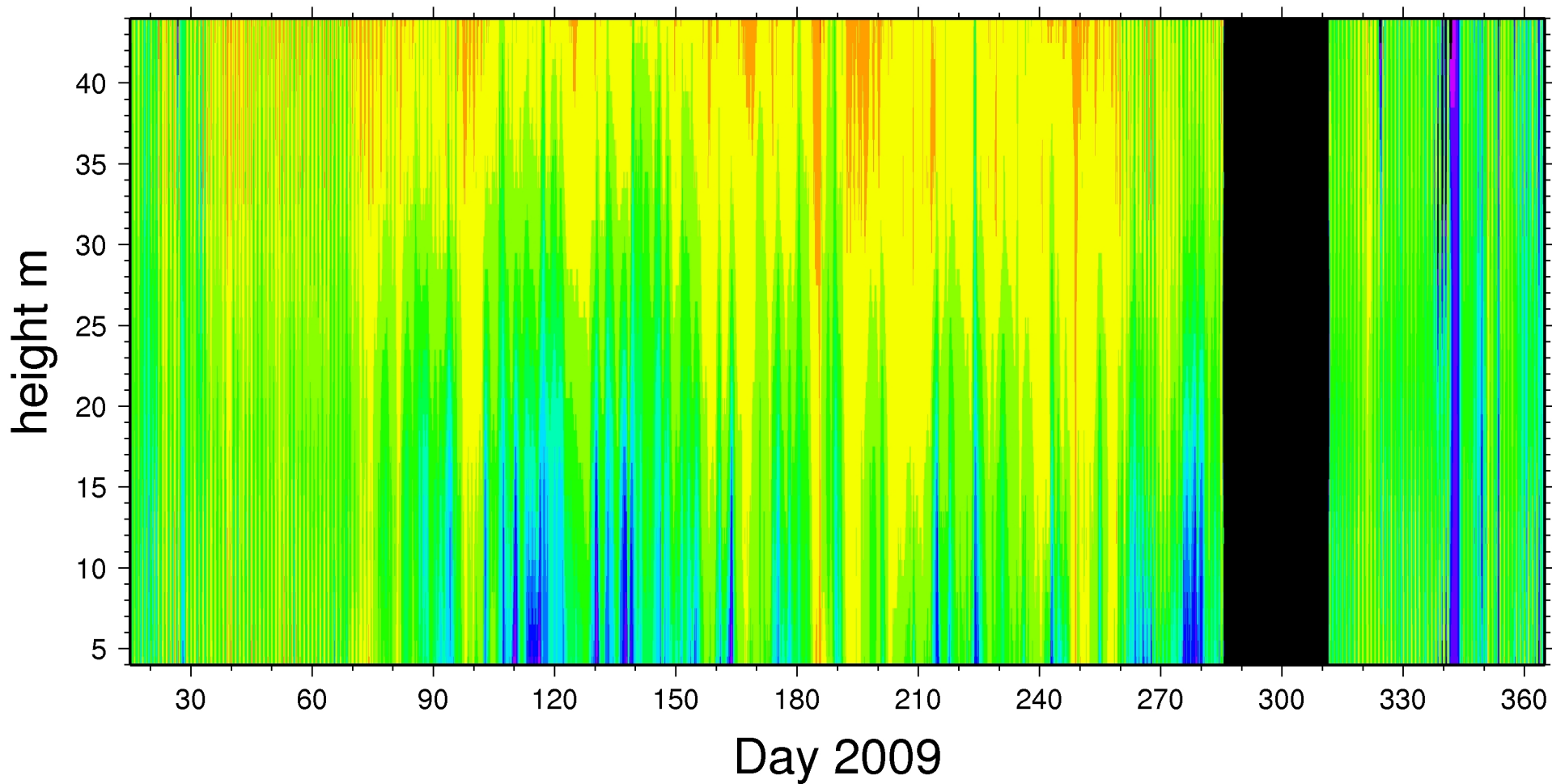
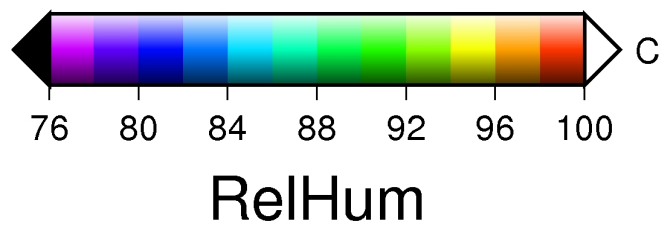


12 June 2009 early morning



Versus ECMWF

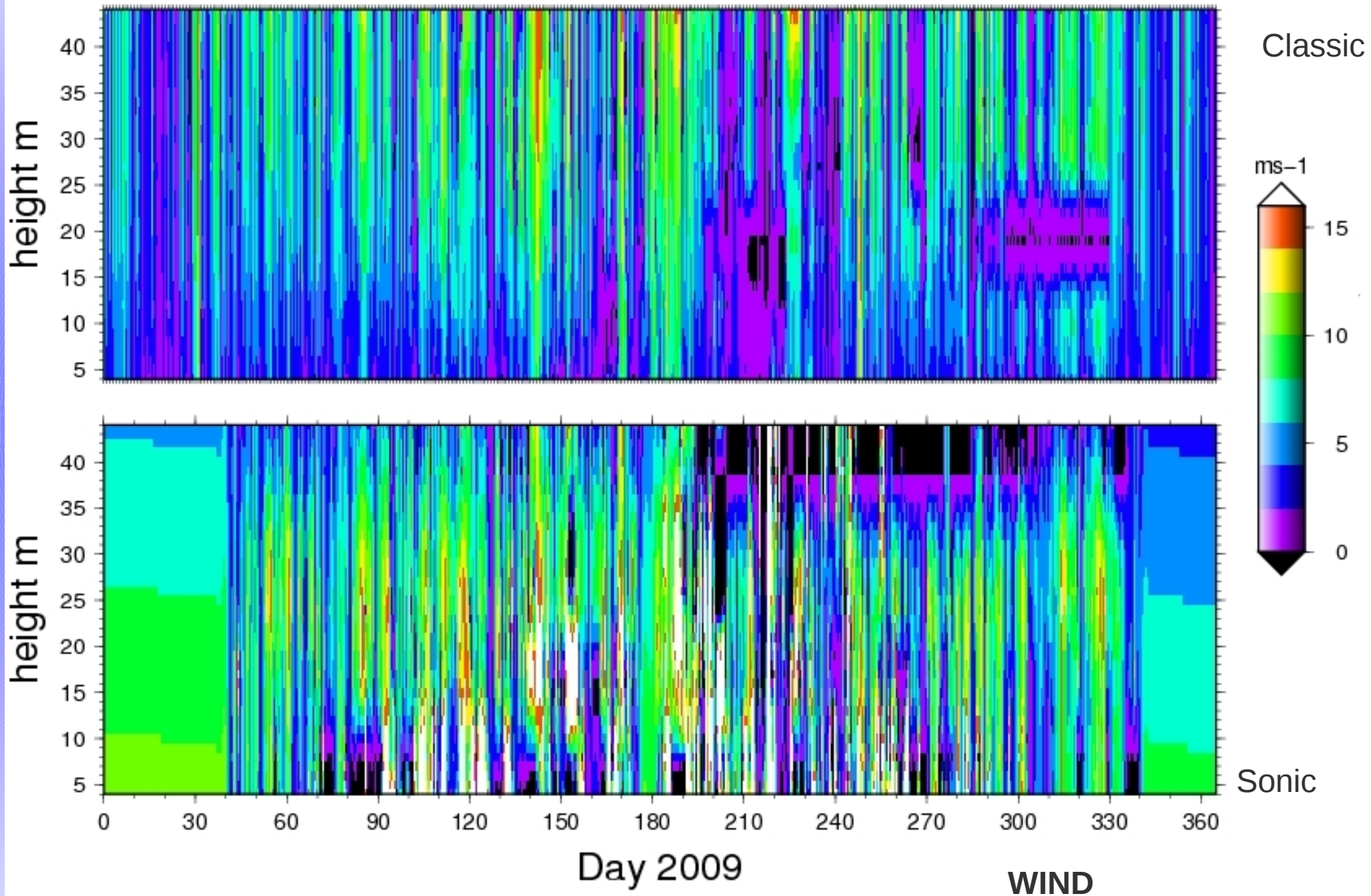


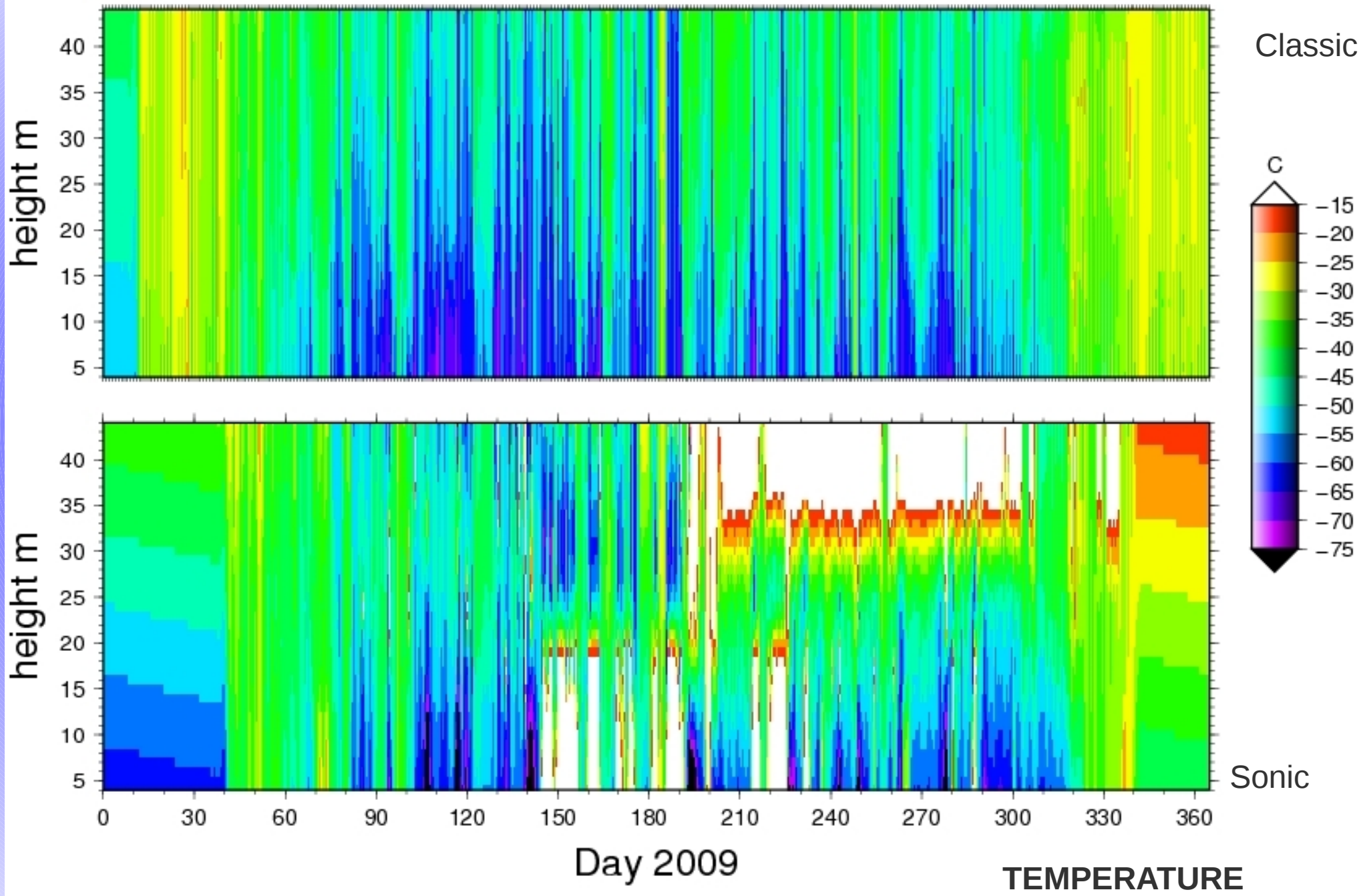




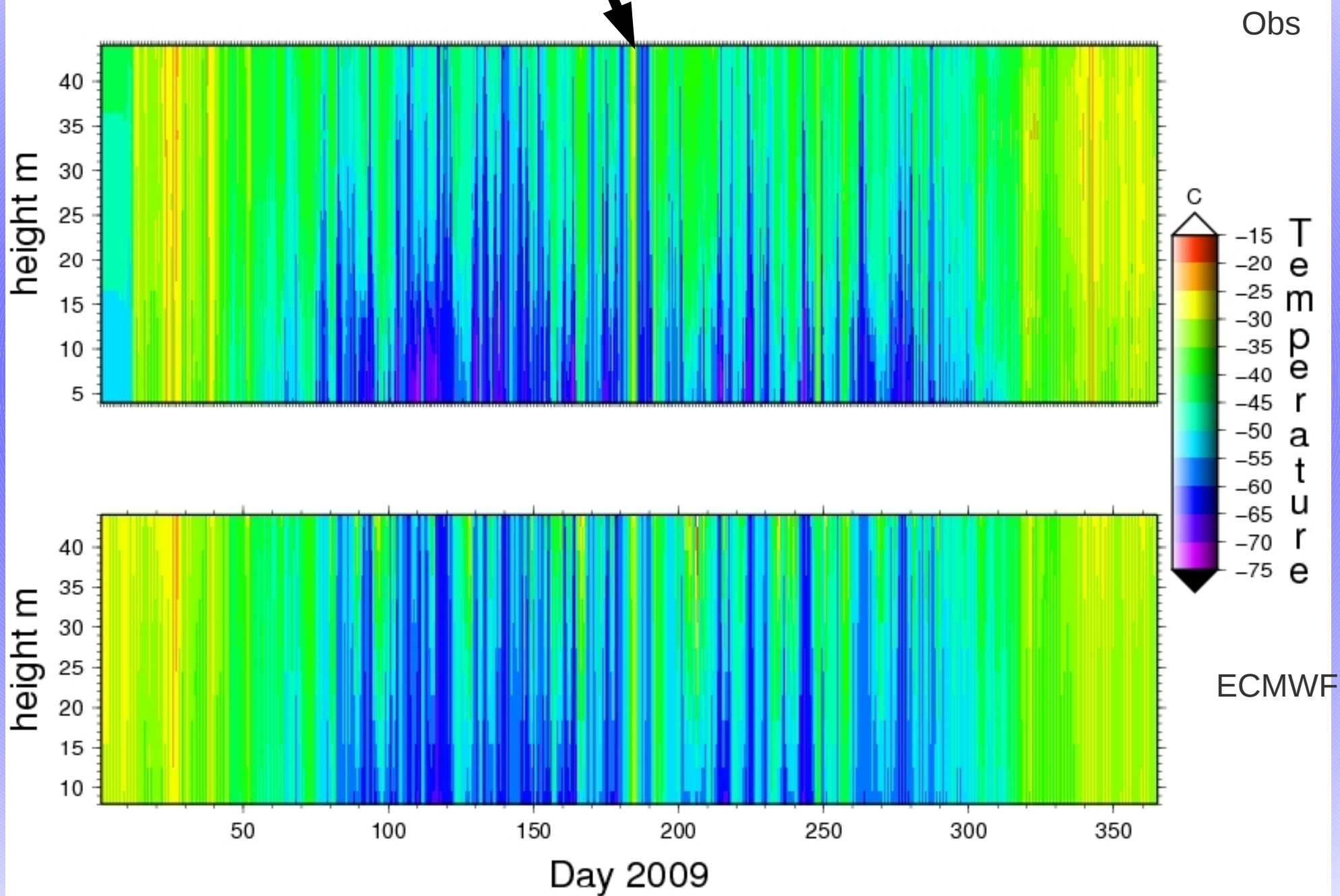
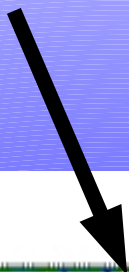
We also have sonic thermo-anemometers on the tower

- No moving parts => A different susceptibility to the environment
- High frequency (10 Hz) => Direct measurement of turbulence





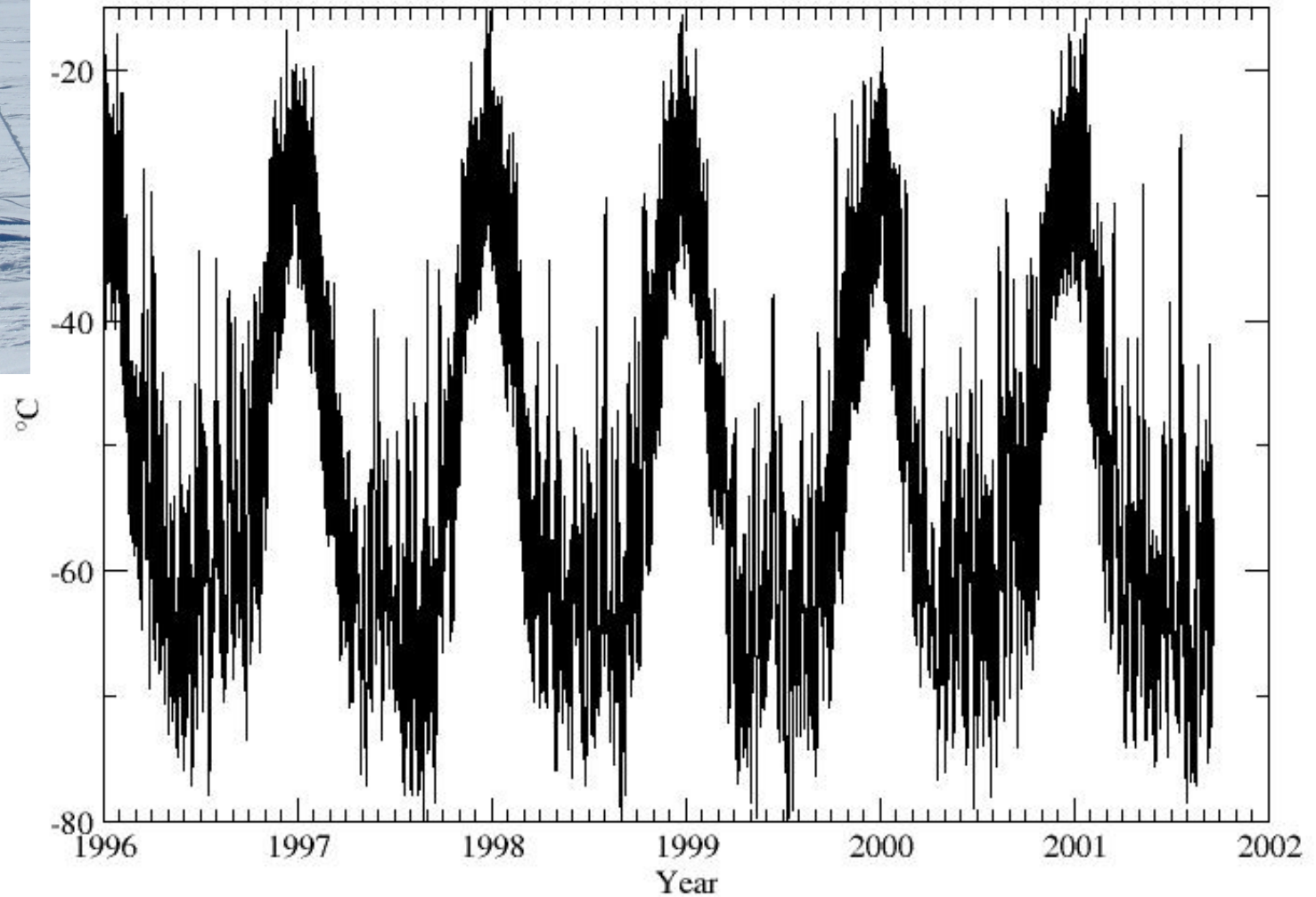
This is a « warm event »



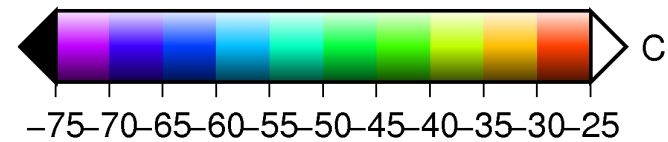
Warm events are nothing exceptional at Dome C



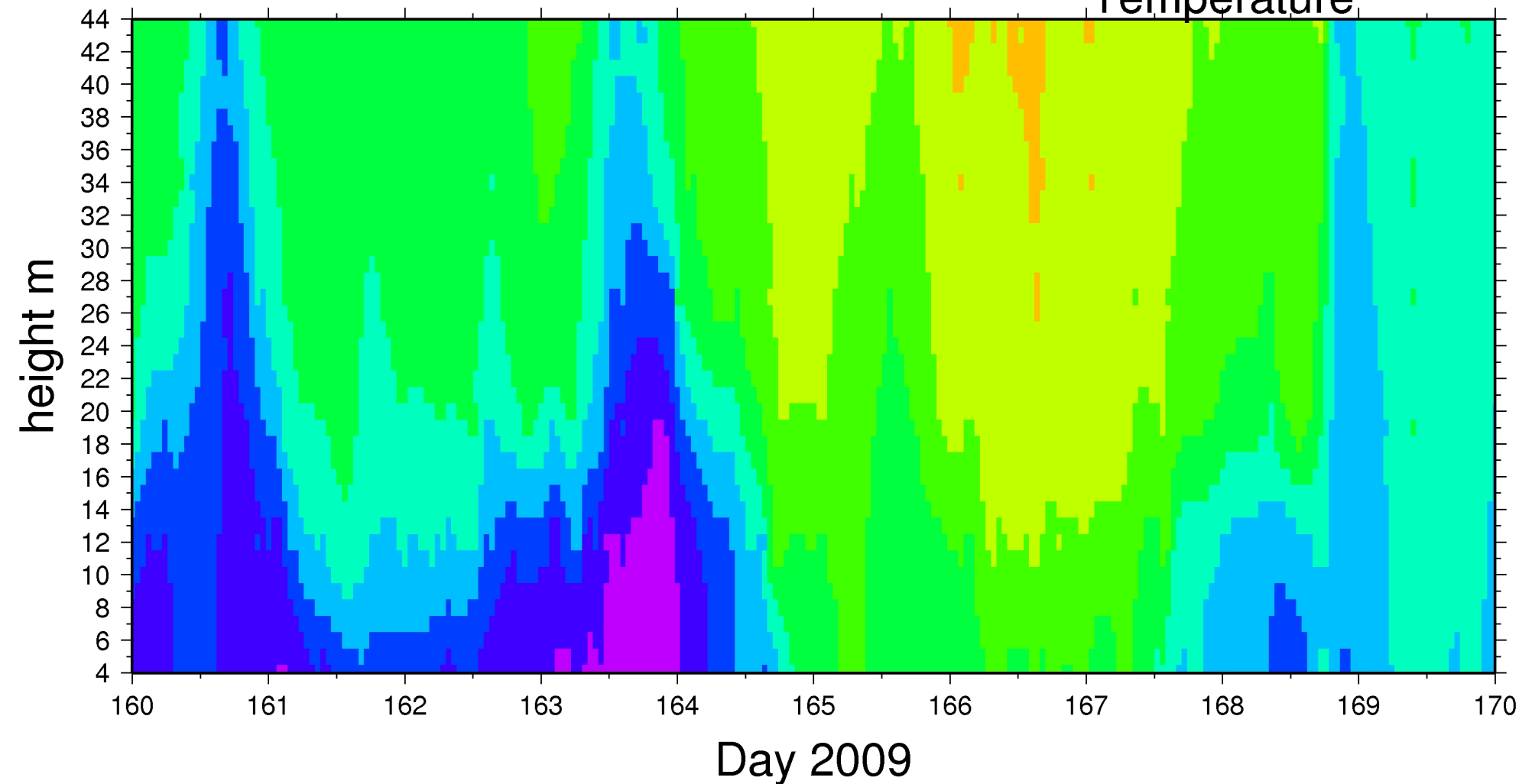
Dome C AMRC AWS



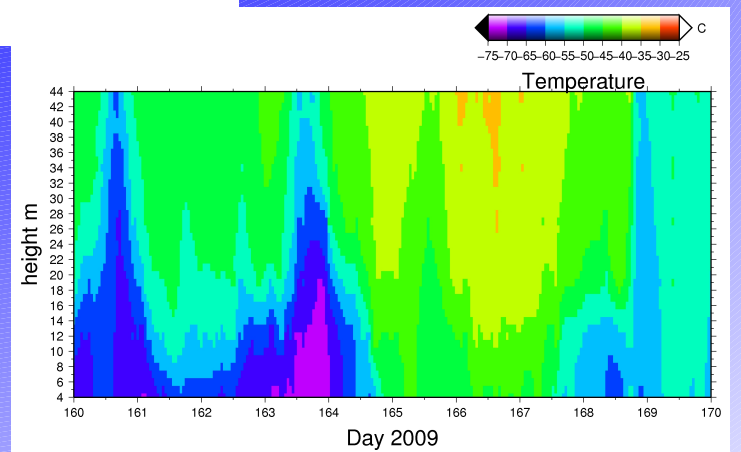
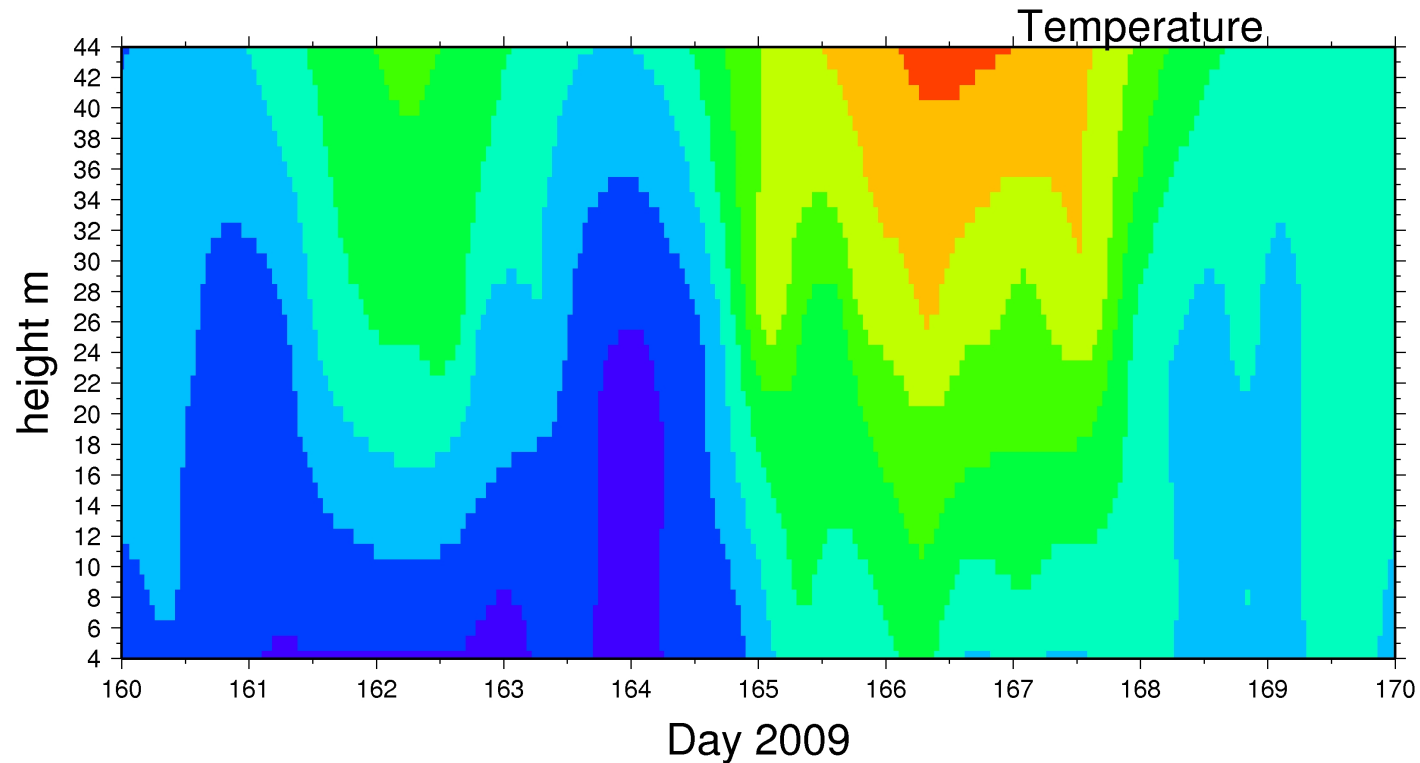
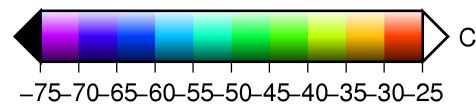
Warm event close-up, observations



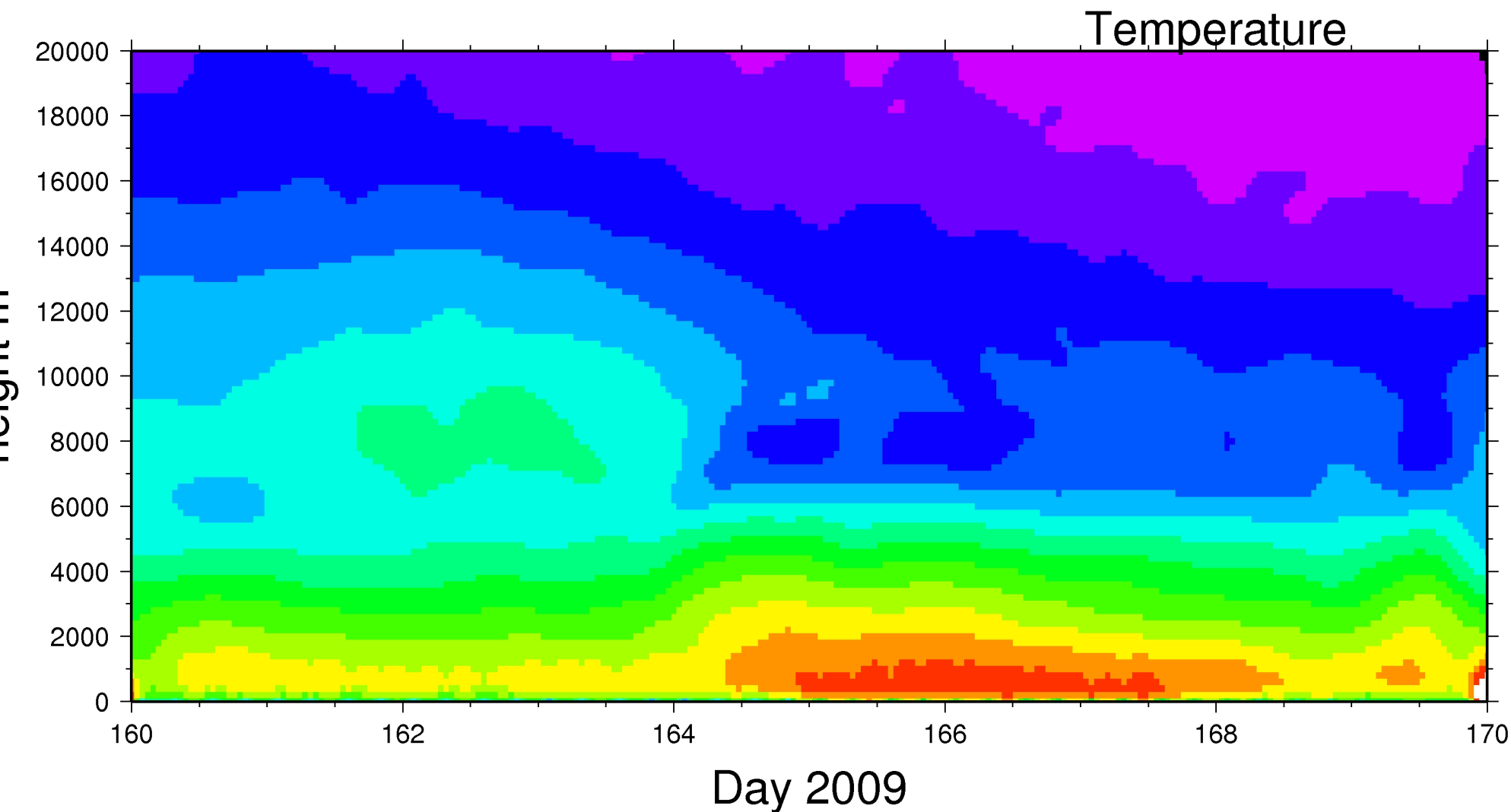
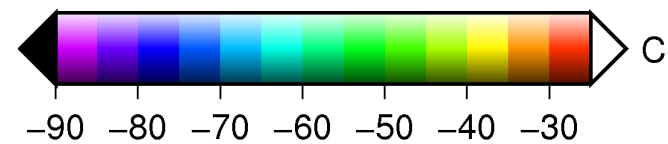
Temperature



Warm event close-up, ECMWF



Warm event wide angle, ECMWF



Next, outlook:

- Maintain instruments for CONCORDIASI SOP 2010**
- Compare ARPEGE / AROME CONCORDIASI analyses**
- Process sonic data => Turbulence (e.g. TKE) and energy balance analyses**
- Expand from surface (radiometer temperature, see Delphine) to full BL (tethered kites/balloons, see Delphine; profiler, see Philippe) to troposphere (clouds, satellites)**