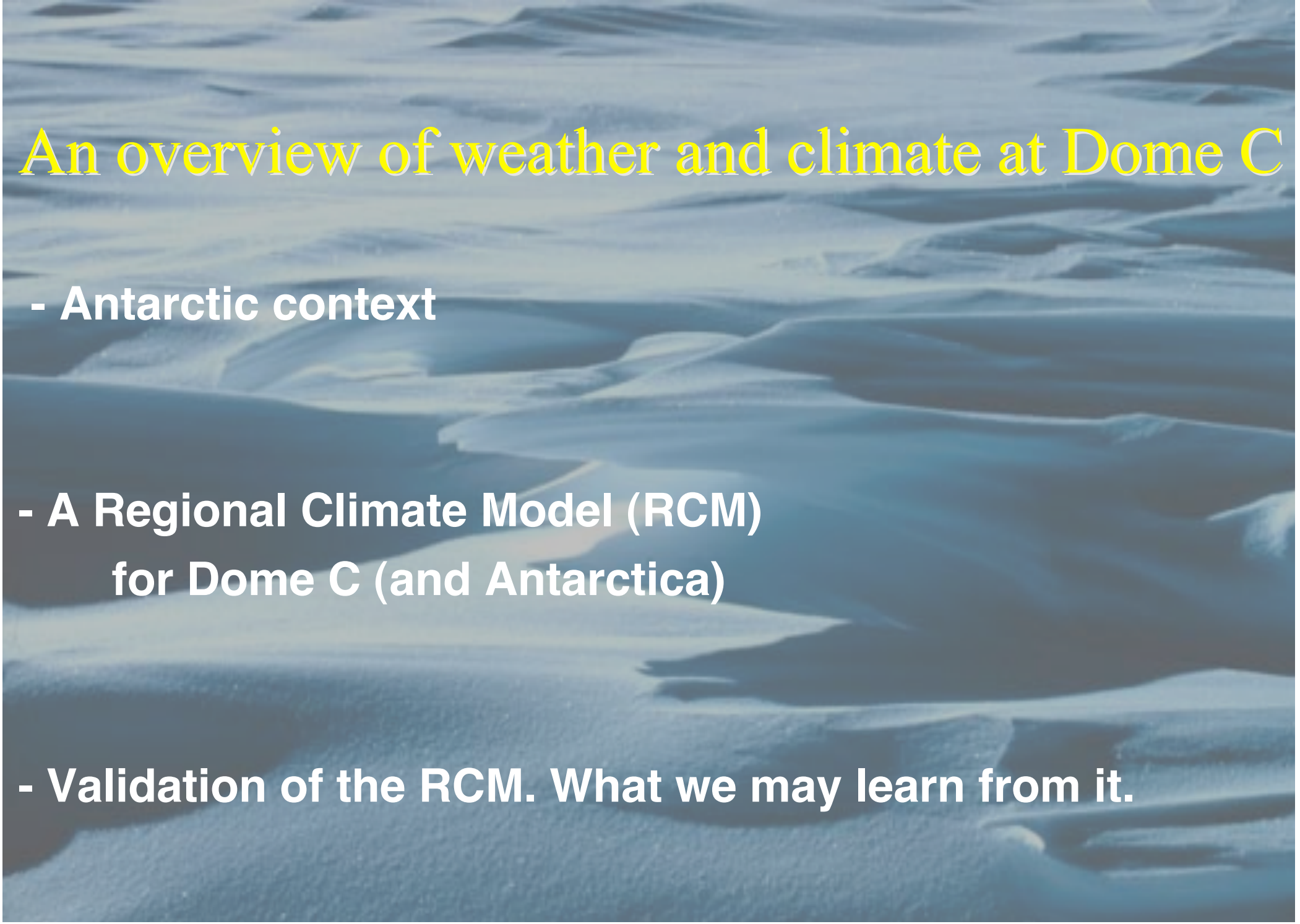

An overview of weather and climate at Dome C
- Antarctic context
- A Regional Climate Model (RCM)
for Dome C (and Antarctica)
- Validation of the RCM. What we may learn from it.

Particularities of the antarctic atmosphere

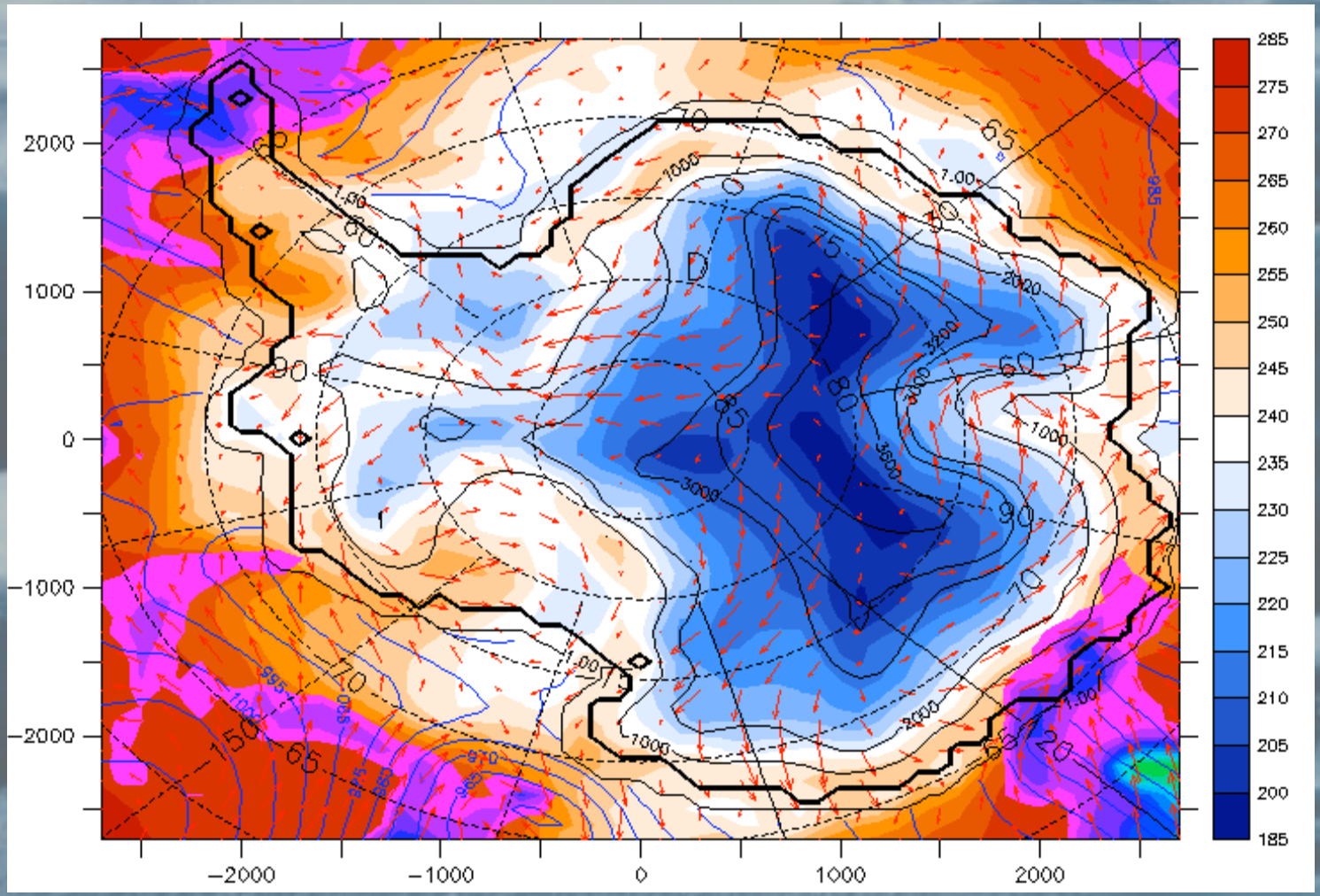
- Strong surface homogeneity over the ice sheet.
  Antarctic plateau may be viewed as an ice ocean:
  - sastrugi comparable to waves over the sea
  - fully differs from mountains sites

  BUT:
  - (weak) slopes are effective everywhere

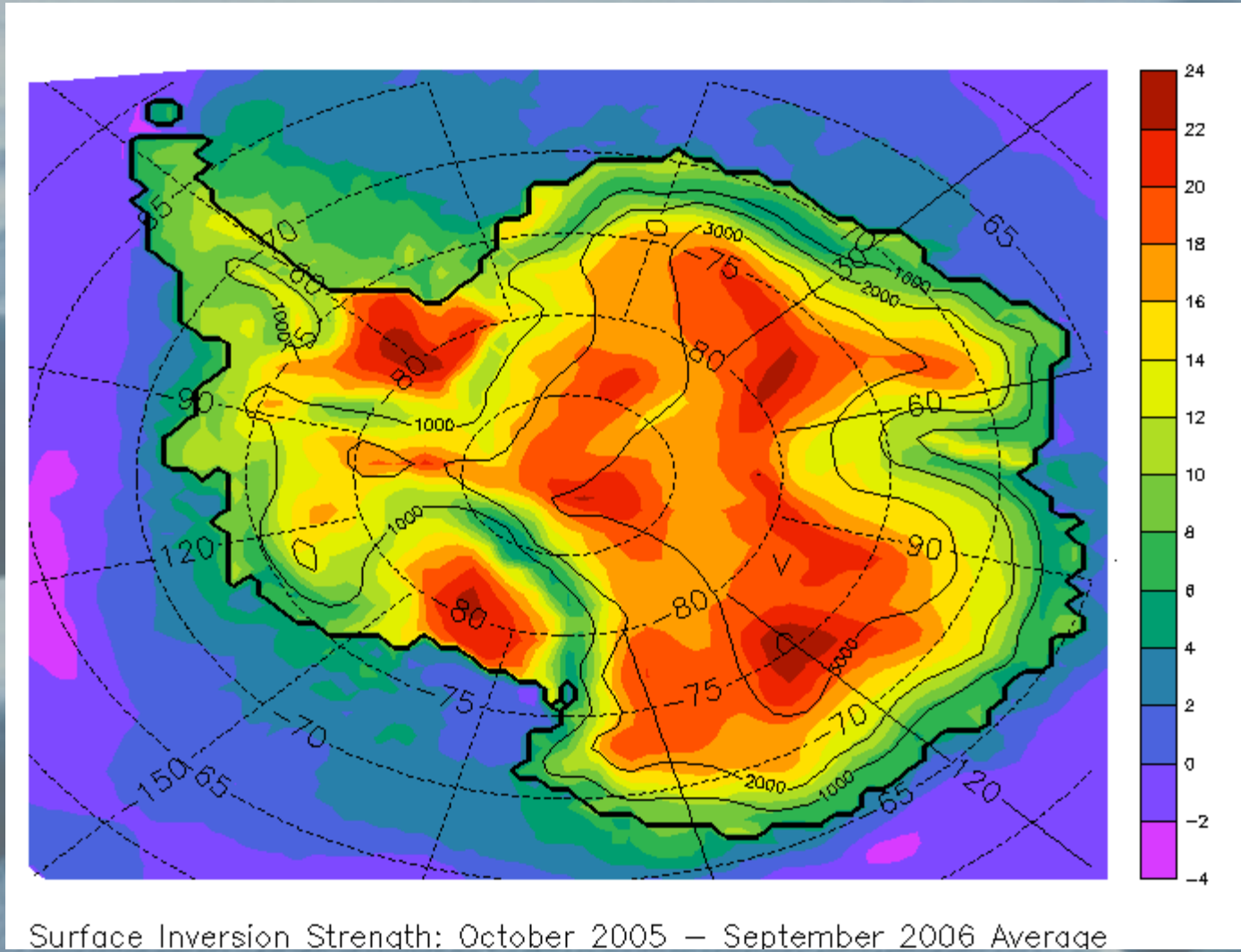
- Strong surface radiative cooling is responsible for a strong surface inversion
- Inversion + Slope → gravity flows
  thermal winds and katabatic winds

Antarctique atmosphere

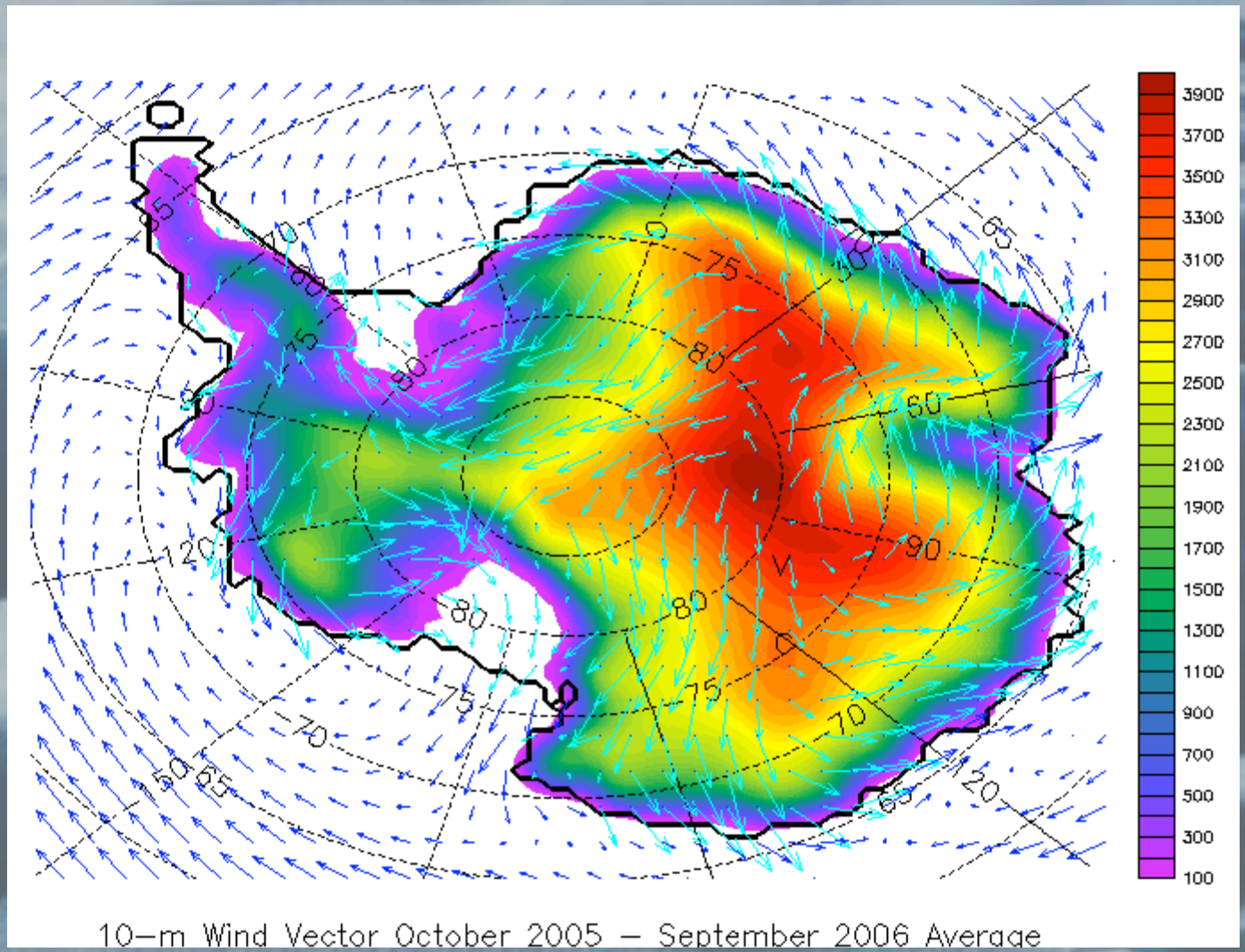
- Mid-latitude dépressions
- High constancy of surface winds



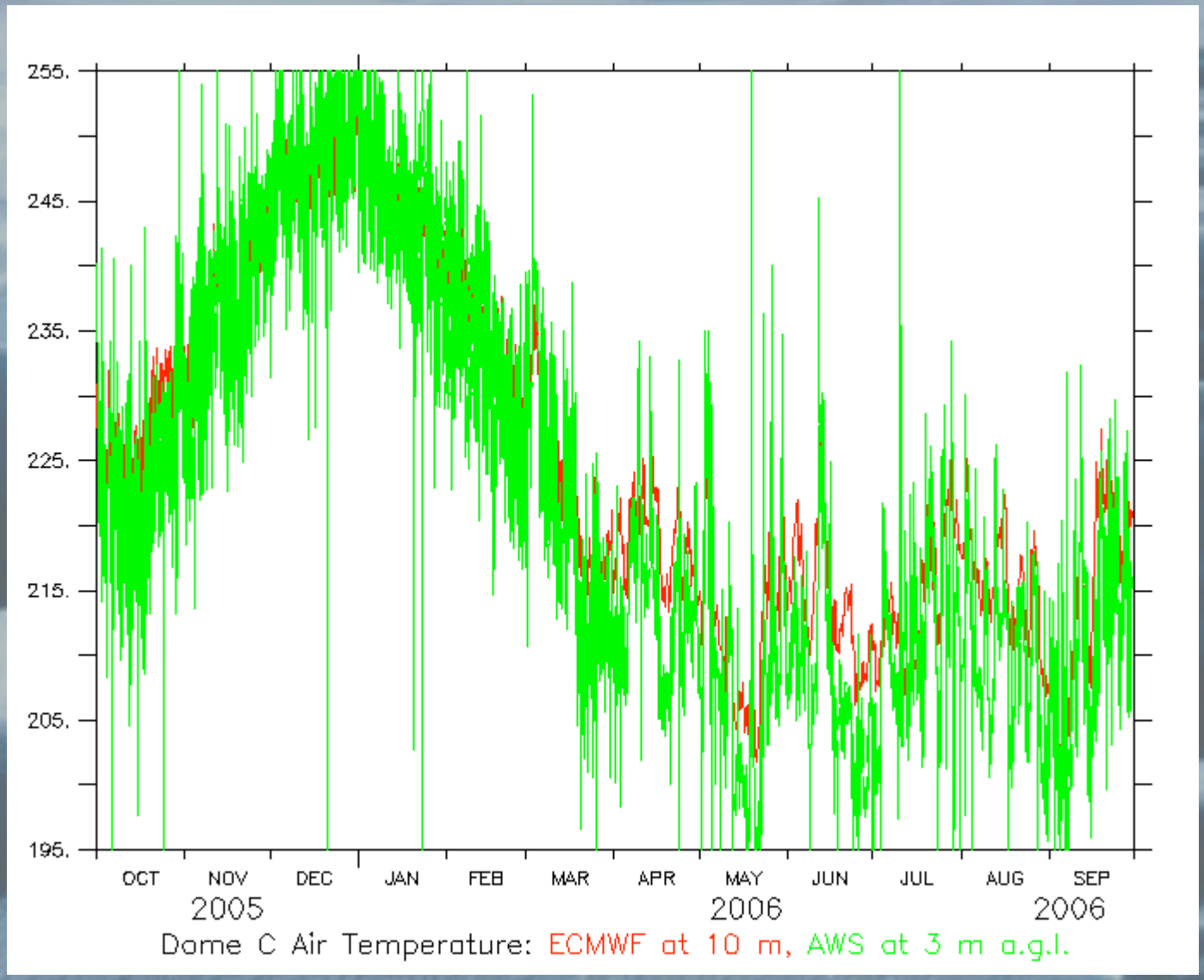
Annual Mean Surface Inversion Strength (2005-2006)



Annual Mean Wind Vector



Annual Cycle of Temperature at Dome C

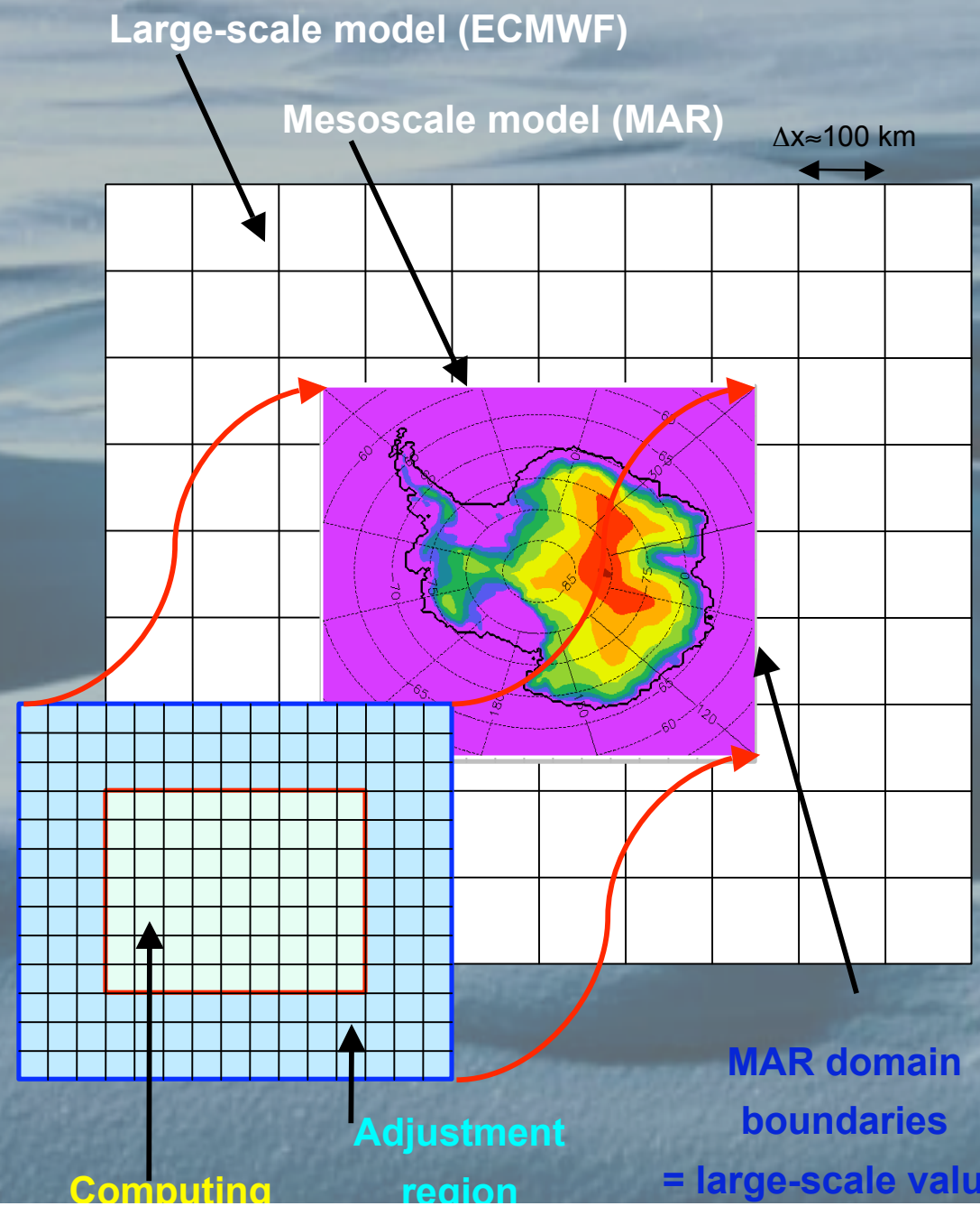


A Regional Climate Model for Dome C

- Conservation Equations for
  - Momentum (primitive form of Navier Stokes Equations)
  - Heat
  - Water vapour and 4 hydrometeors
    - cloud ice crystals
    - cloud drops
    - snow flakes,
    - rain drops
- Discretisation using finite differences

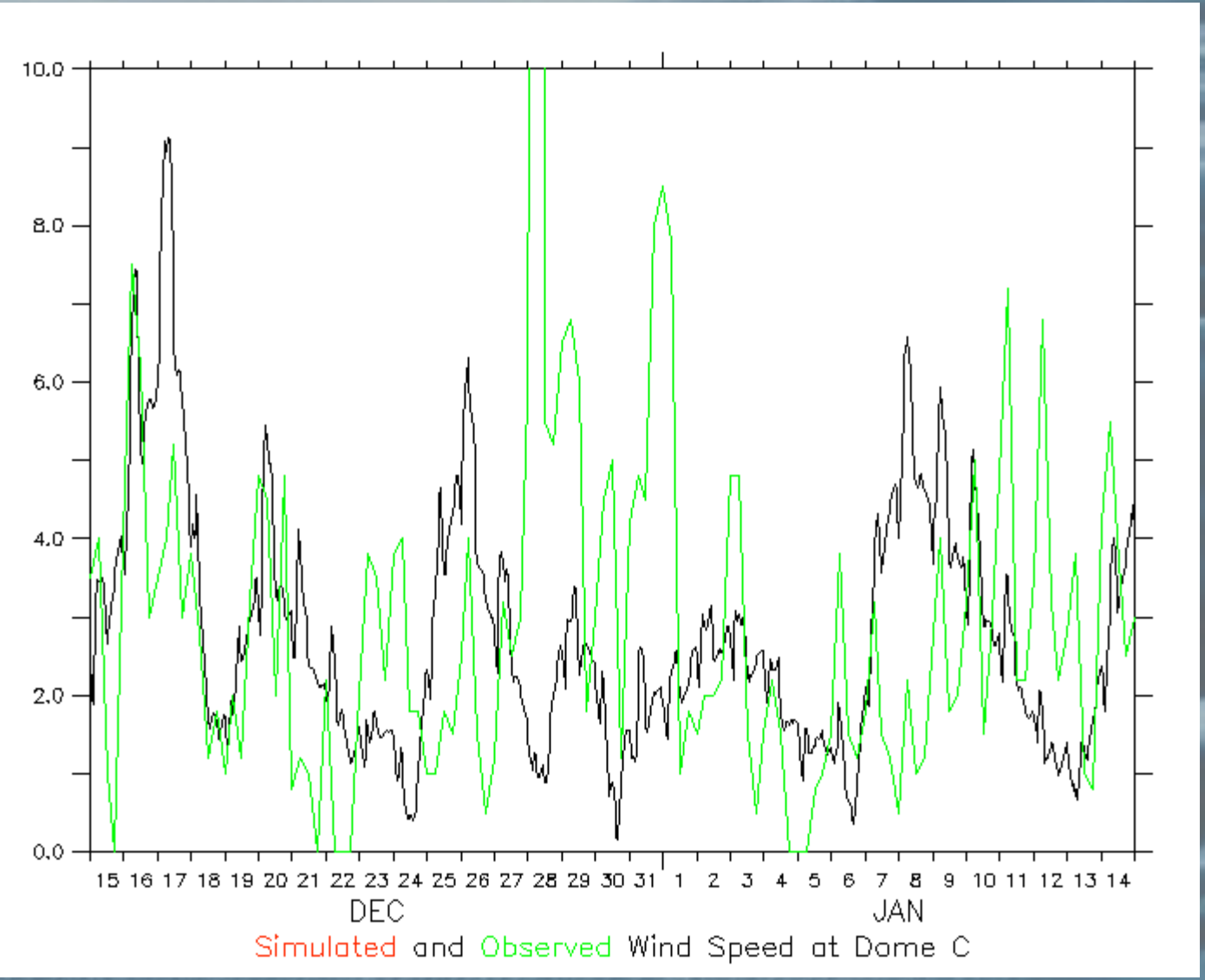
→ Parametrisation of subgrid processes
- turbulence,
- convection,
- cloud microphysical processes,

MODEL SET-UP: NESTING in ECMWF



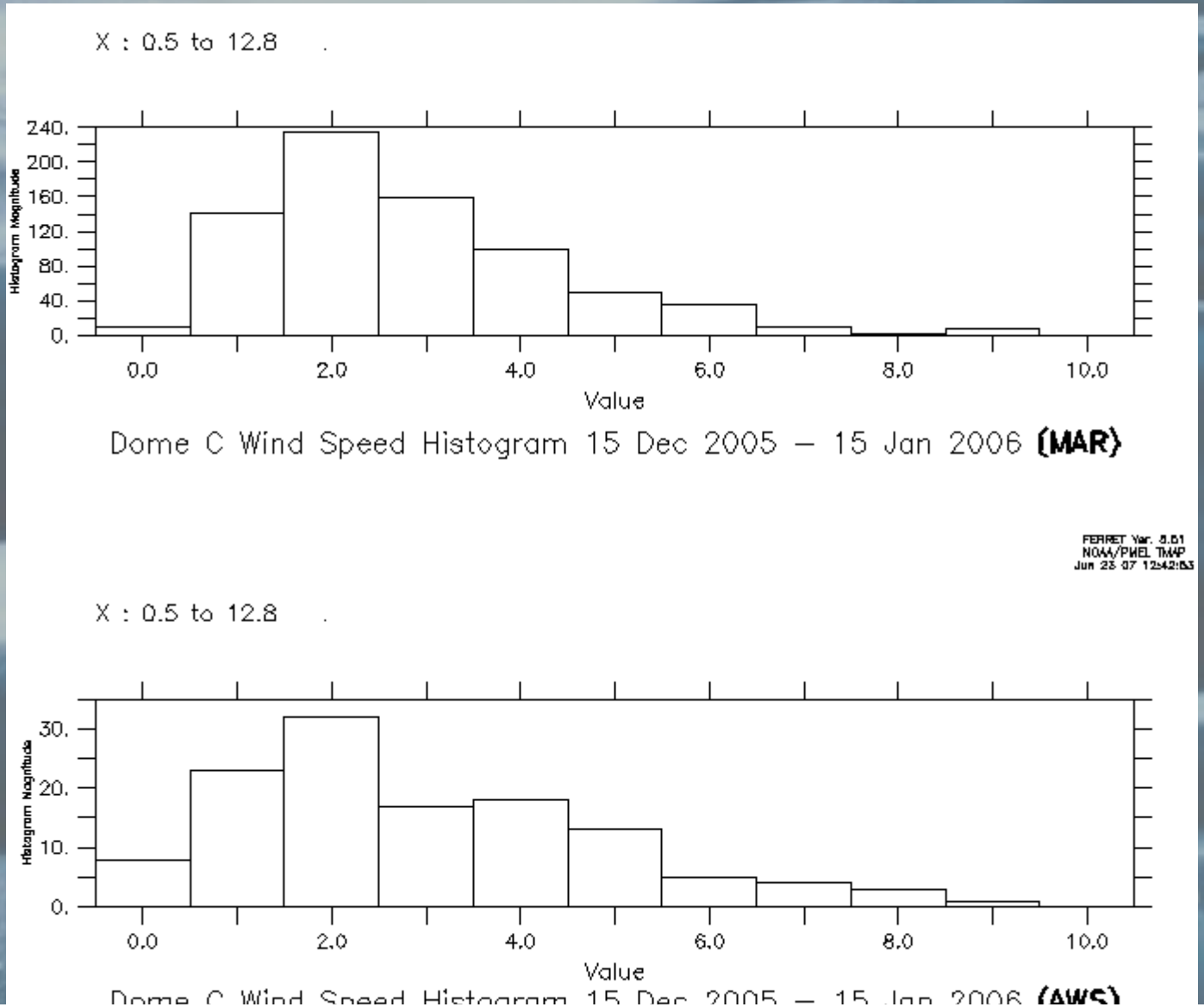
Summer at Dome C

Wind Speed:



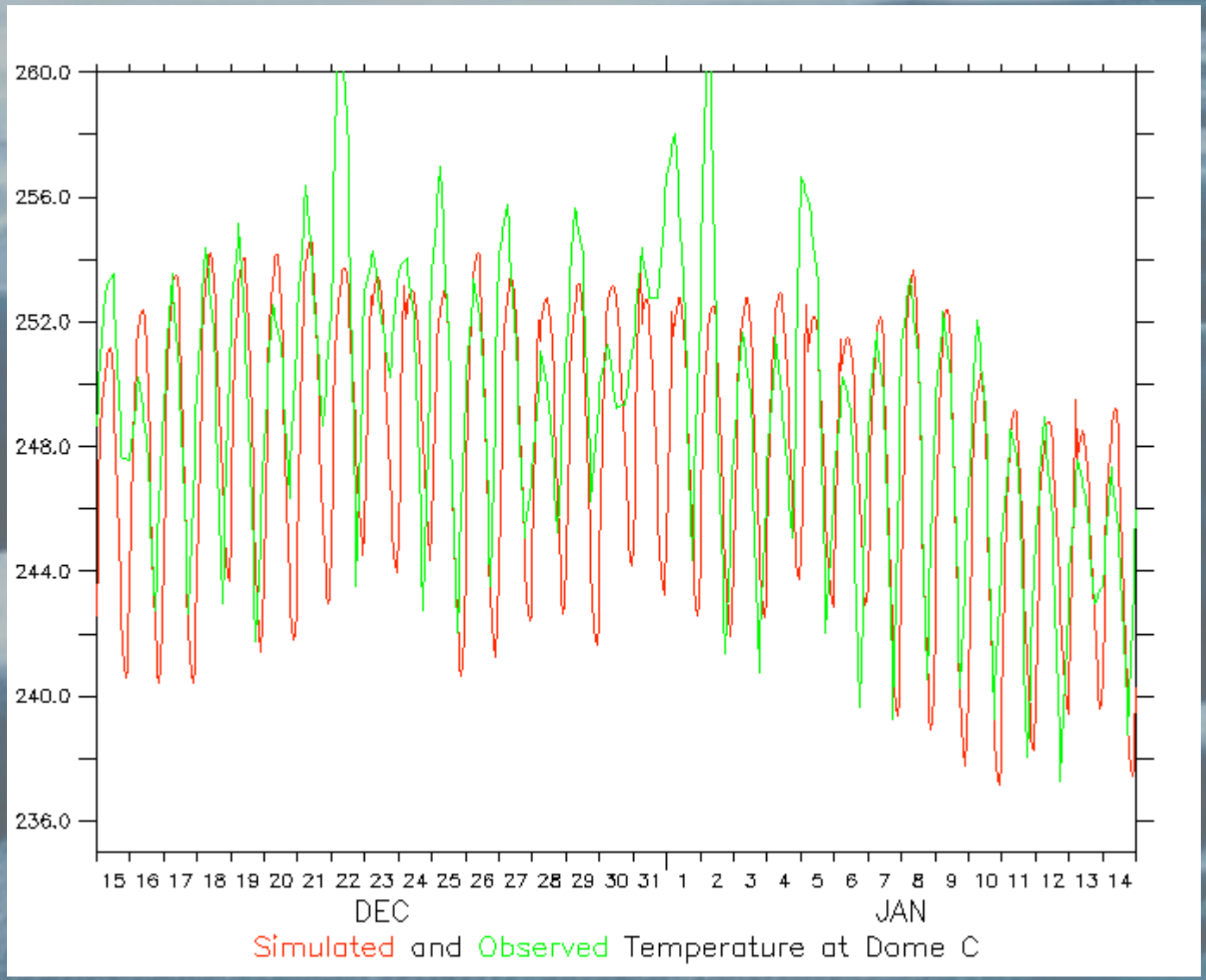
Summer at Dome C

Wind Speed:



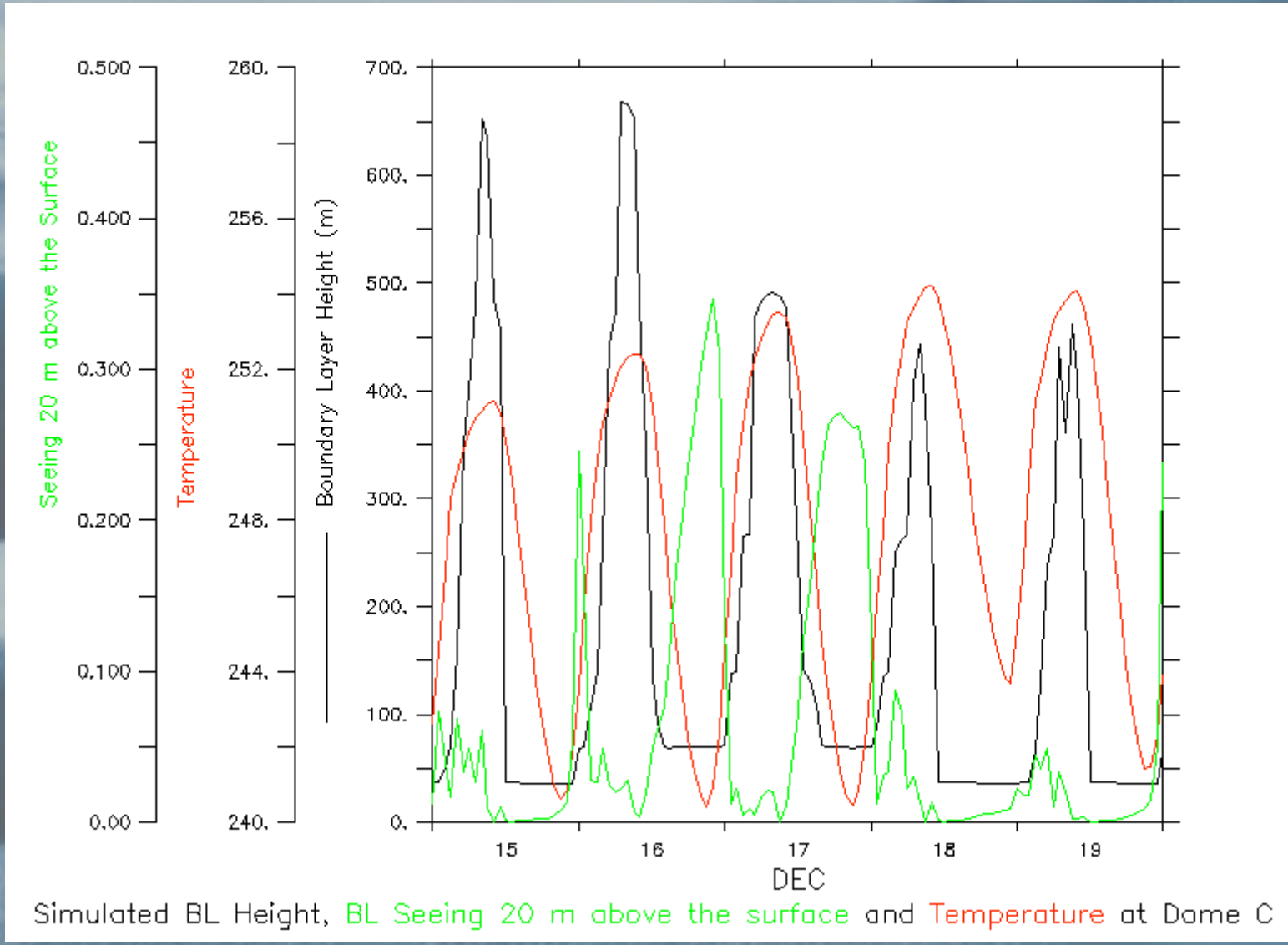
Summer at Dome C

Temperature:



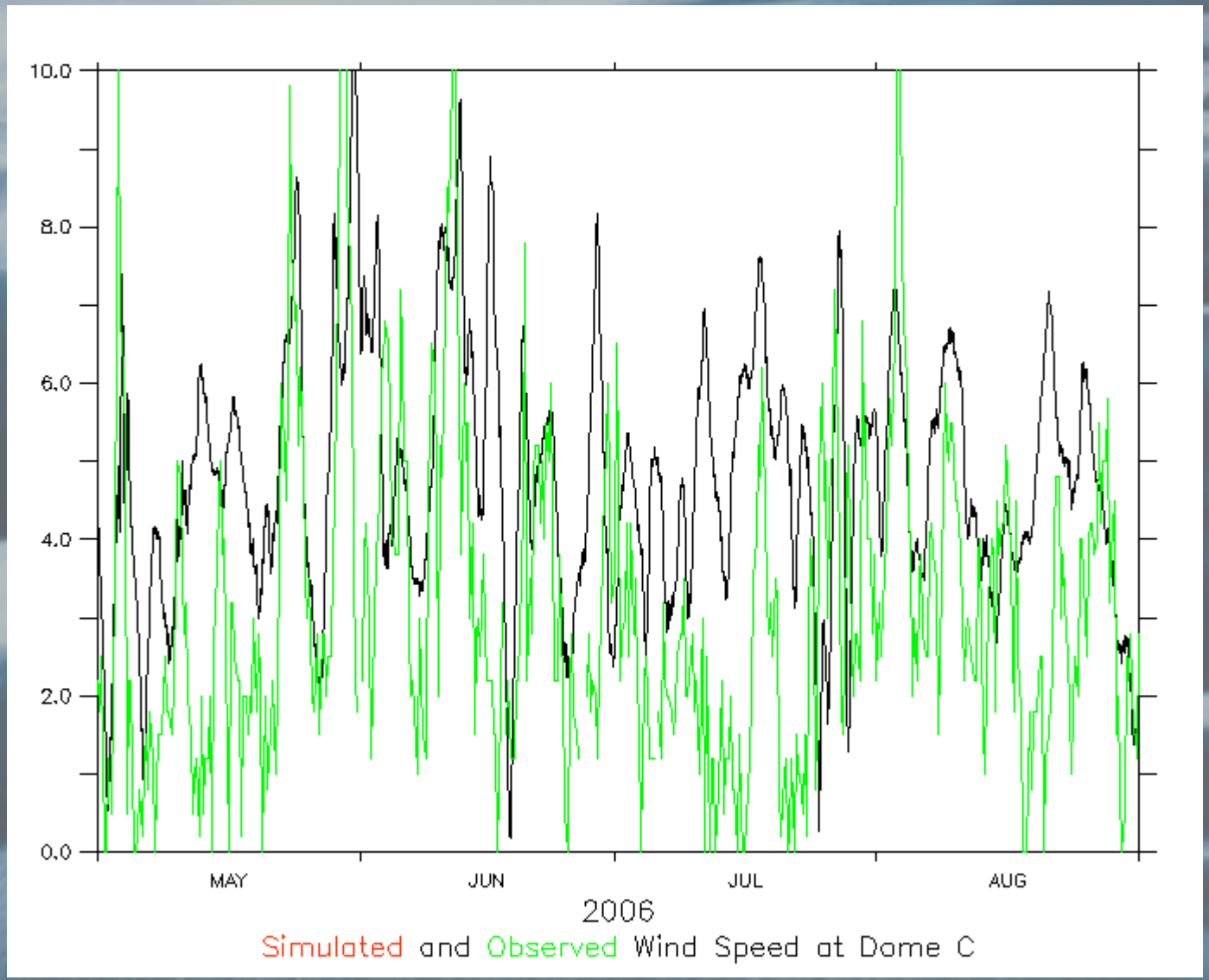
Summer at Dome C

Temperature, Boundary Layer Height and Seeing:



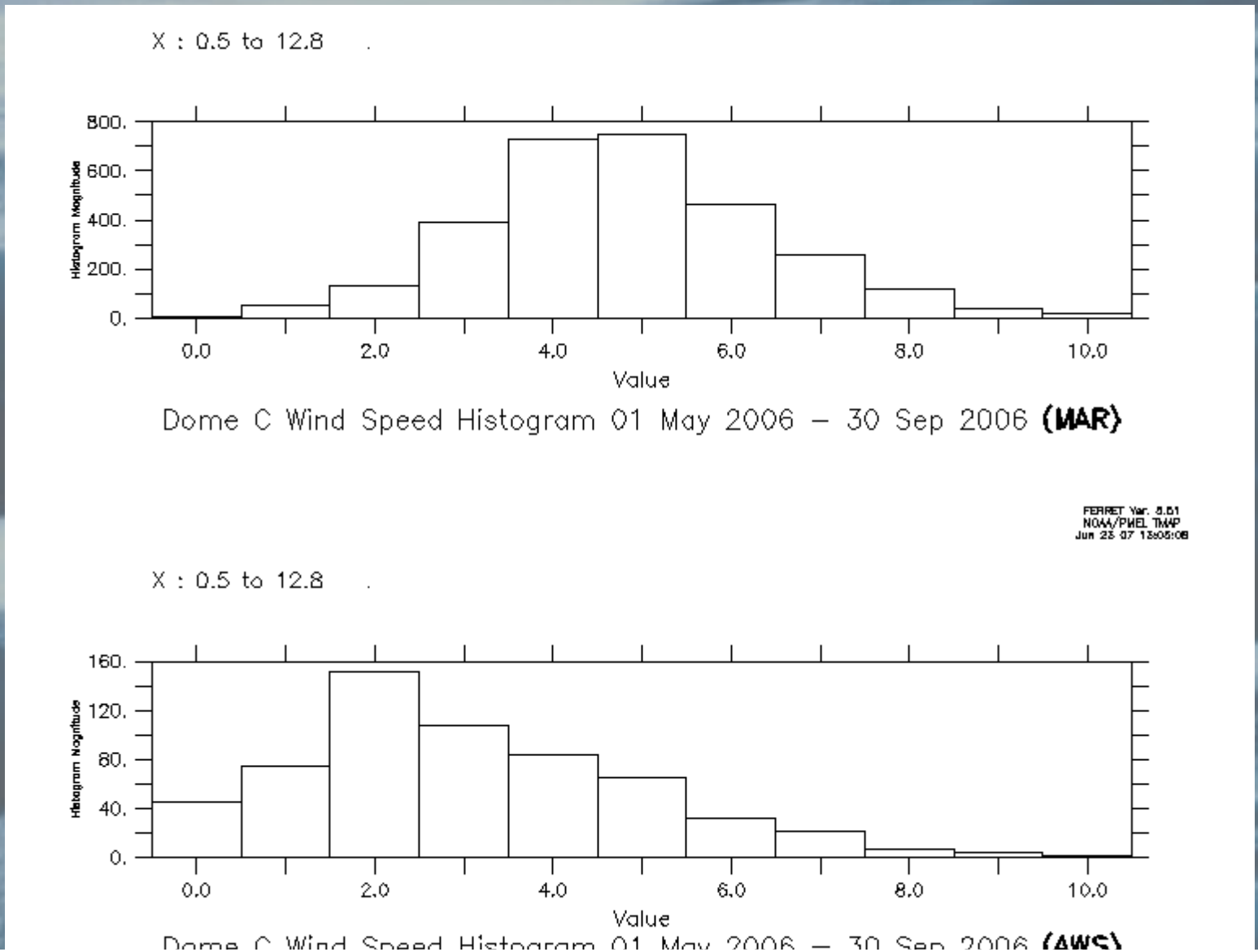
Winter at Dome C

Wind Speed:



Winter at Dome C

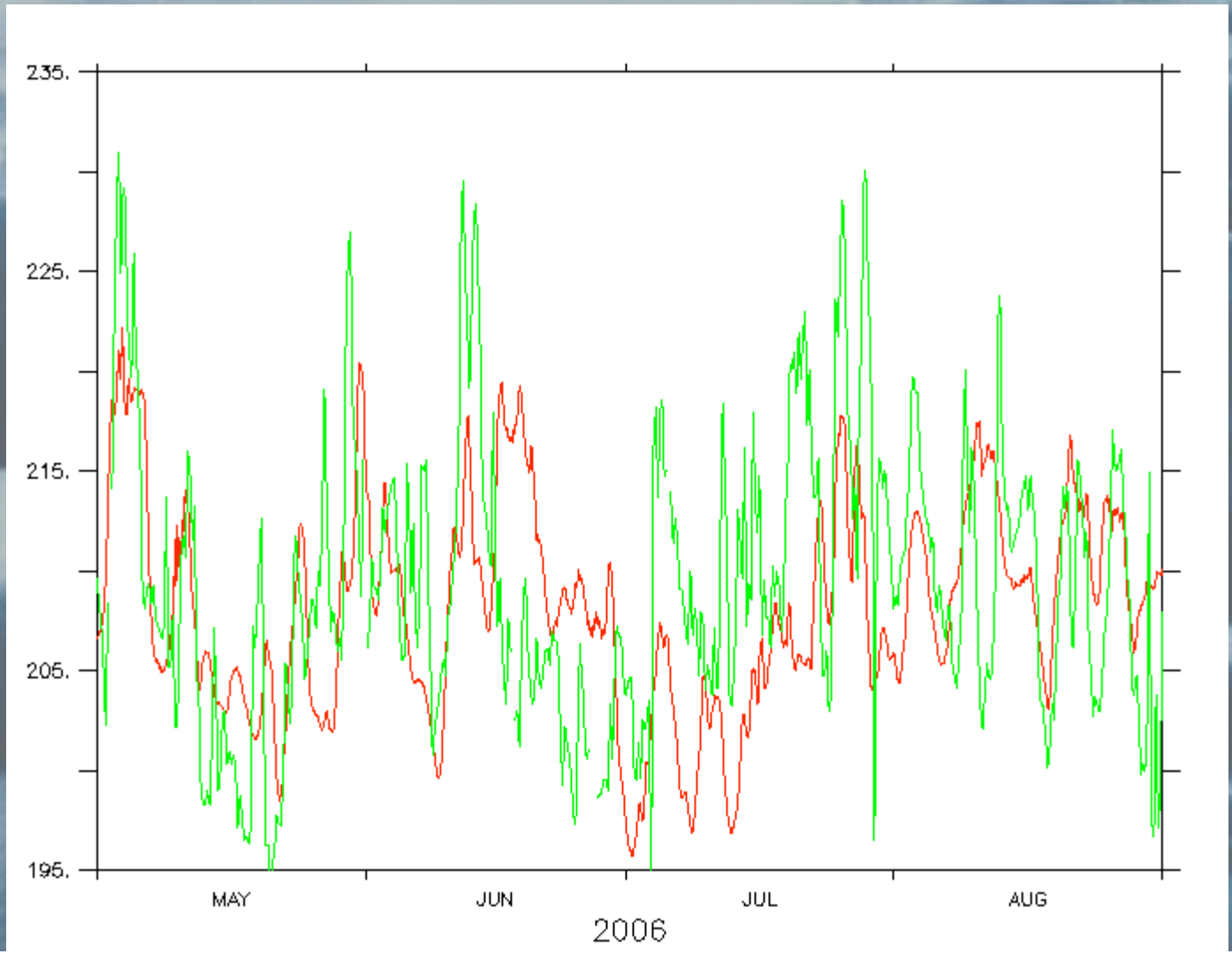
Wind Speed:



Winter at Dome C

Temperature: time average: **Observed** **209.6 K**

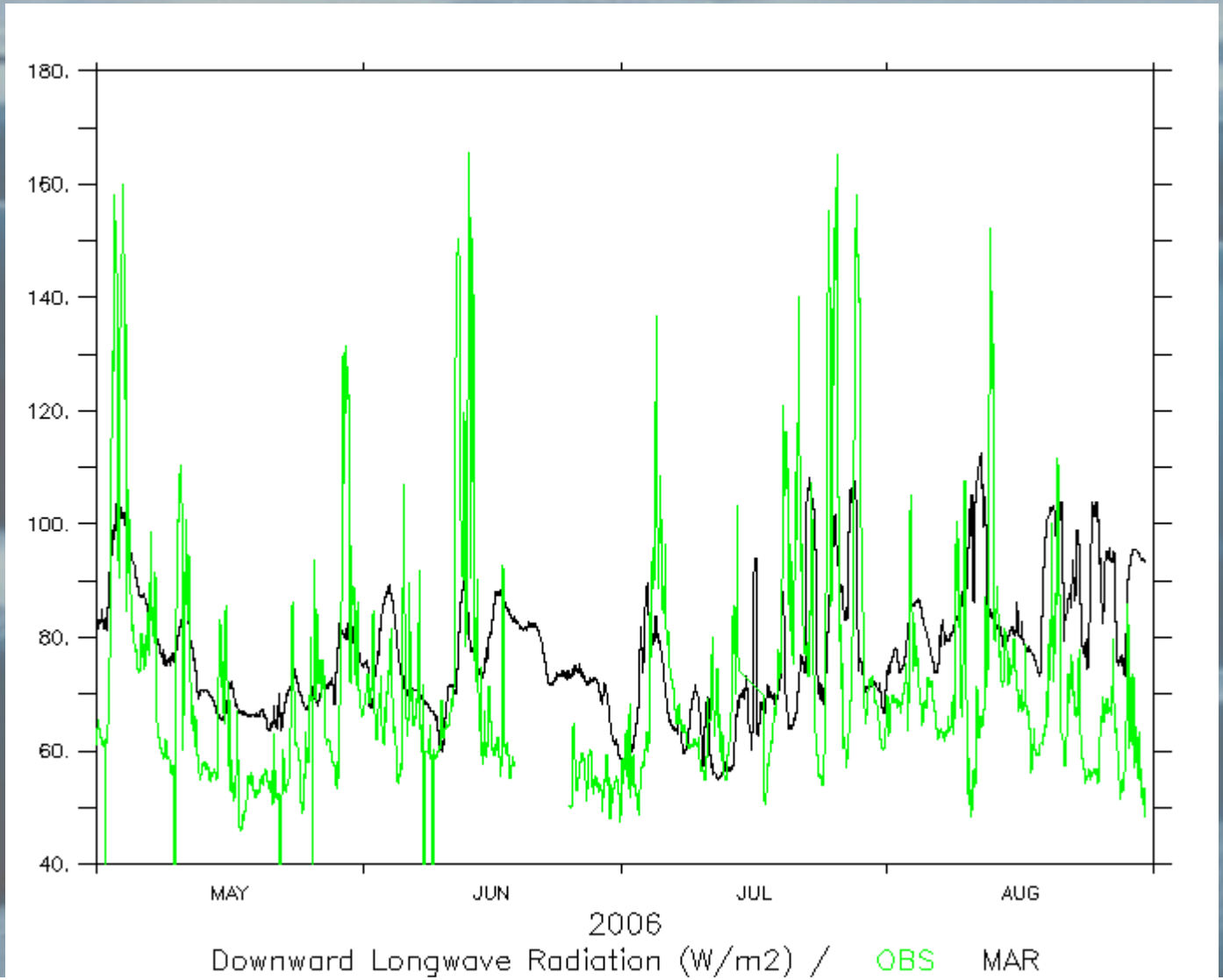
Simulated **208.2 K**



Winter at Dome C

Downward Longwave Radiation: **time average:** **Obs. 59 W/m2**

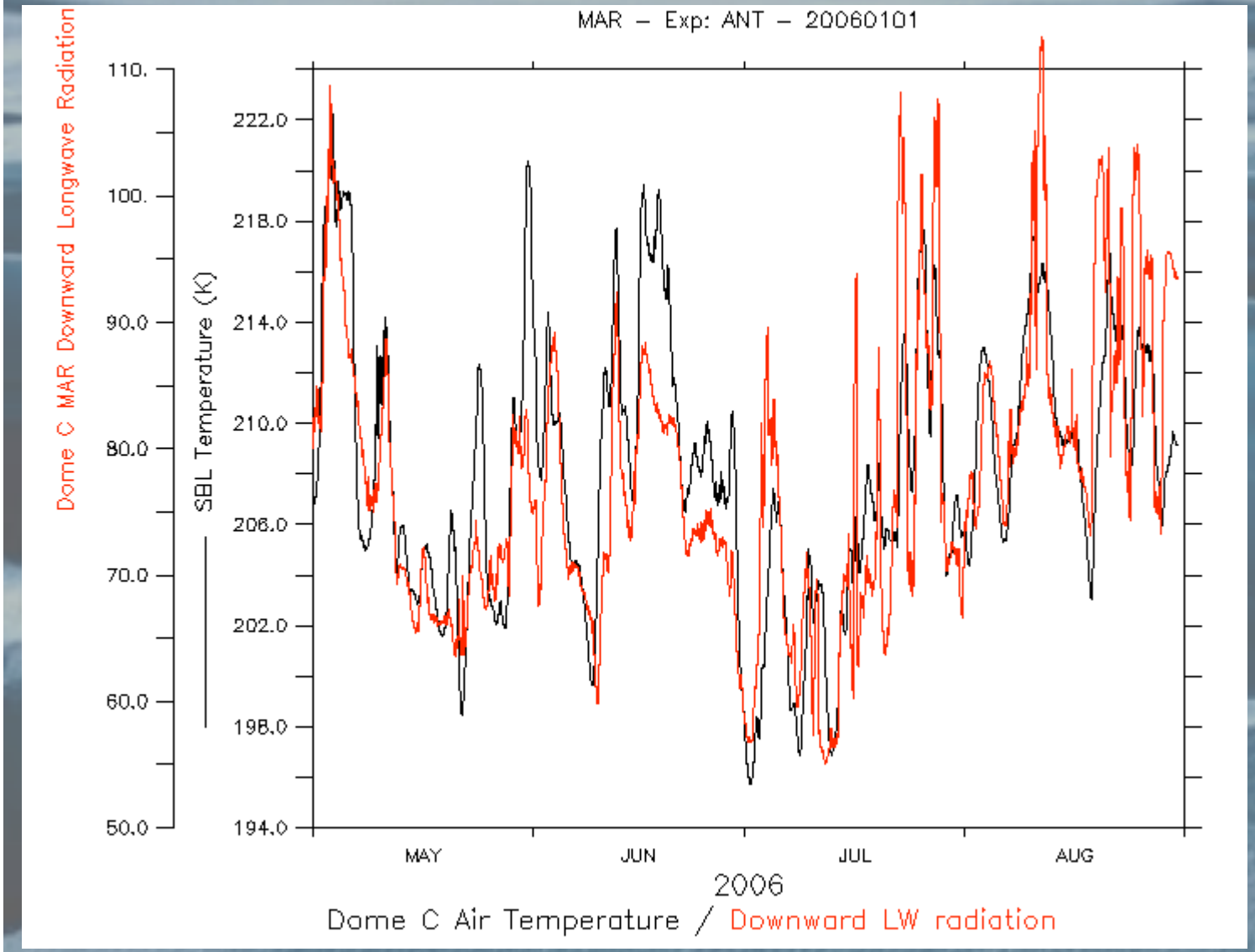
Sim. 78 W/m2



High Lwd corresponds to high t°

Winter at Dome C

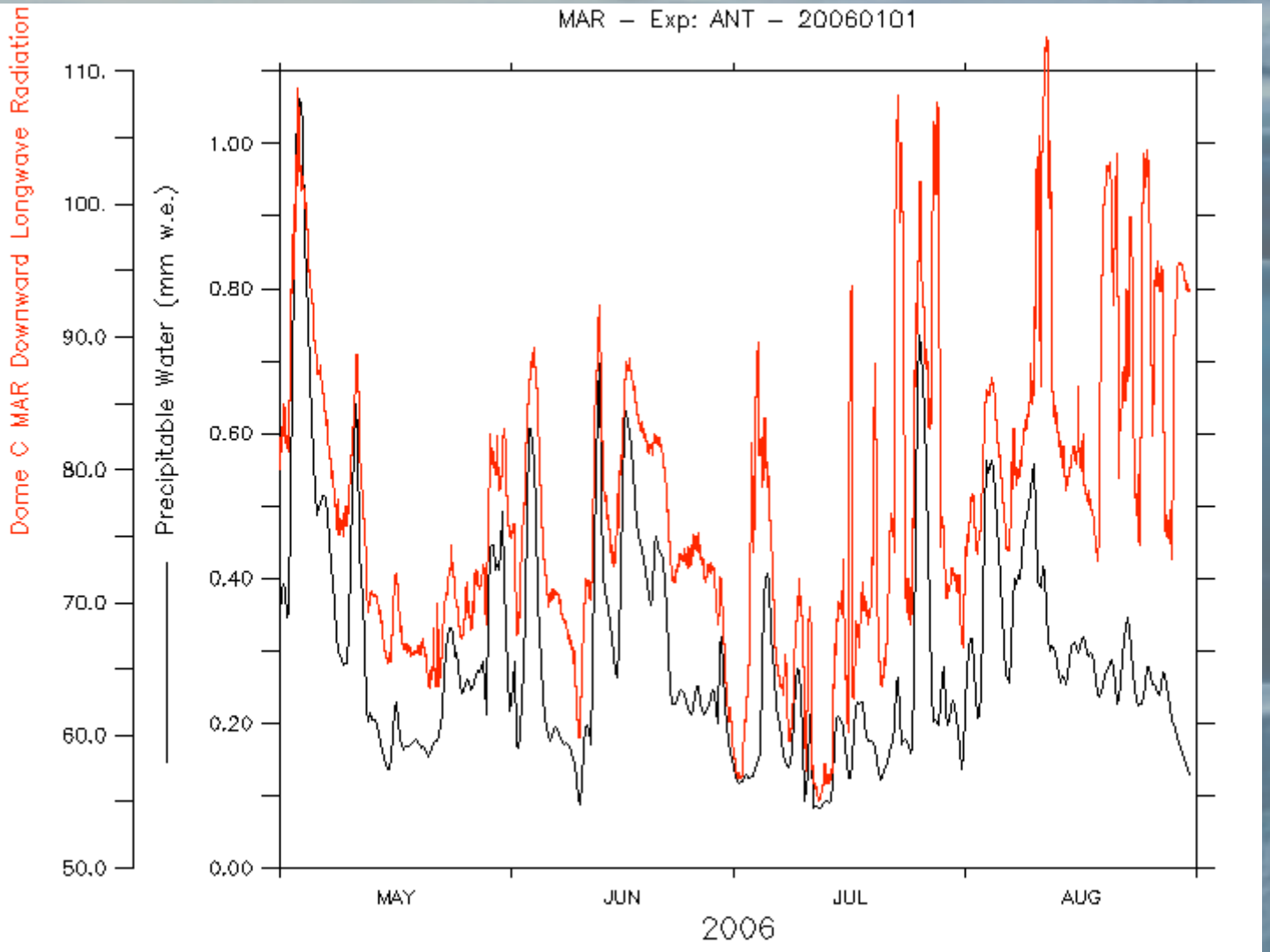
Simulated Temperature and Downward Longwave Radiation:



High Lwd corresponds to high t°

Winter at Dome C

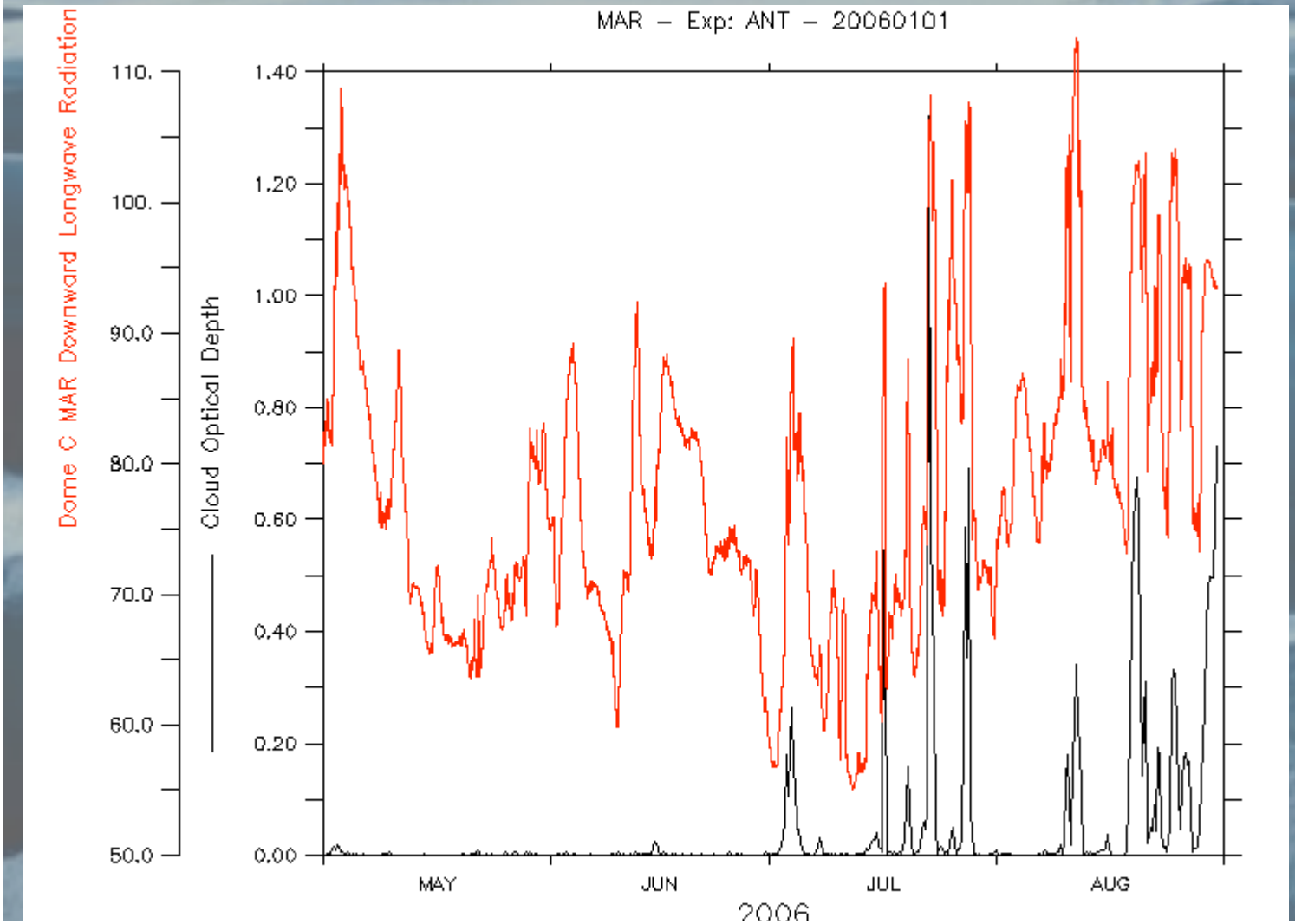
PWV and Downward Longwave Radiation: correlation: 0.6



High Lwd corresponds to high PWV

Winter at Dome C

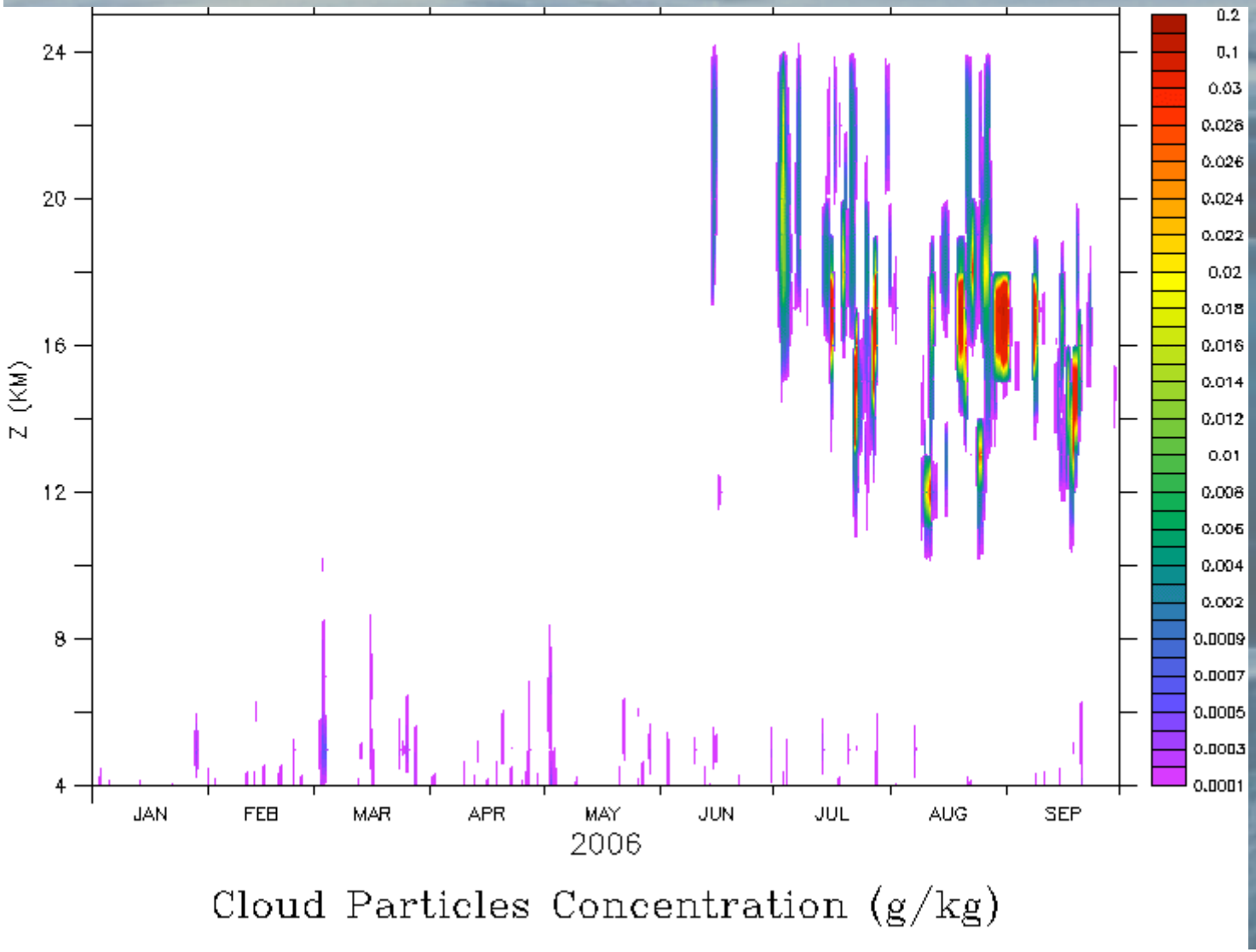
Clouds and Downward Longwave Radiation: correlation: 0.56



High Lwd corresponds to high Cloud OD

Clouds over Dome C

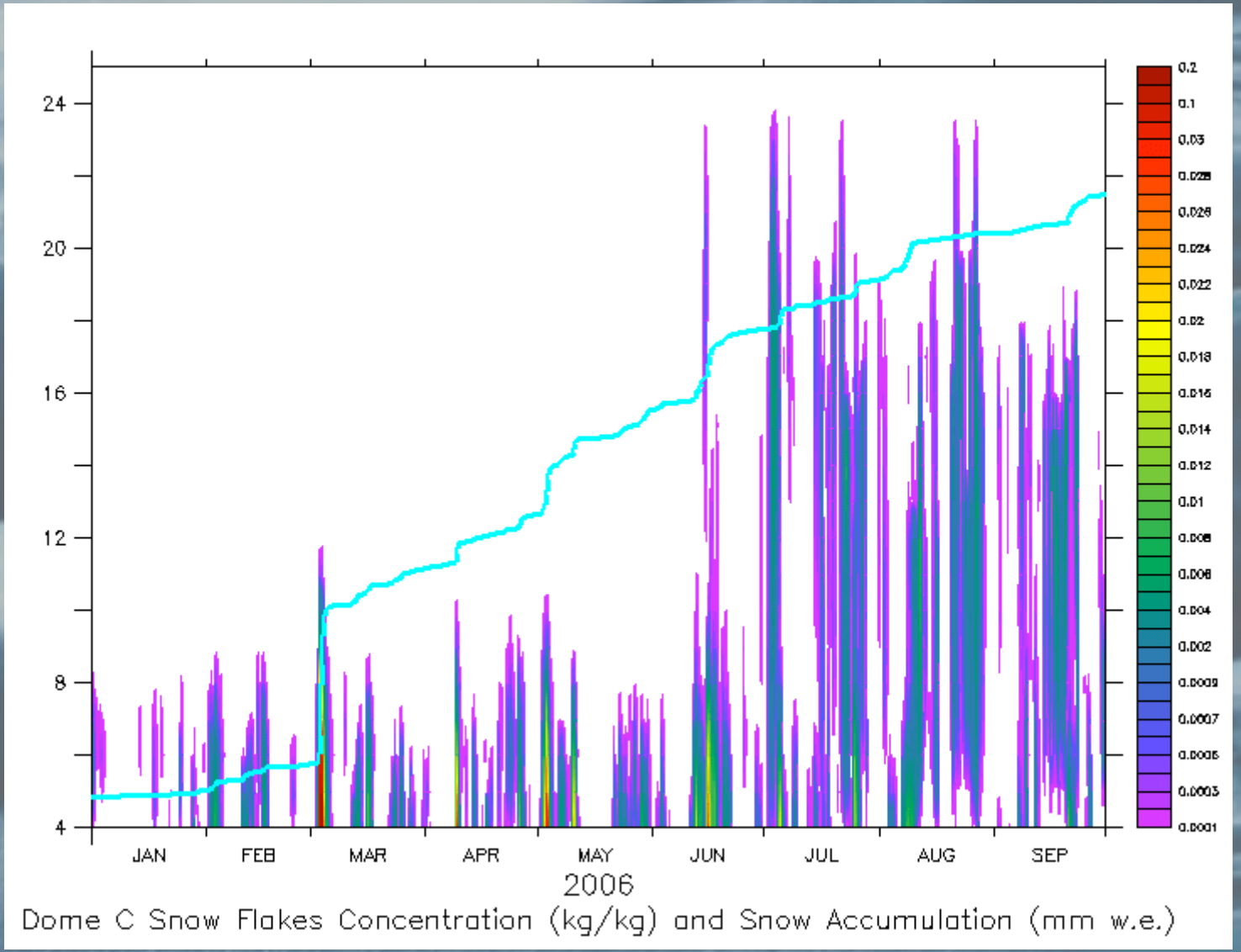
Cloud Ice Particles



PSCs type II

Clouds over Dome C

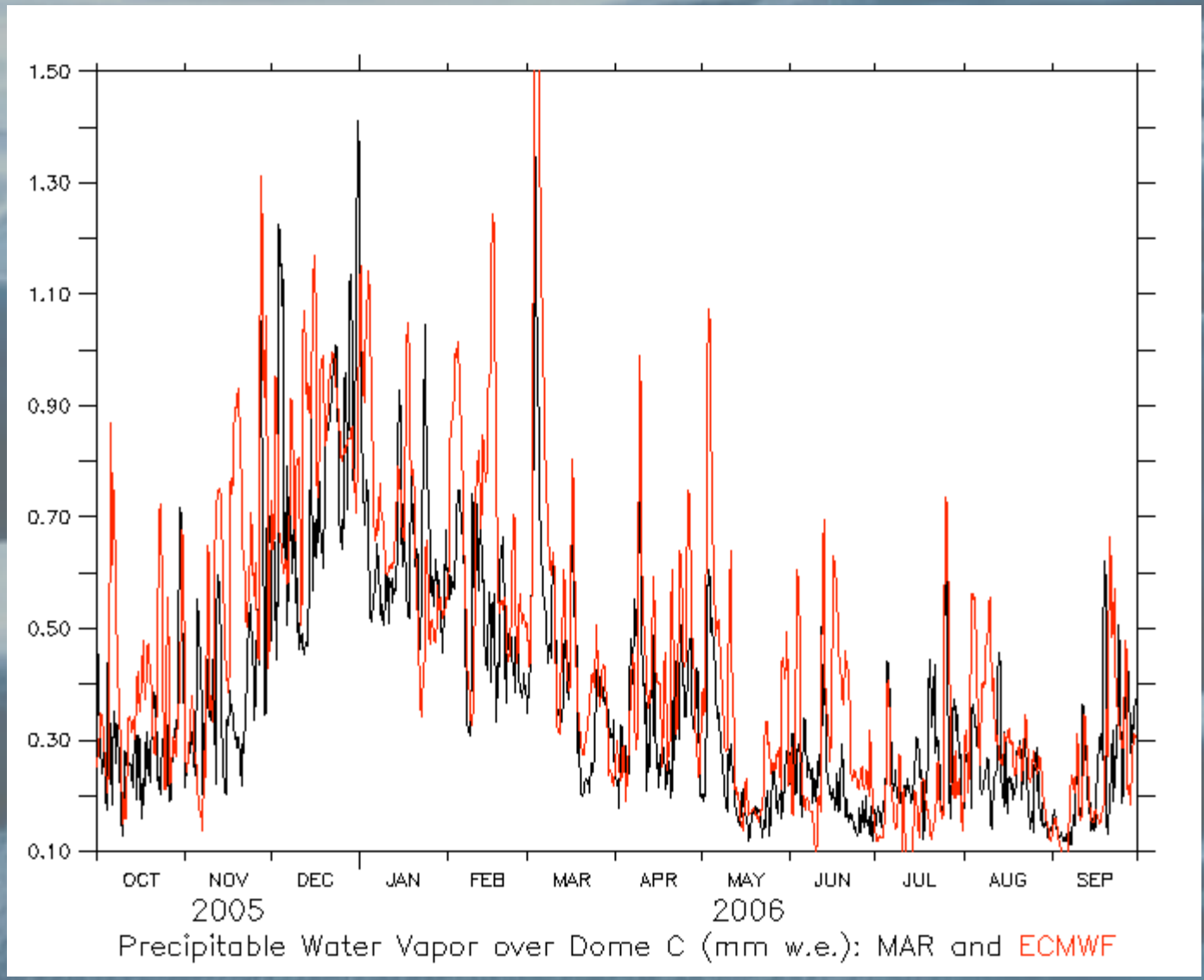
Snow Flakes



Dome C Snow Flakes Concentration (kg/kg) and Snow Accumulation (mm w.e.)

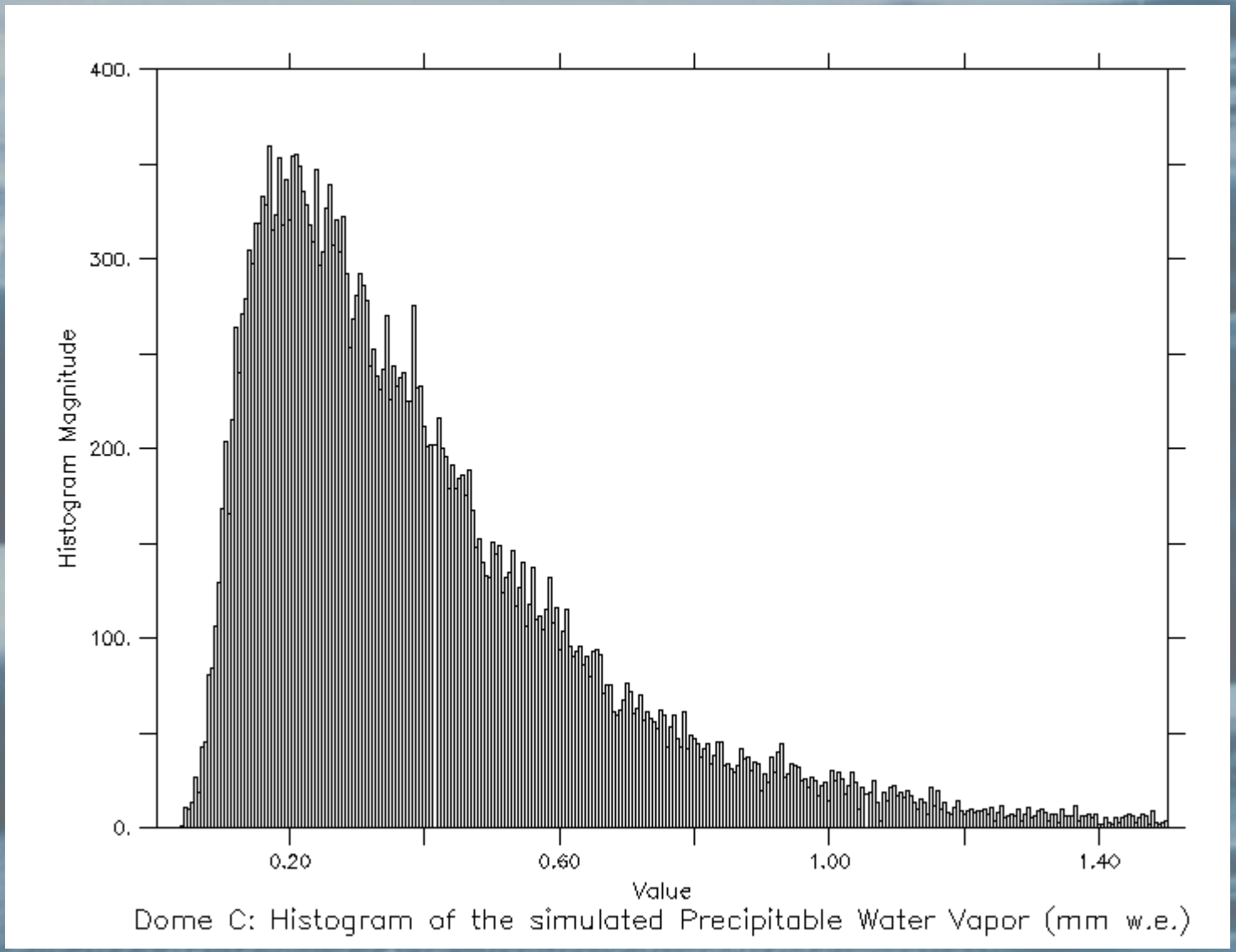
PWV over Dome C

Annual Cycle: Correlation MAR – ECMWF = 0.81



PWV over Dome C

MAR 1980 – 1999 histogram:



Conclusions

Dome C weather and climate characterized by

- strong surface forcing

surface radiative cooling

regional circulation in association with antarctic topography

- marked differences between summer and winter:

summer: well mixed layer during daytime

-> a relatively small BL contribution to seeing

higher t° -> higher PWV

winter: strongly stratified low troposphere

-> a relatively large BL contribution to seeing

lower t° -> lower PWV