



anni dell'Osservatorio

Meteo-Climatologico Antartico



Il contributo dei dati Meteo-Climatici agli studi di bilancio di massa e paleoclima

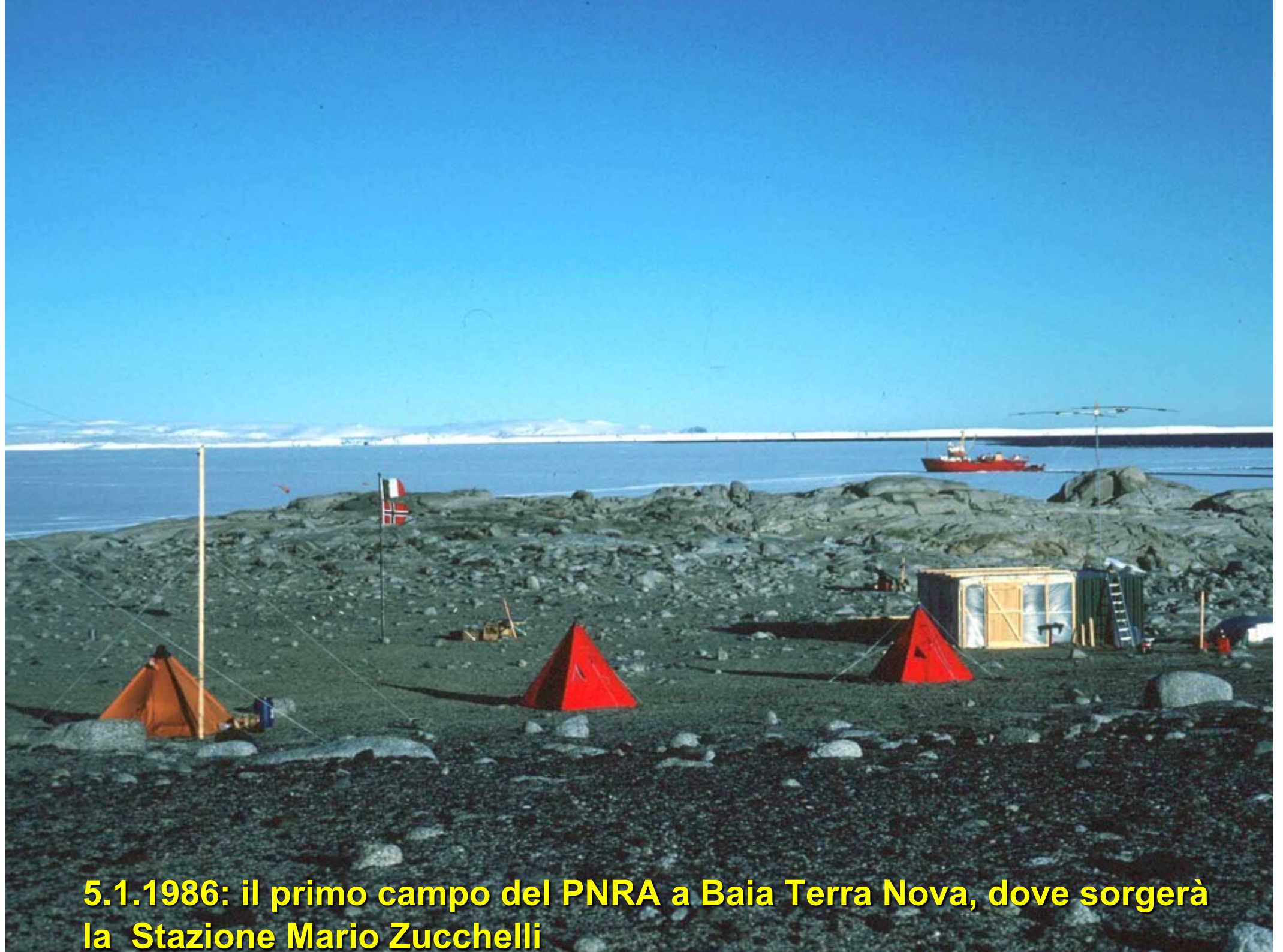
Massimo Frezzotti

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Lyttelton Nuova Zelanda Febbraio 1986



5.1.1986: il primo campo del PNRA a Baia Terra Nova, dove sorgerà la Stazione Mario Zucchelli



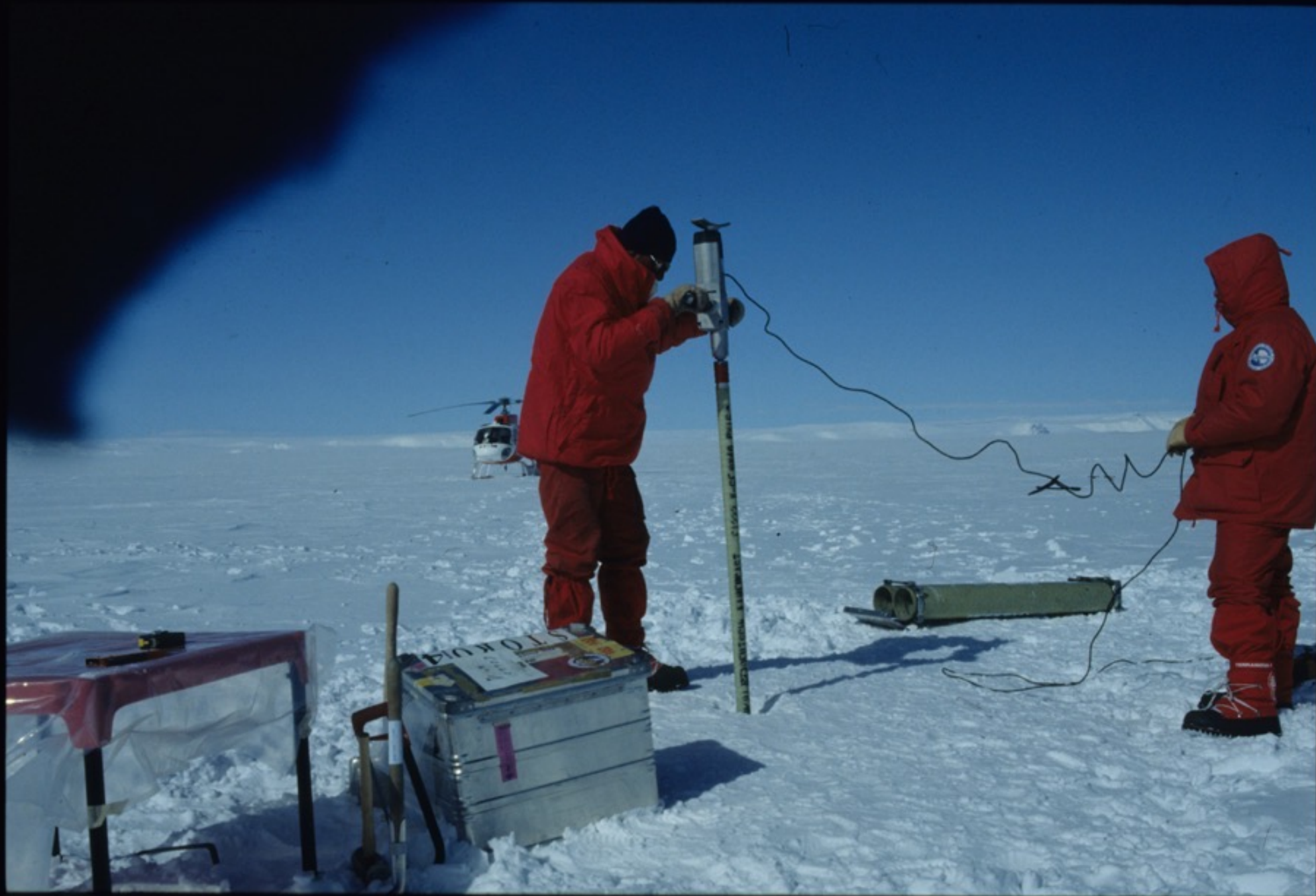
Campo Base 1985



Stazione Mario Zucchelli 2019





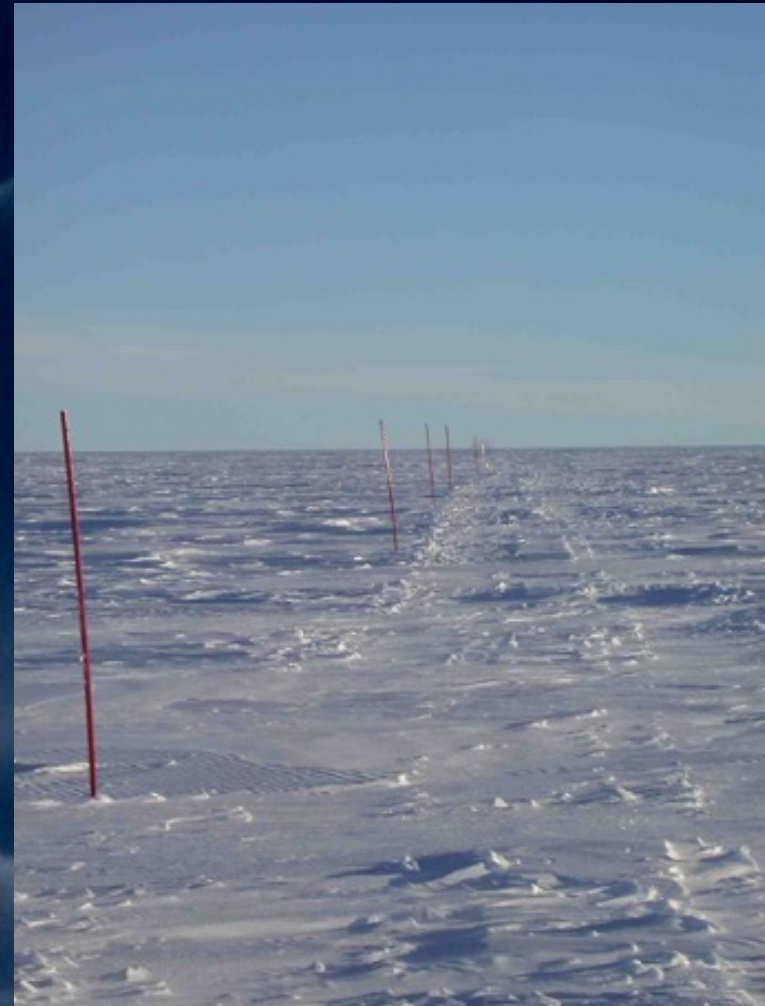






SITE CHARACTERISTICS

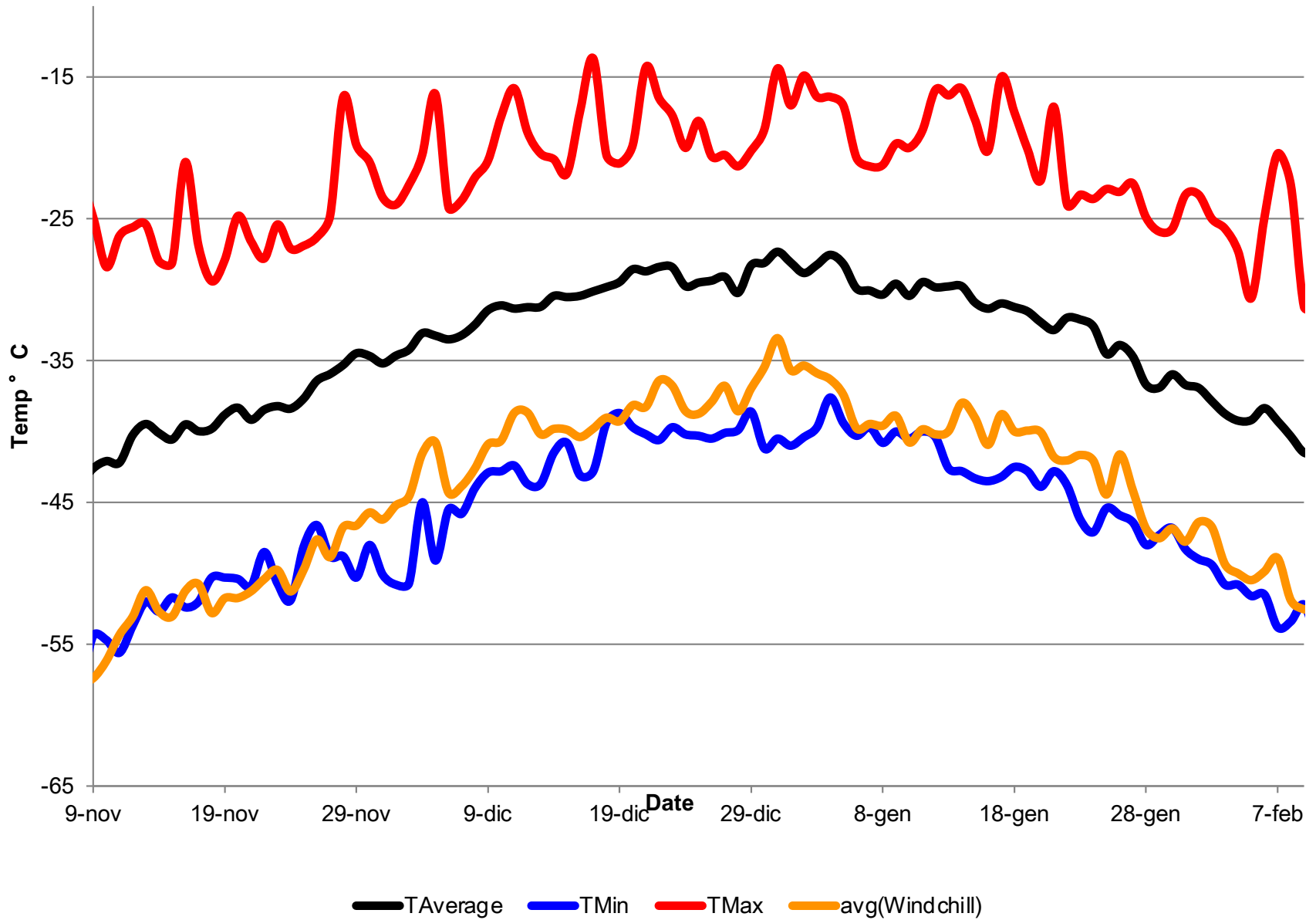
A stake network (40 poles) was installed in 2002, and an Automatic Weather Station was installed during the 2002-2003 season in order to characterise climatic conditions and the spatial-temporal variability of snow precipitation on local and seasonal scales



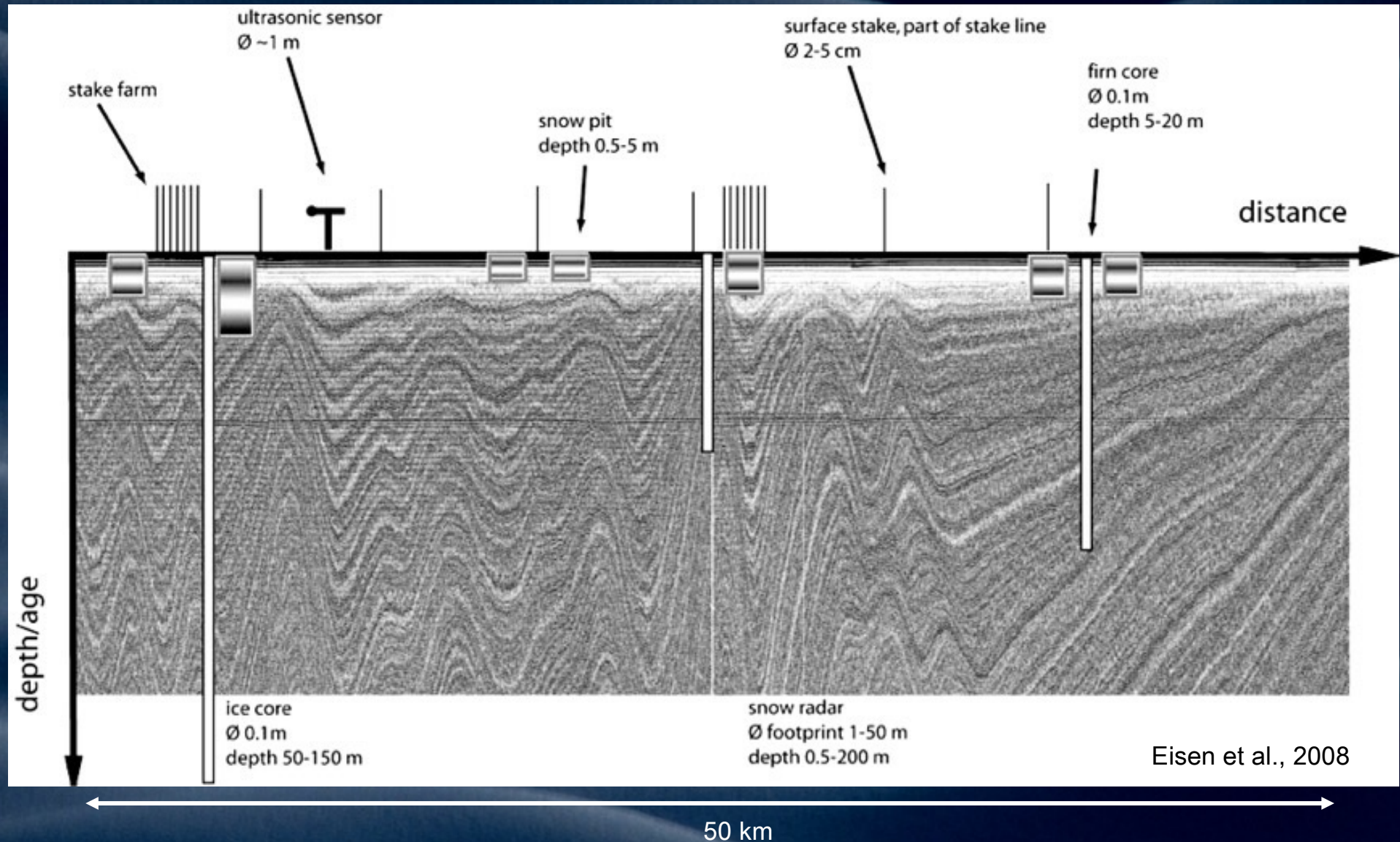




Dome C Temperature



SNOW ACCUMULATION SPATIAL VARIABILITY

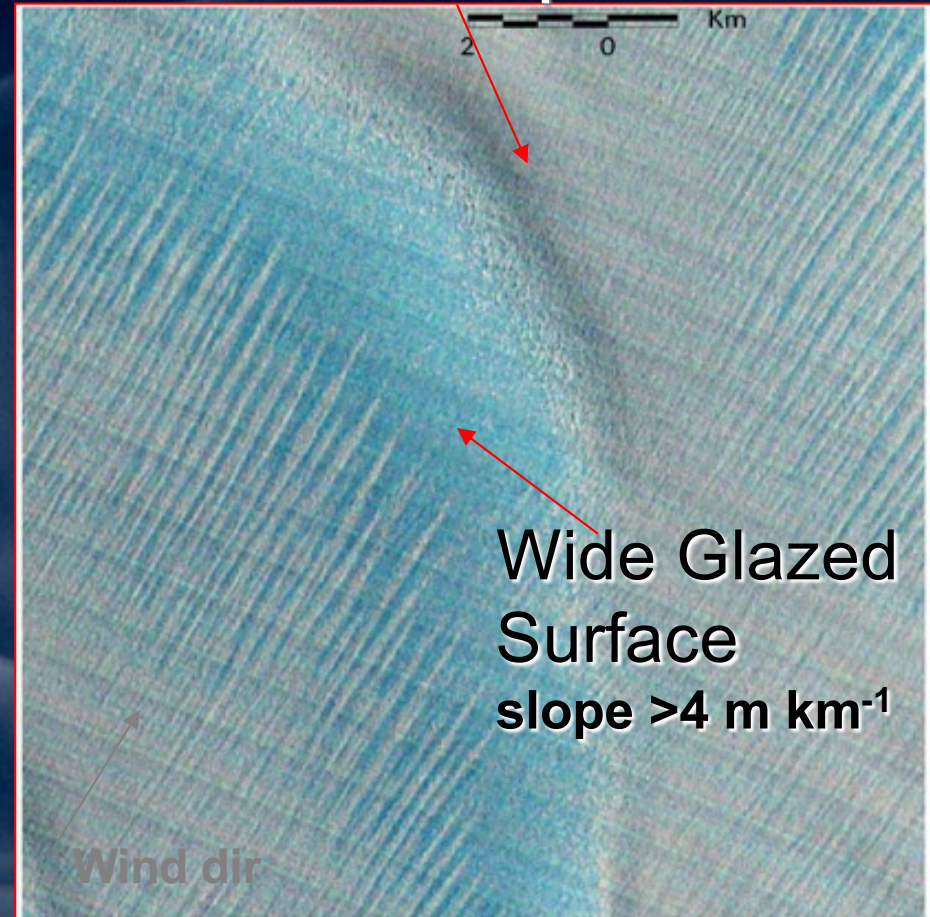


Spatial and “temporal” spatial interval of SMB observations. Spatial variability of snow accumulation at km scale is 1 order of magnitude higher than temporal variability at 10s-100s years and spatial variability influences the interpretation of past accumulation from ice core analysis (eg Anschutz et al., 2006; 2007; Arcone et al, 2005; Karlof et al., 2005; Frezzotti et al., 2005; 2007; Kaspari et al., 2005; Hamilton, 2004; Vaughan et al., 2004).



Satellite analysis integrated with field data allowed the survey of the following macro-morphology:

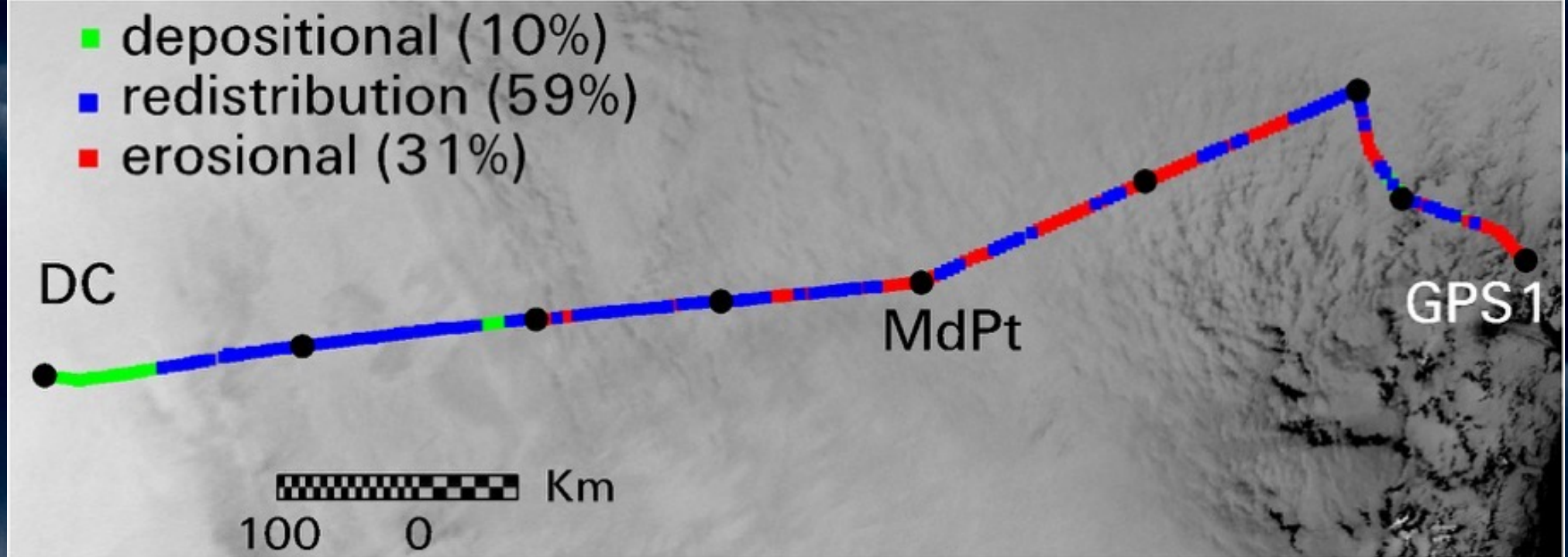
Transverse dune
 at bottom of slope $> 4 \text{ m km}^{-1}$



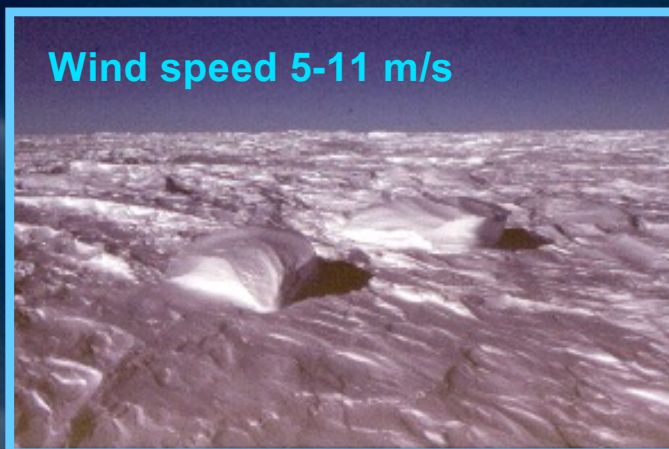


The snow deposition process is very complicated on the Antarctic Plateau, where blowing snow is severe, accumulation is low and where snow remains as aeolian particles on the surface

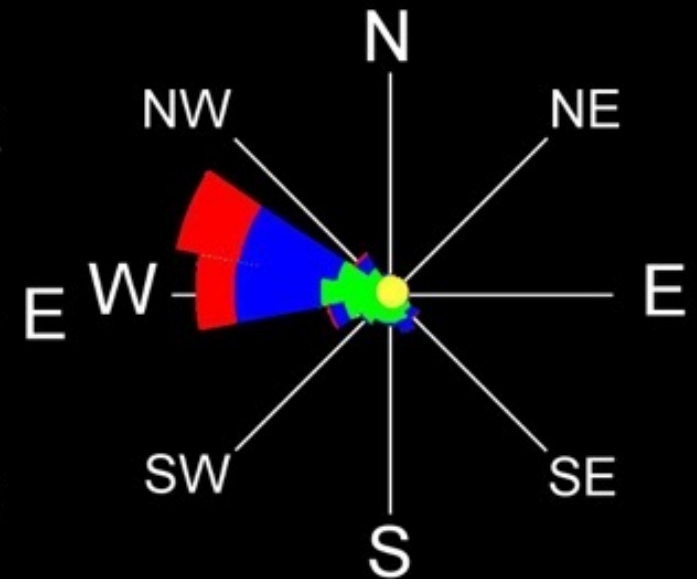
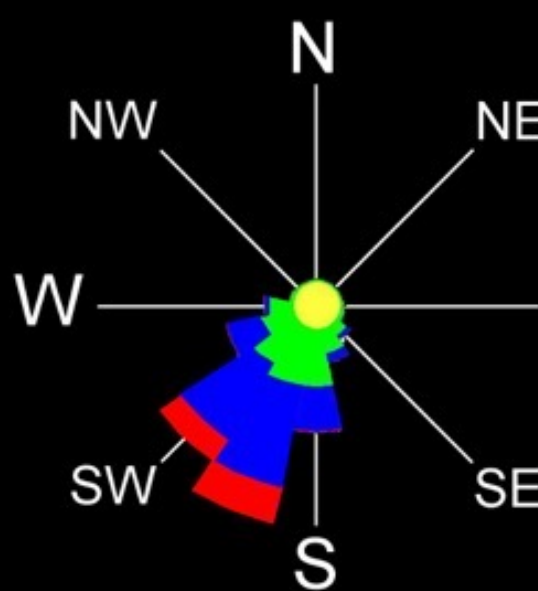
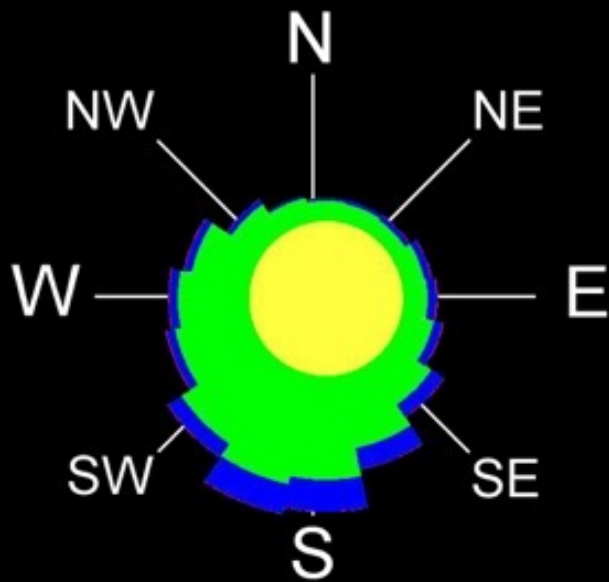


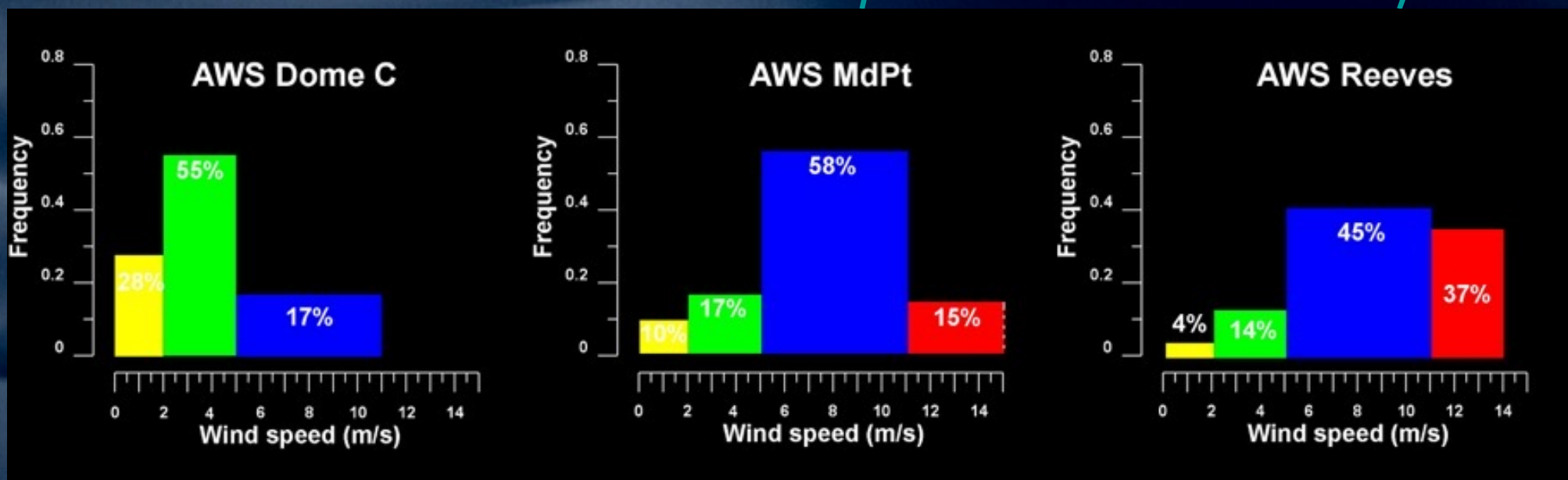
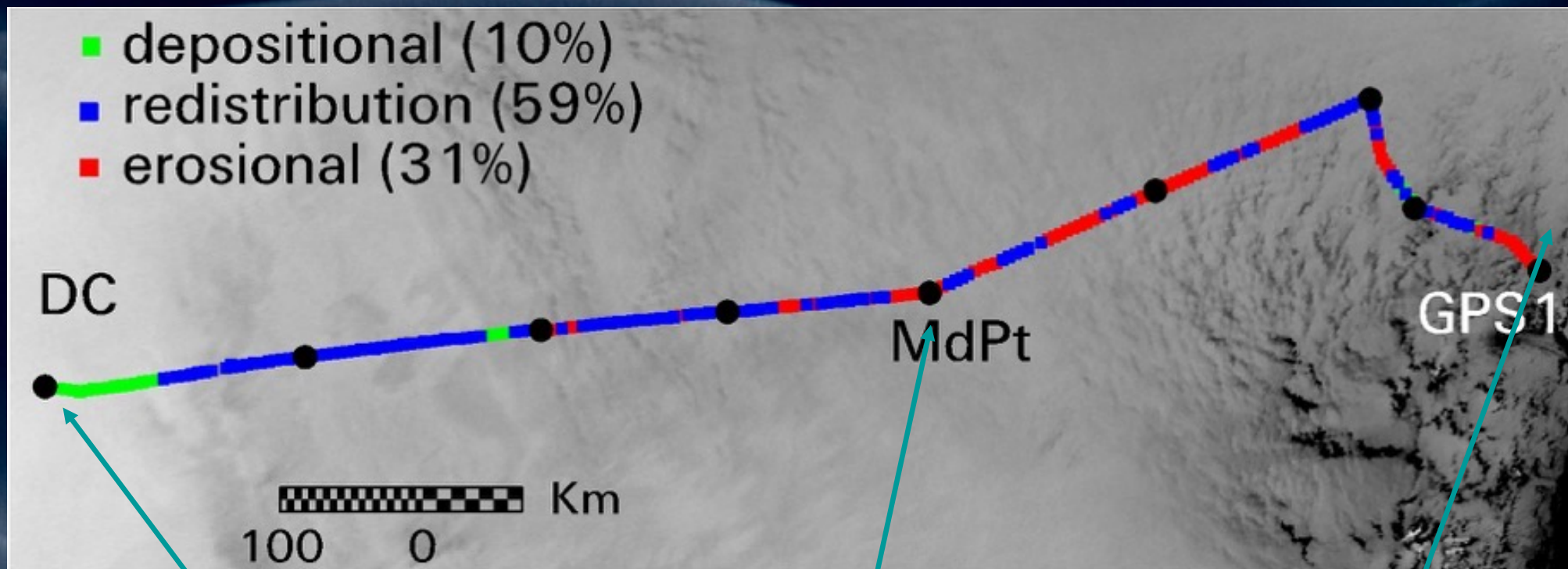


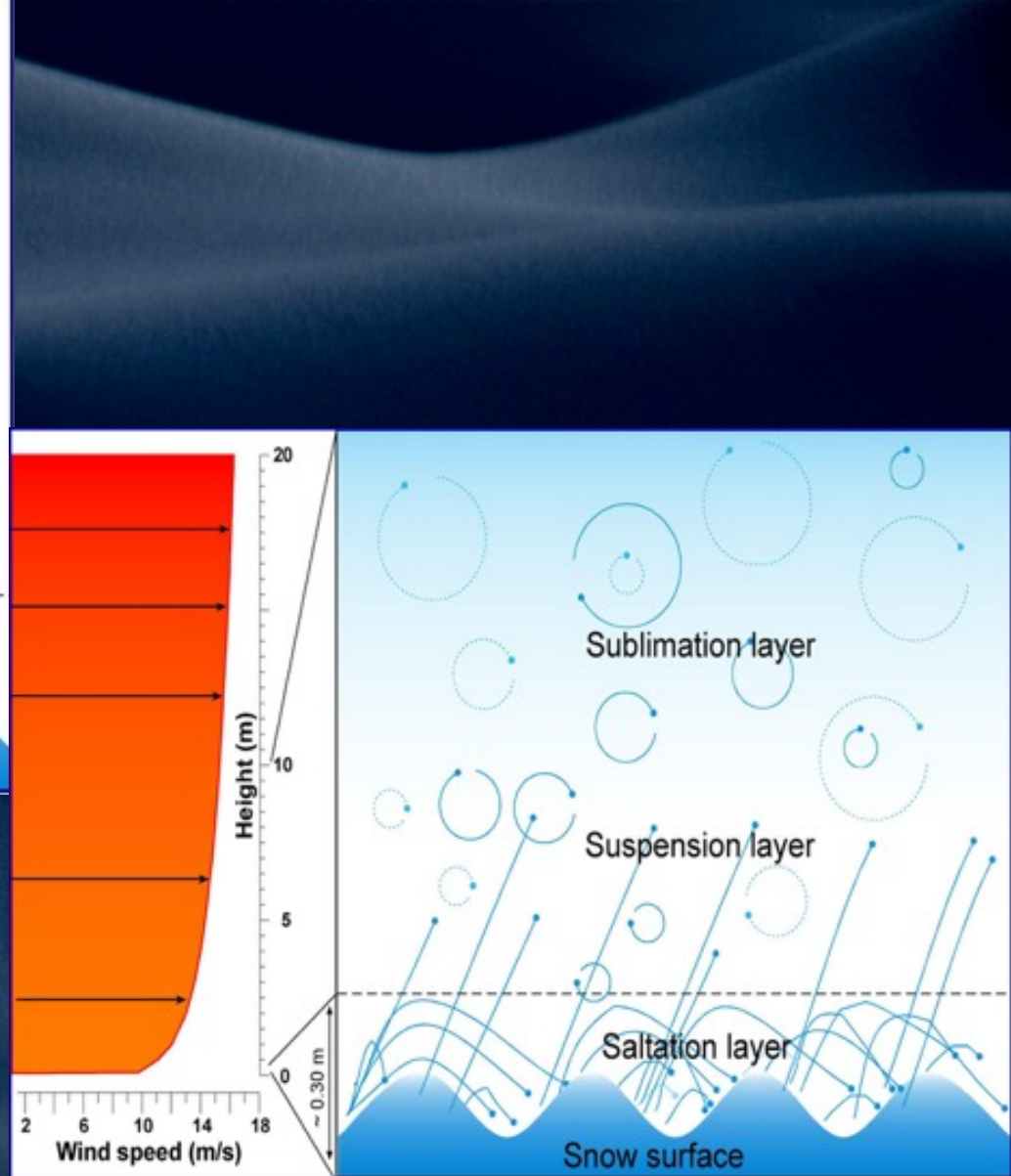
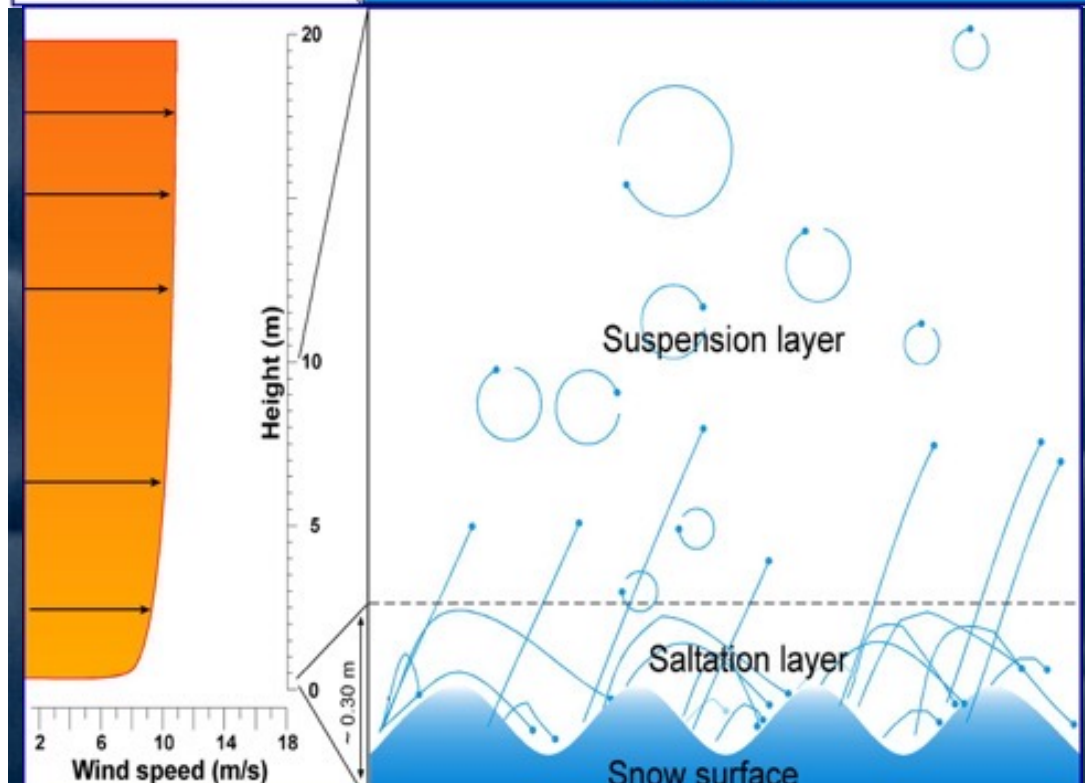
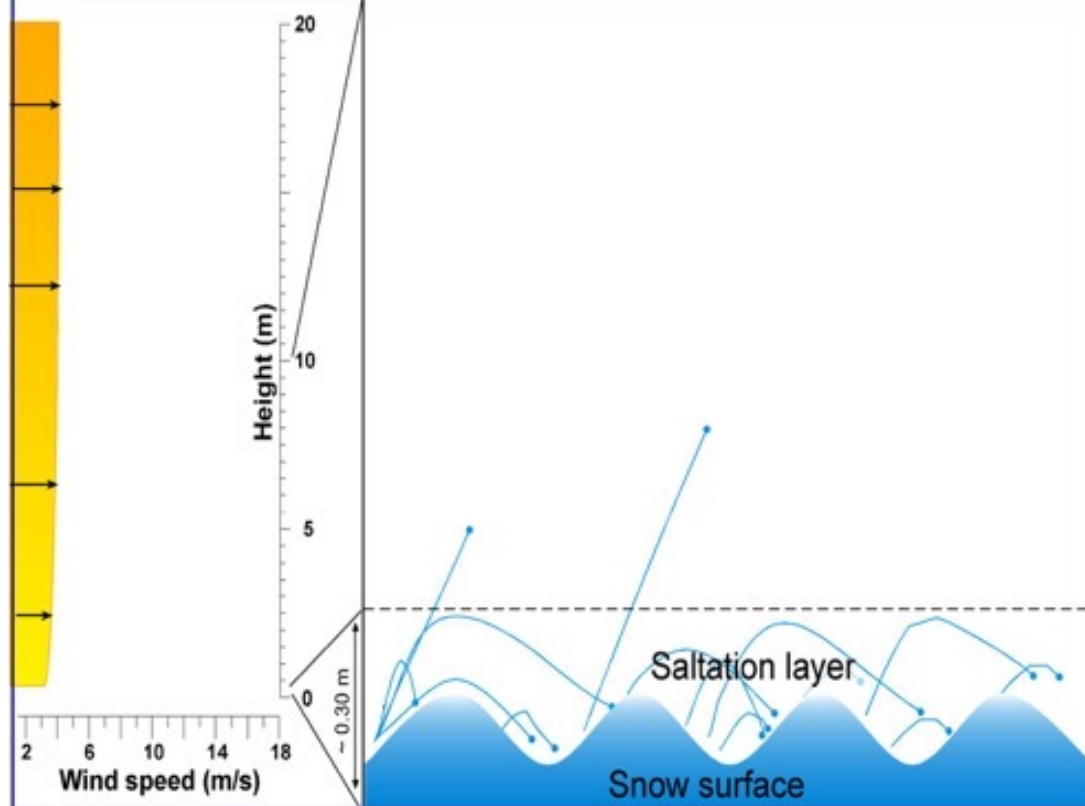
Along the traverse Terra Nova Bay-Dome C, **erosional** features (wind crust or glazed surface) constitute 31%, redistribution features (sastrugi) 59% and **depositional** features only 10% of micro-relief.



- depositional (10%)
- redistribution (59%)
- erosional (31%)







Noise signal ratio in stake/core record

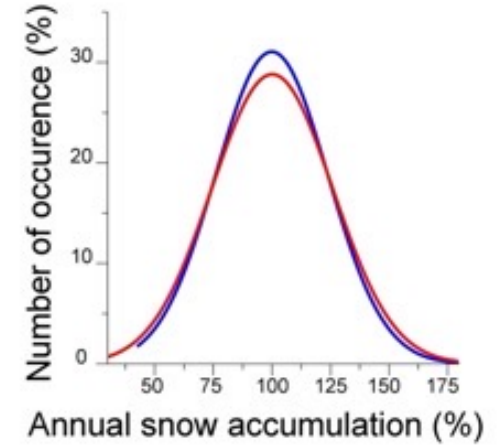
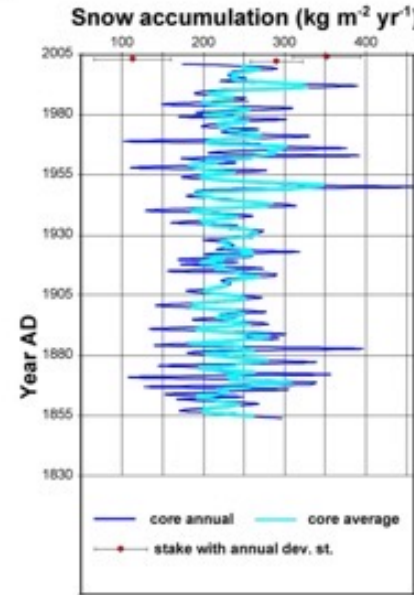
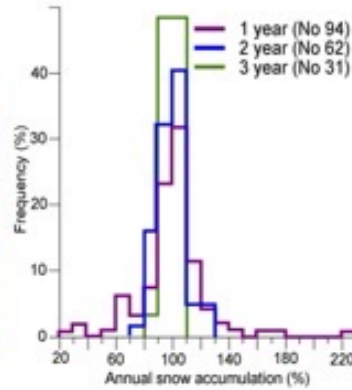
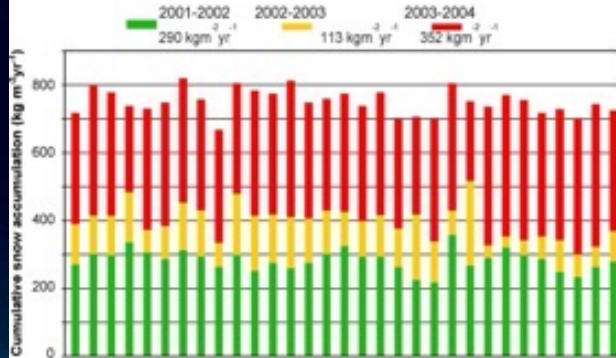
Stake farm

Firn Core

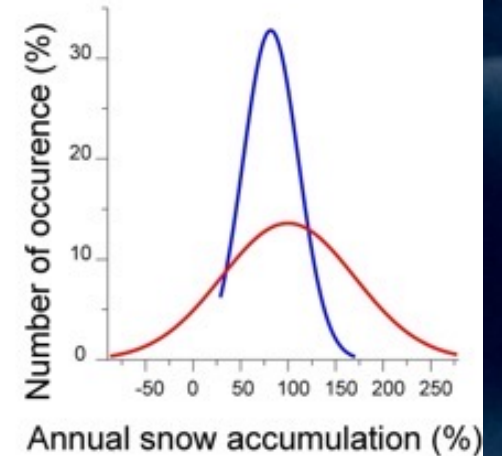
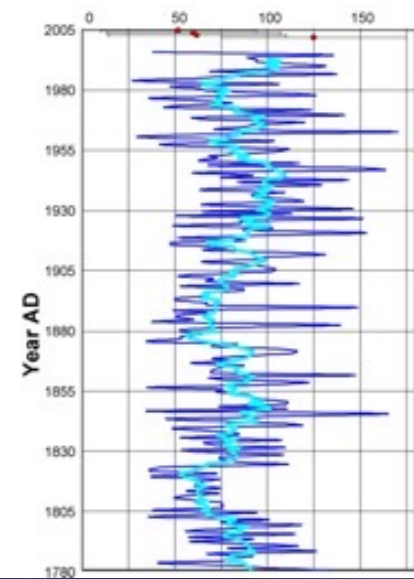
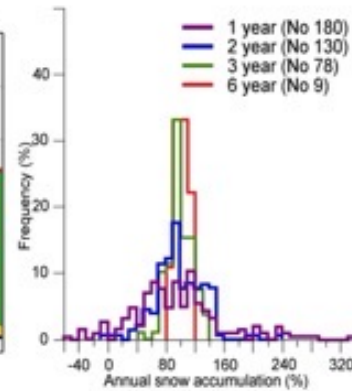
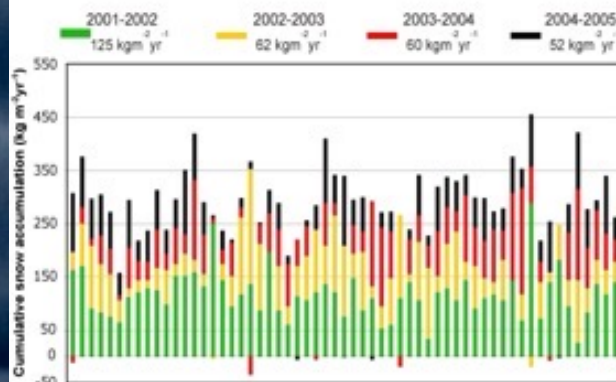
Comparison

— core — stake

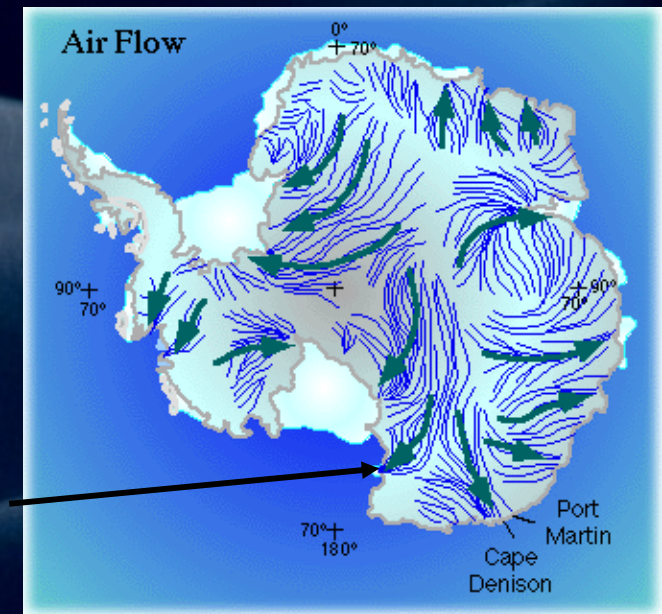
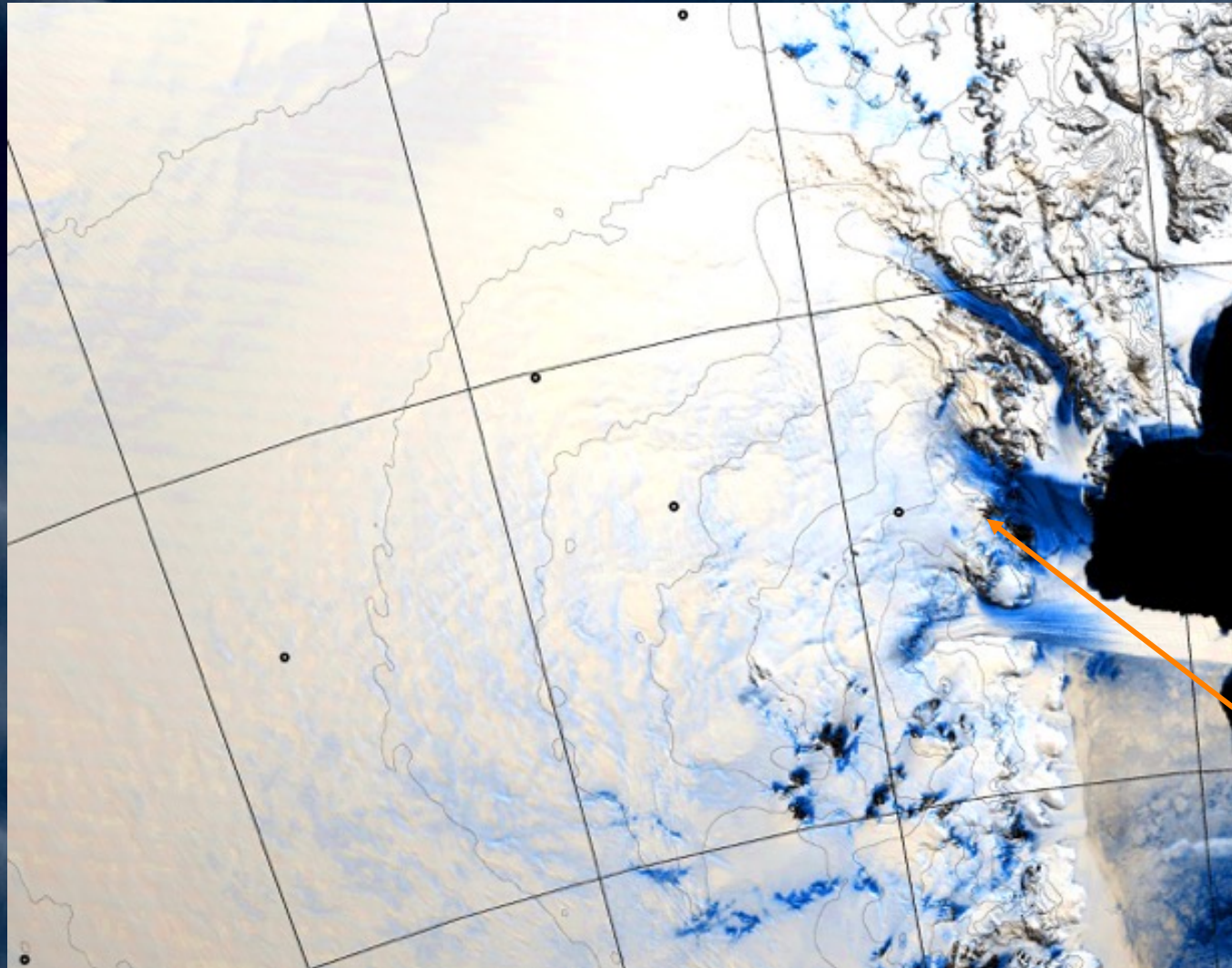
GV7 240 kg m⁻²yr⁻¹



TD 85 kg m⁻²yr⁻¹



EXTRAORDINARY BLOWING SNOW TRANSPORT IN EAST ANTARCTICA



Extensive presence of ablation surface (blue ice and wind crust) suggest that the combine processes of blowing snow sublimation and snow transport remove up to 50% of the precipitation in the coastal and slope convergence area. These phenomena represent a major negative effect on the snow accumulation, and they are not sufficiently taken into account in studies of surface mass balance.

Scarchilli et al. 2010



SATELLITE IMAGES OF TERRA NOVA BAY

A clouds

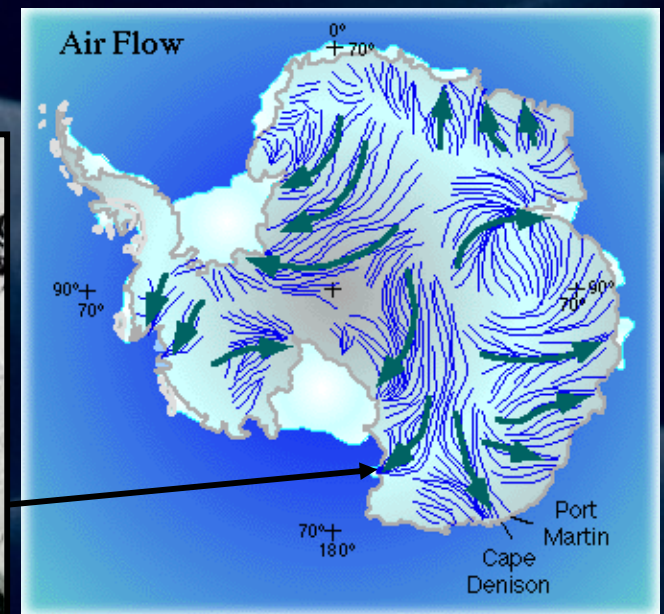
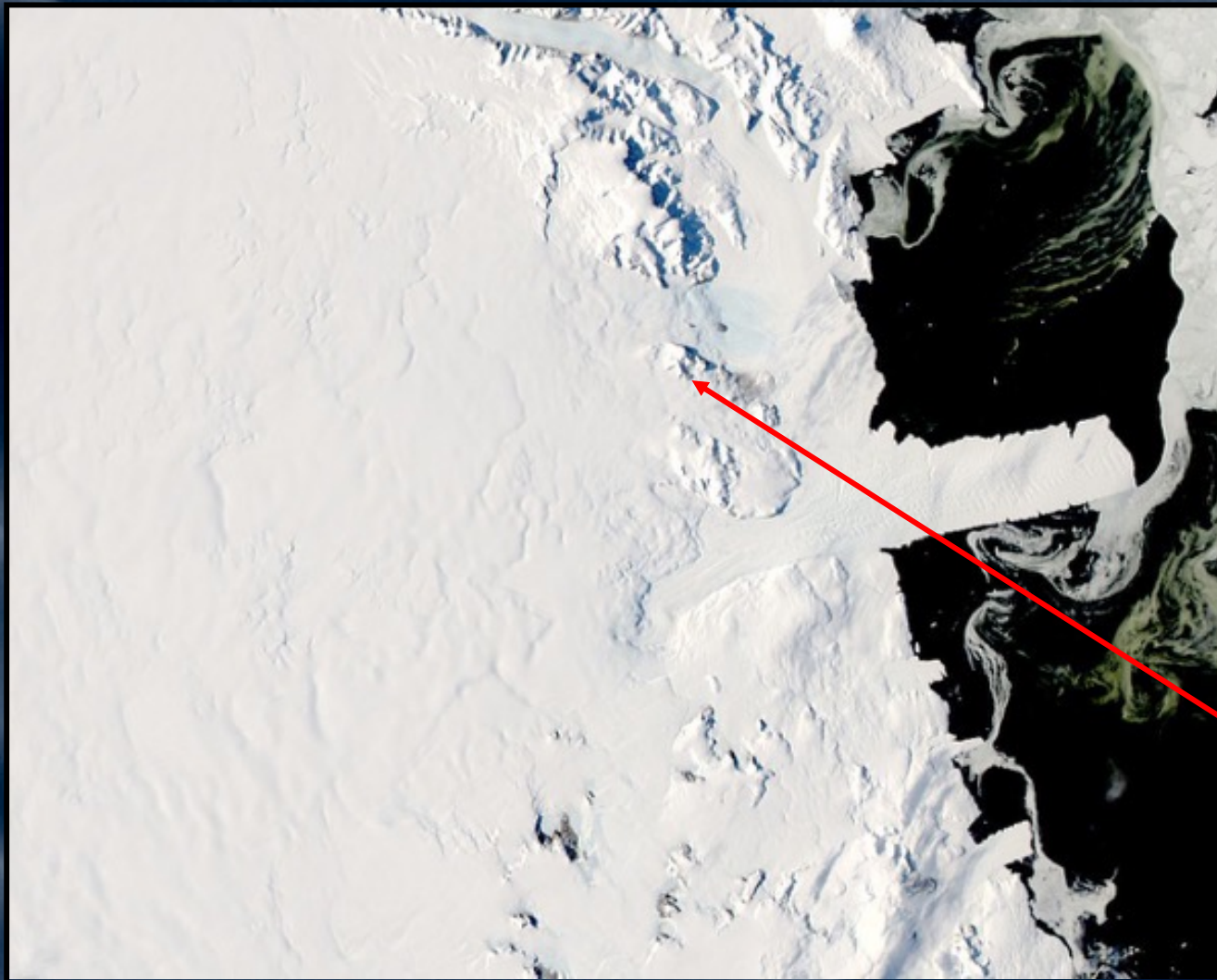
B no drift

C light blowing

D heavy blowing



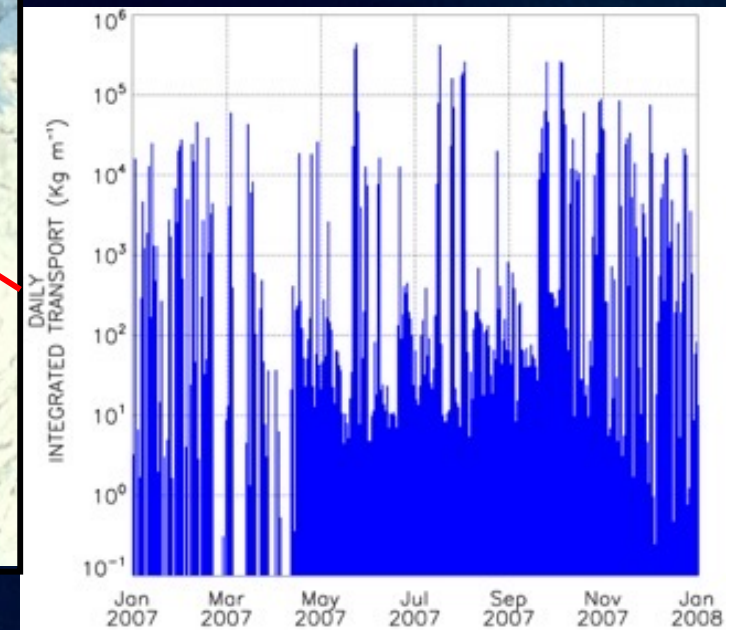
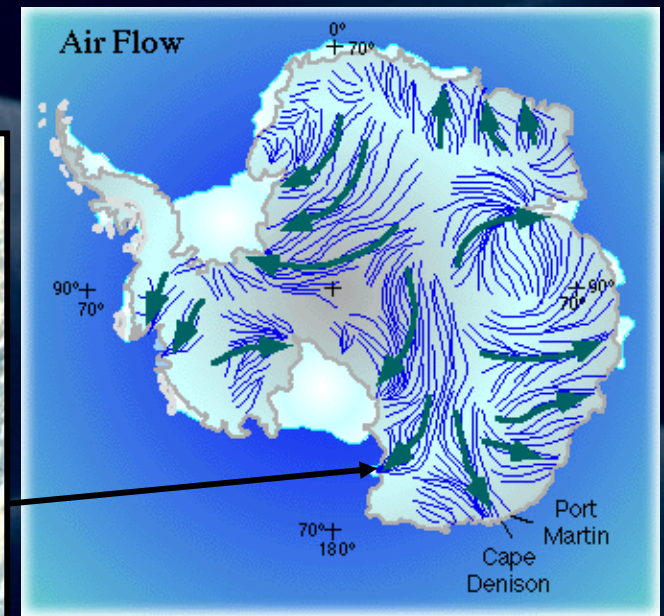
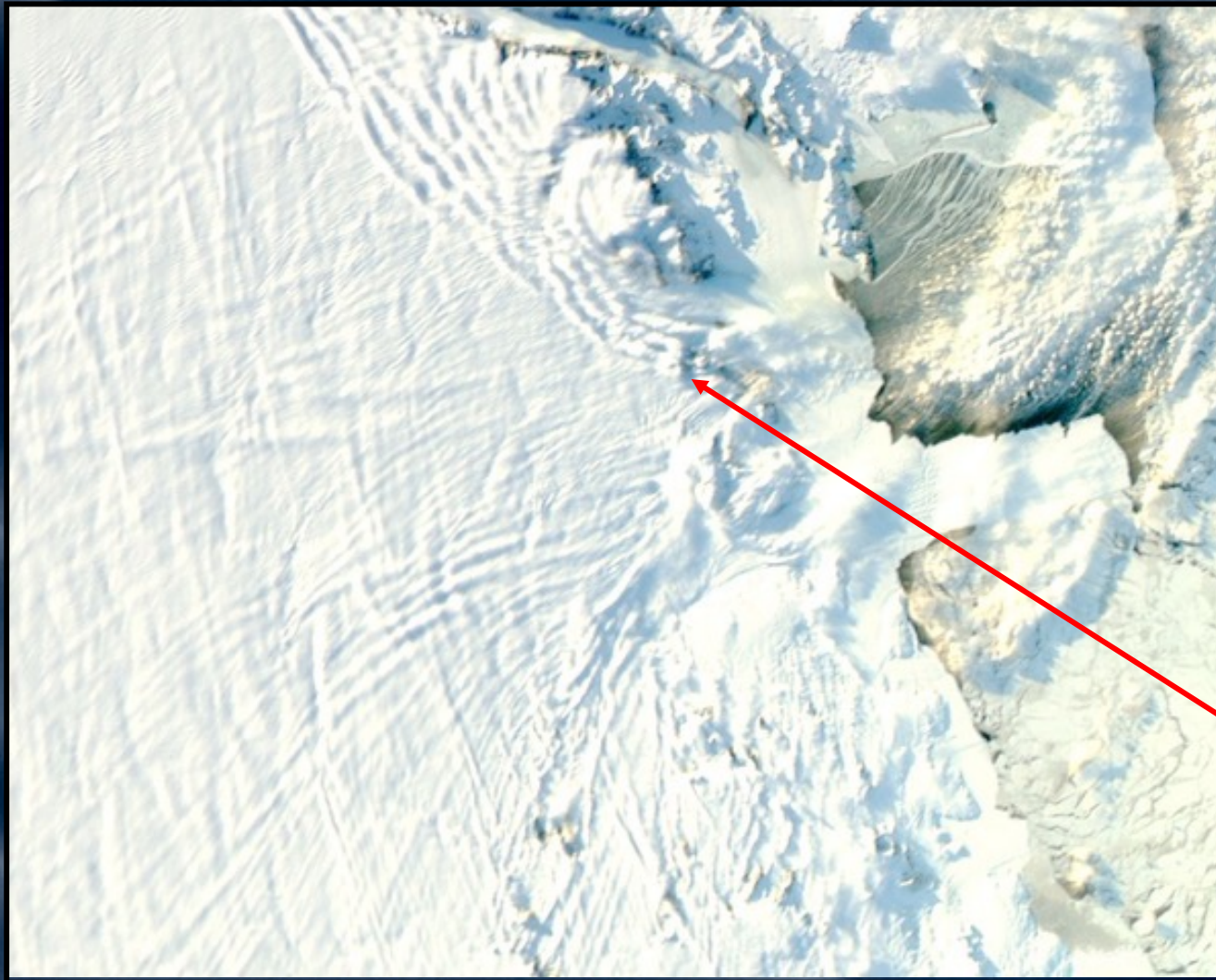
SNOW EXPORT DIRECTLY INTO THE SEA



Wind transport about $\text{Mton m}^{-1} \text{yr}^{-1}$
Precipitation about $200 \text{ kg m}^2 \text{yr}^{-1}$
SMB close to zero

(Scarchilli et al., 2010)

SNOW EXPORT DIRECTLY INTO THE SEA



Wind transport of snow occur 90% of time. Blowing occurs at 30% of time up to elevation of 50-100 m. Wind exports into the polynya about 3 Mton km⁻¹, coming from 50-100 km from coast (Scarchilli et al., 2010).

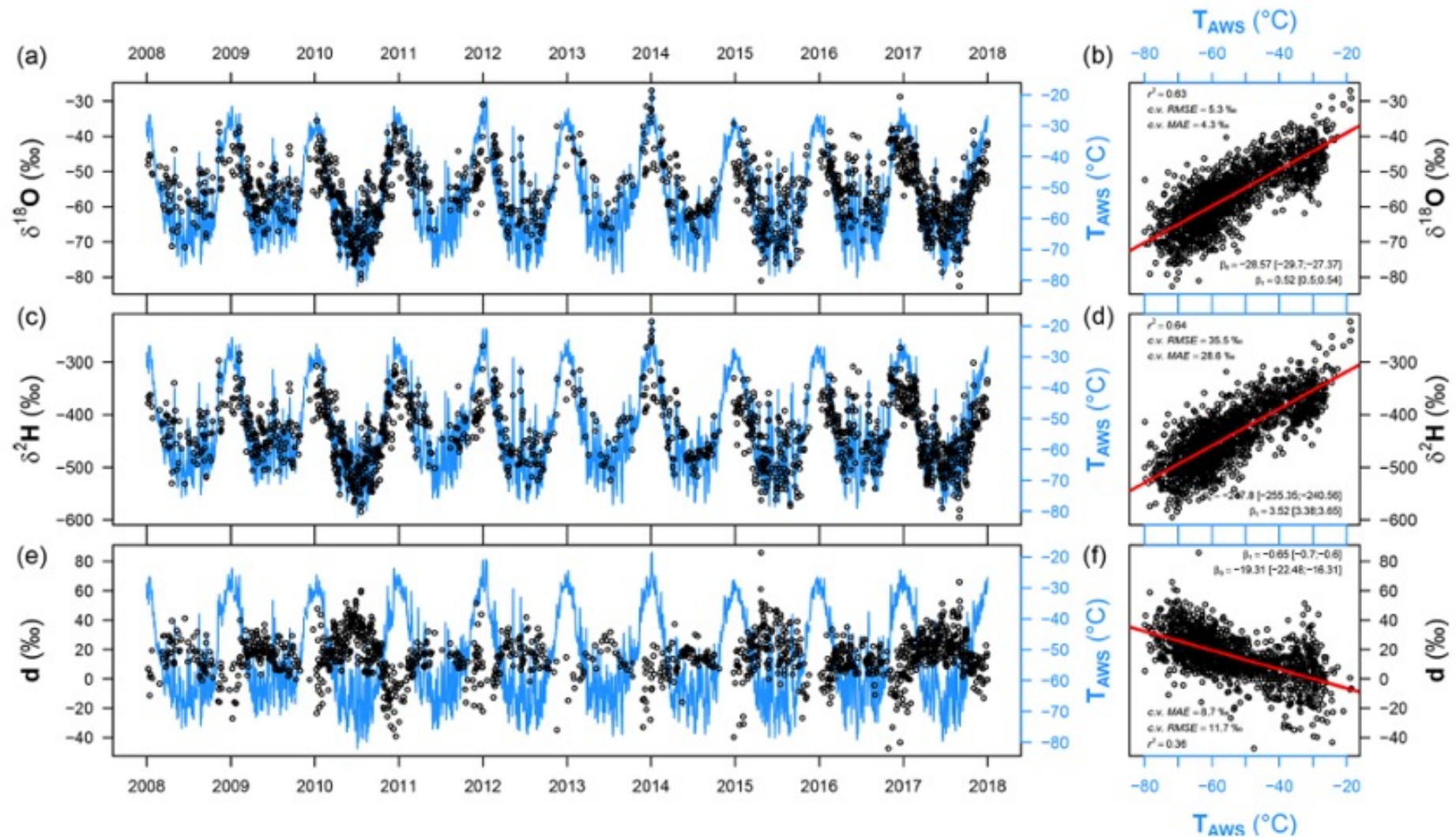


Figure 1. (a, c, e) Time series of the daily averaged air temperature (blue lines) and the isotopic composition of snow (black dots) measured at Concordia during 2008–2017. (b, d, f) Linear regressions between the isotopic composition of snow and air temperature.

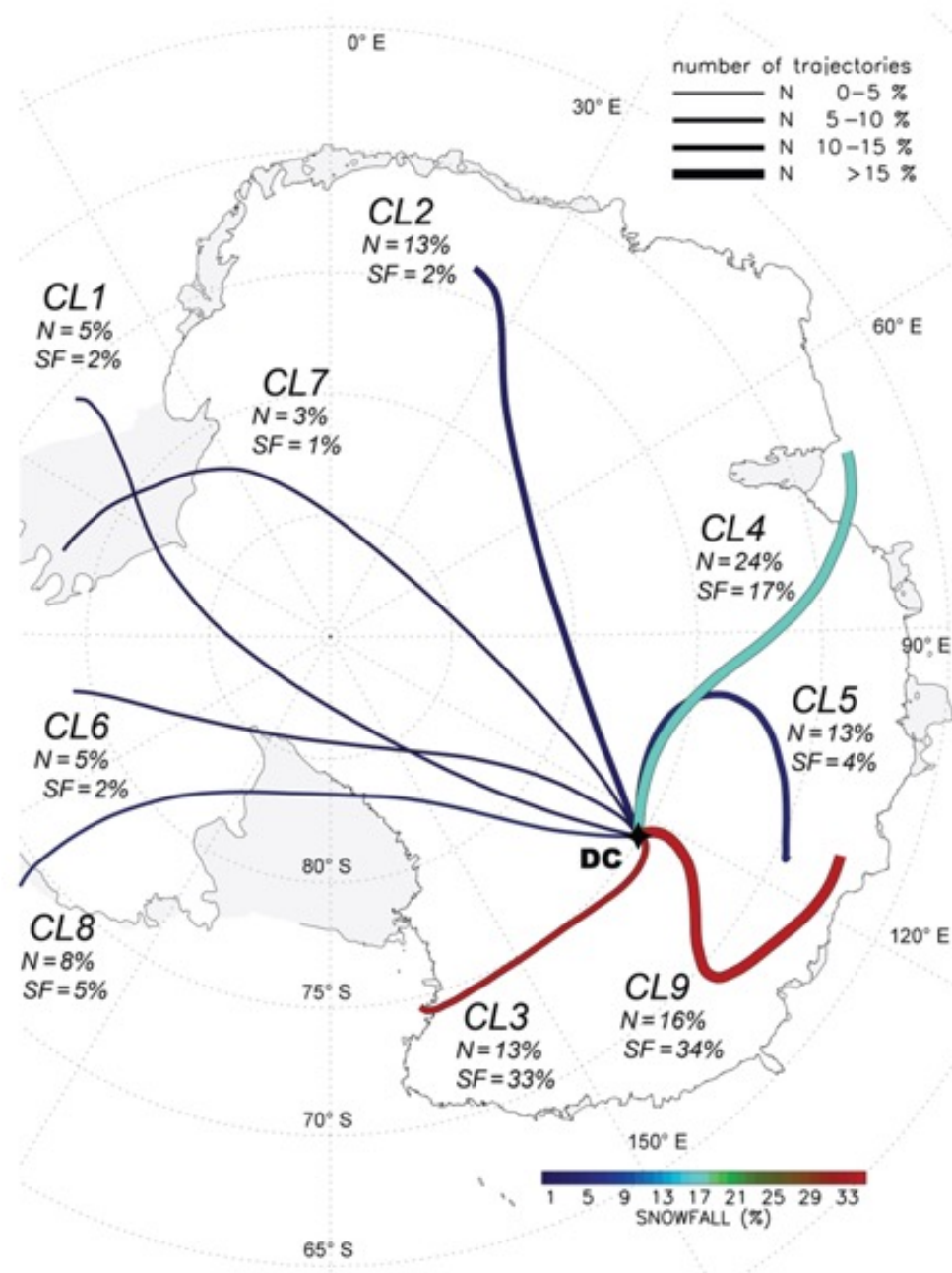


Figure 5. Back trajectory pathway representative for each cluster (CL1 to CL9) in the cluster analysis. Label shows the percentage of total snowfall and number of trajectories at DC related to each cluster in the period 2006–2012. The color code is the snowfall amount (%) in each cluster and line thickness represent back trajectories number (%).

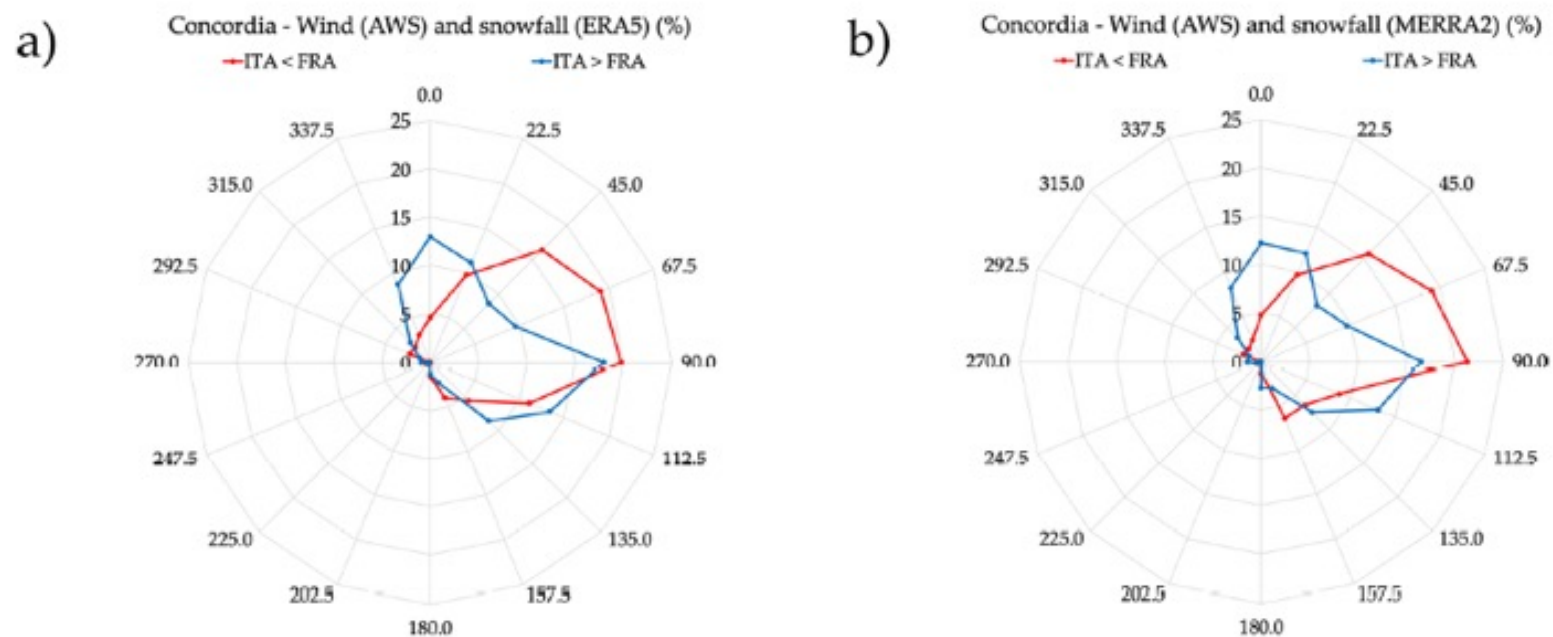


Figure 12. Direction of the wind near Concordia Station during snowfall events; the “ITA < FRA” and “ITA > FRA” cases are considered (see the text for the details). Wind data taken from the Italian AWS of Concordia and snowfall from (a) ERA5 and (b) MERRA2.



Grazie per la vostra attenzione

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