Cal/val measurements for CryoSat along the EGIG line, Greenland

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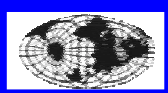
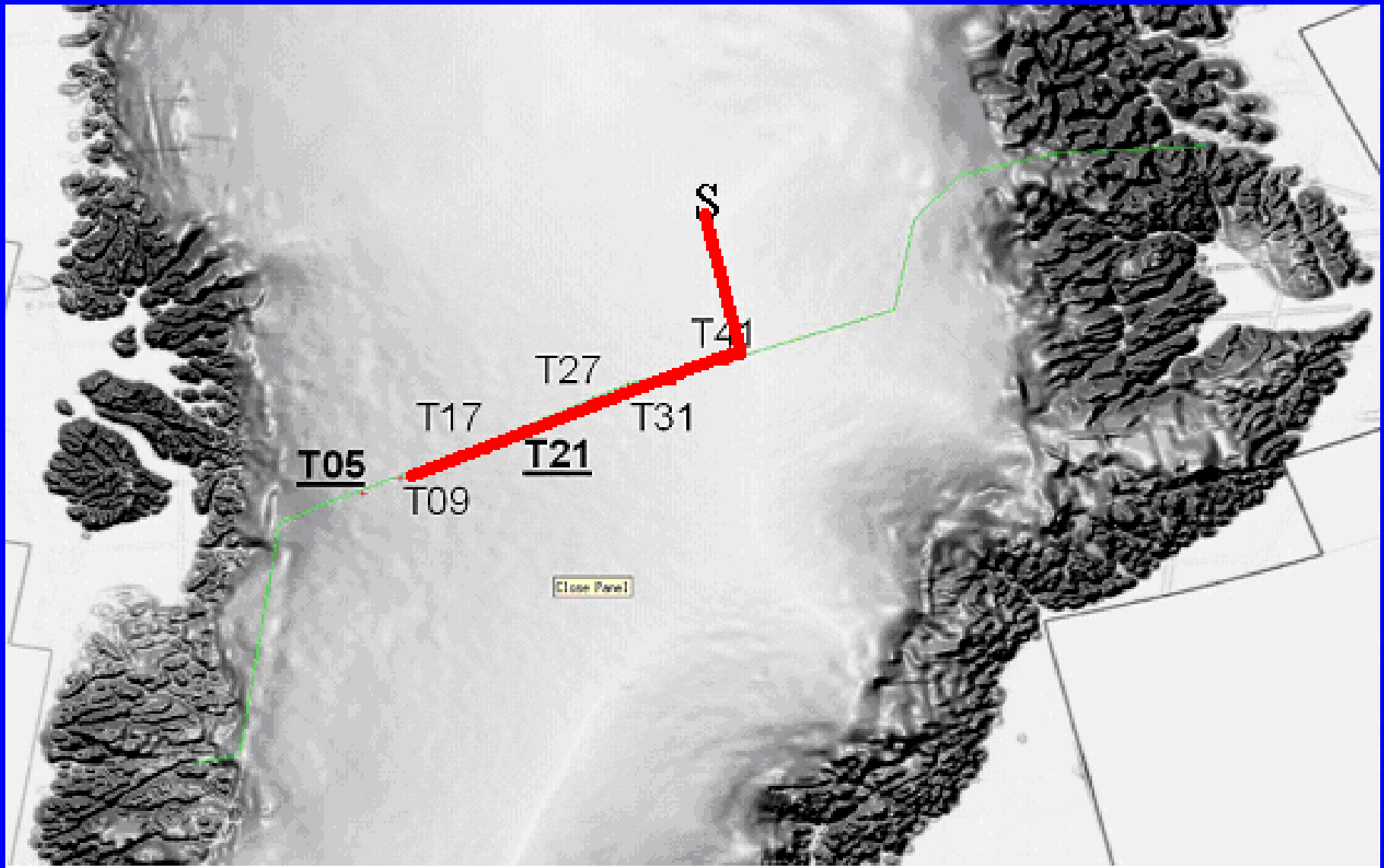
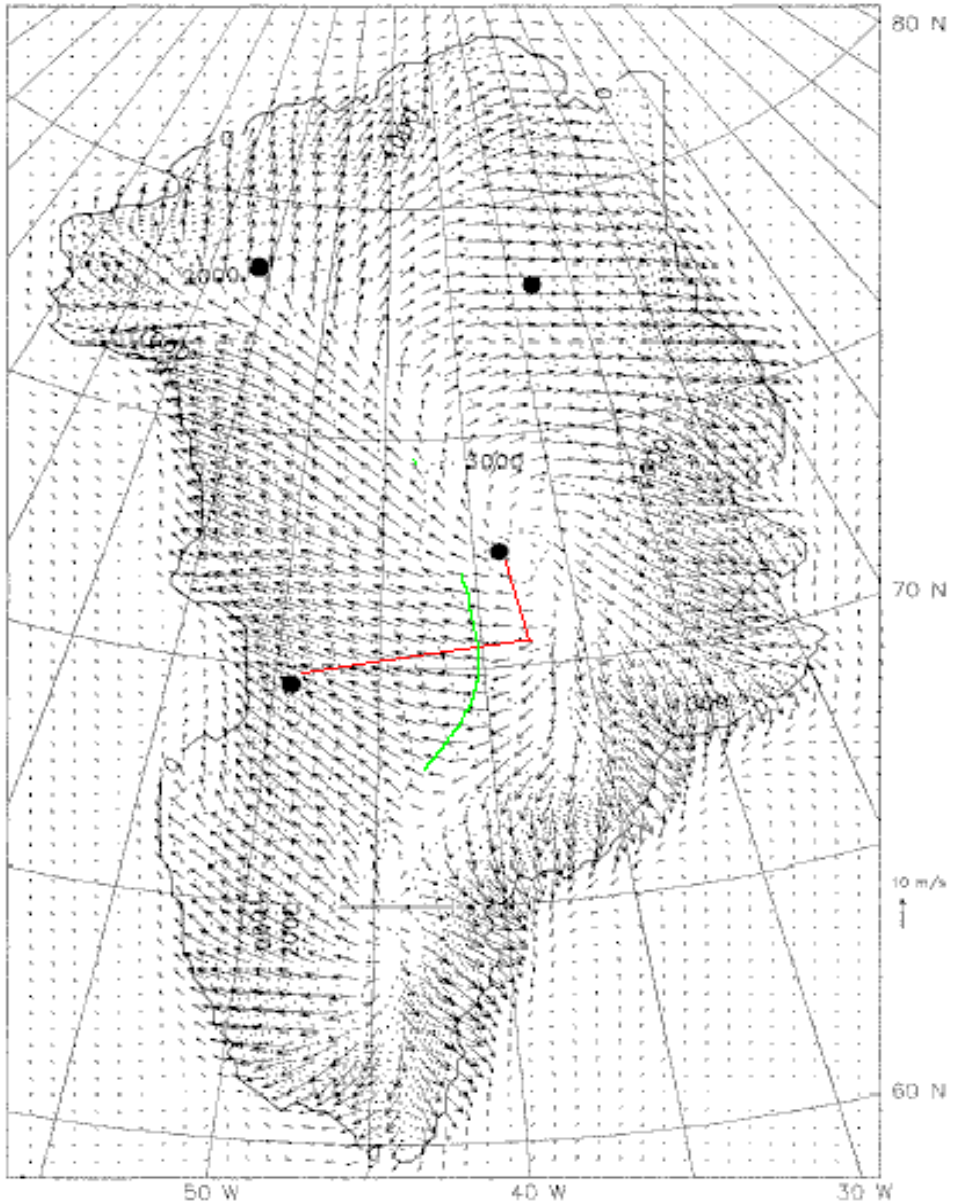


Objectives of land ice teams

- To measure those properties of near surface snow and firn which affect the e. m. response at the time of ASIRAS over-flights
- To determine the temporal and spatial covariance of mass accumulation fluctuations
- To investigate the e.m. response using VHB ground-based radar



The EGIG line over the Greenland Ice Cap



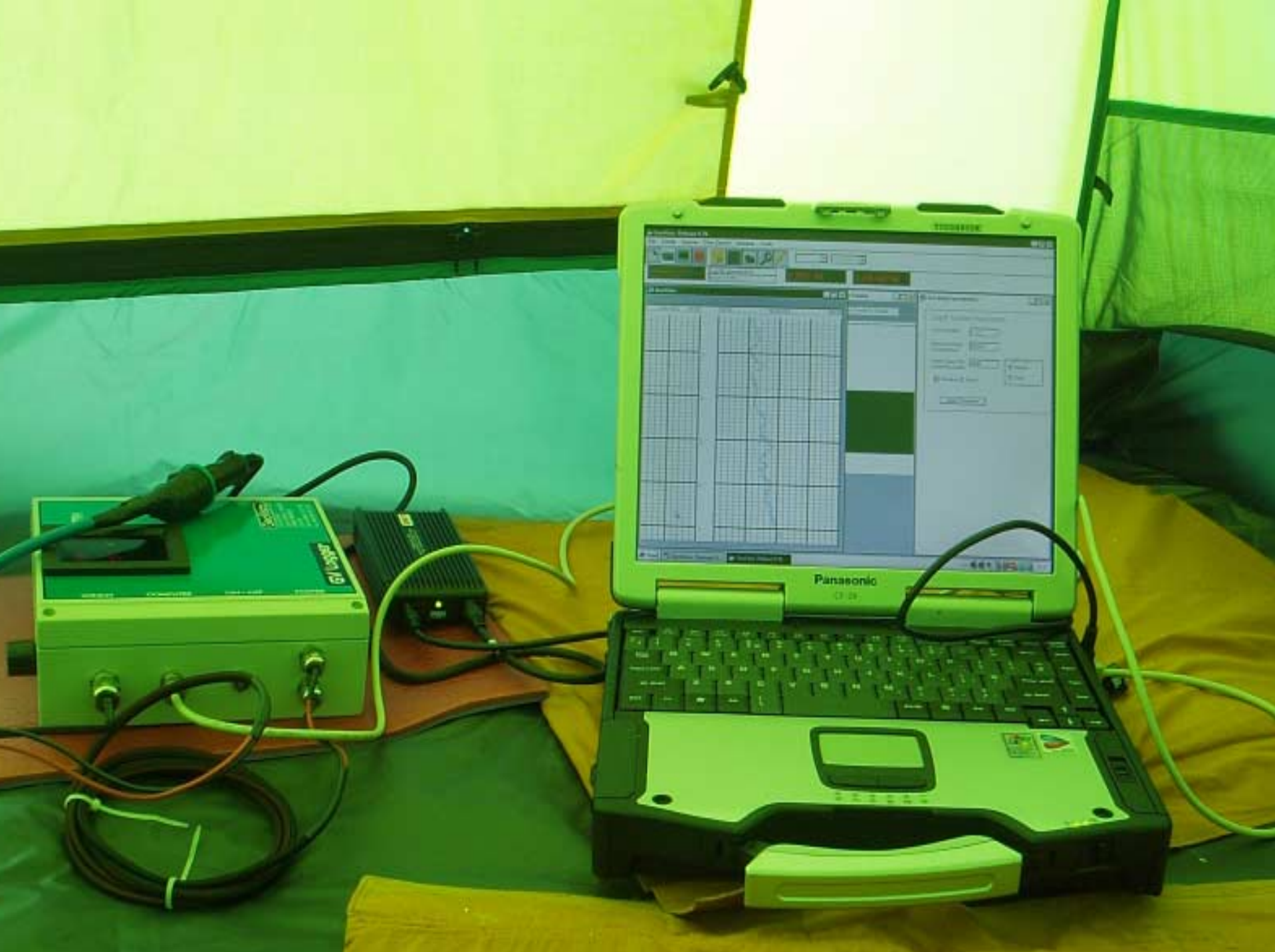
Katabatic wind field (modelled)

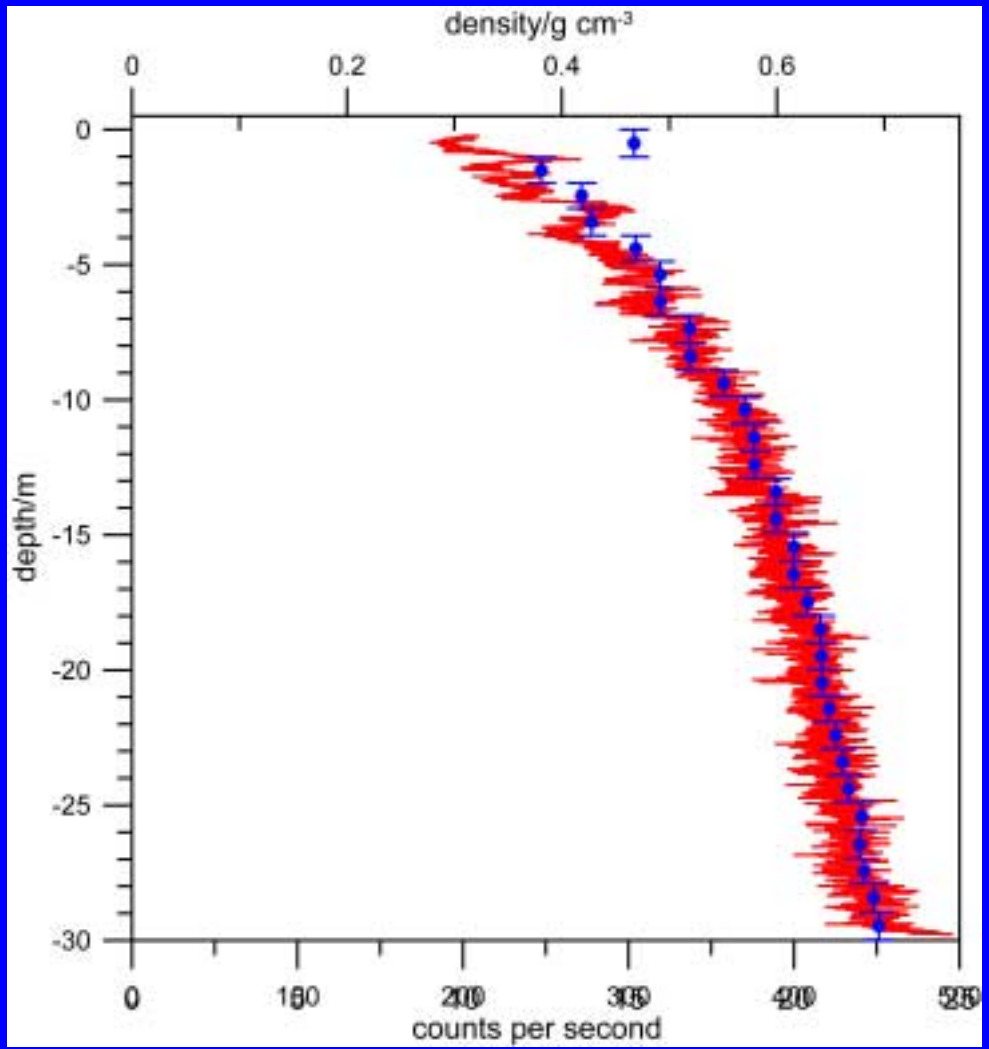
The arrows show wind speed at 12m at night during summer

Below T31 wind speed is greater than 8 m/s

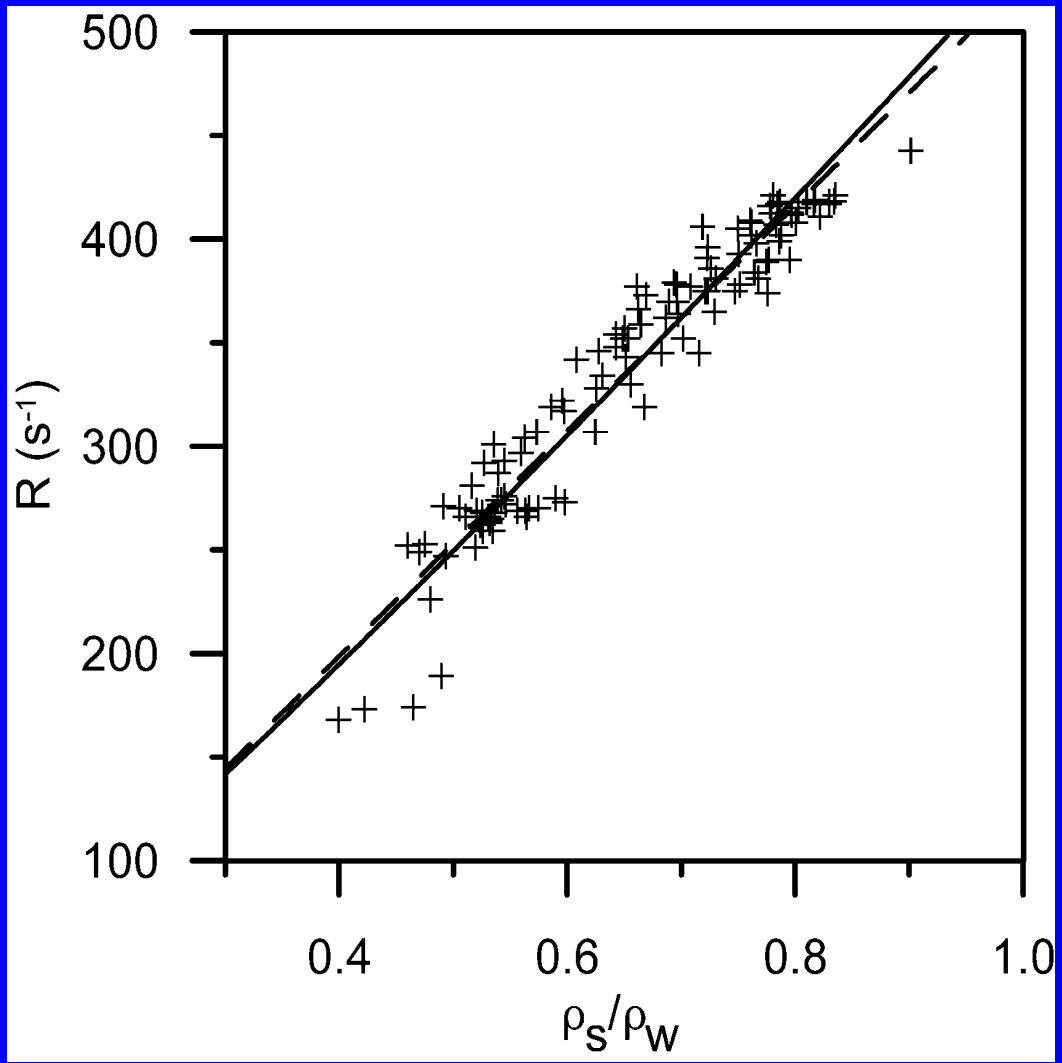

T21


TYPE A
UN3332

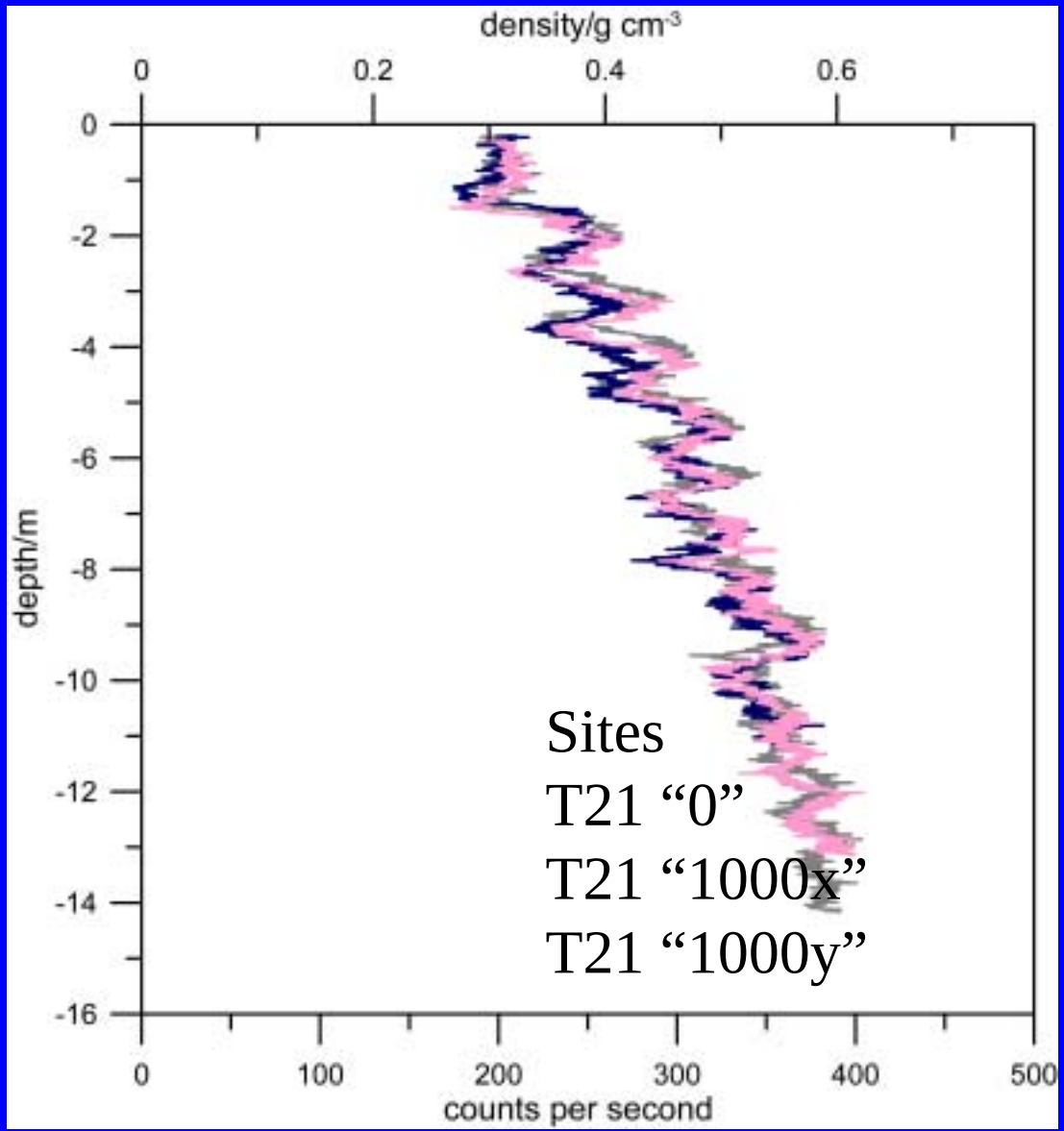

Panasonic



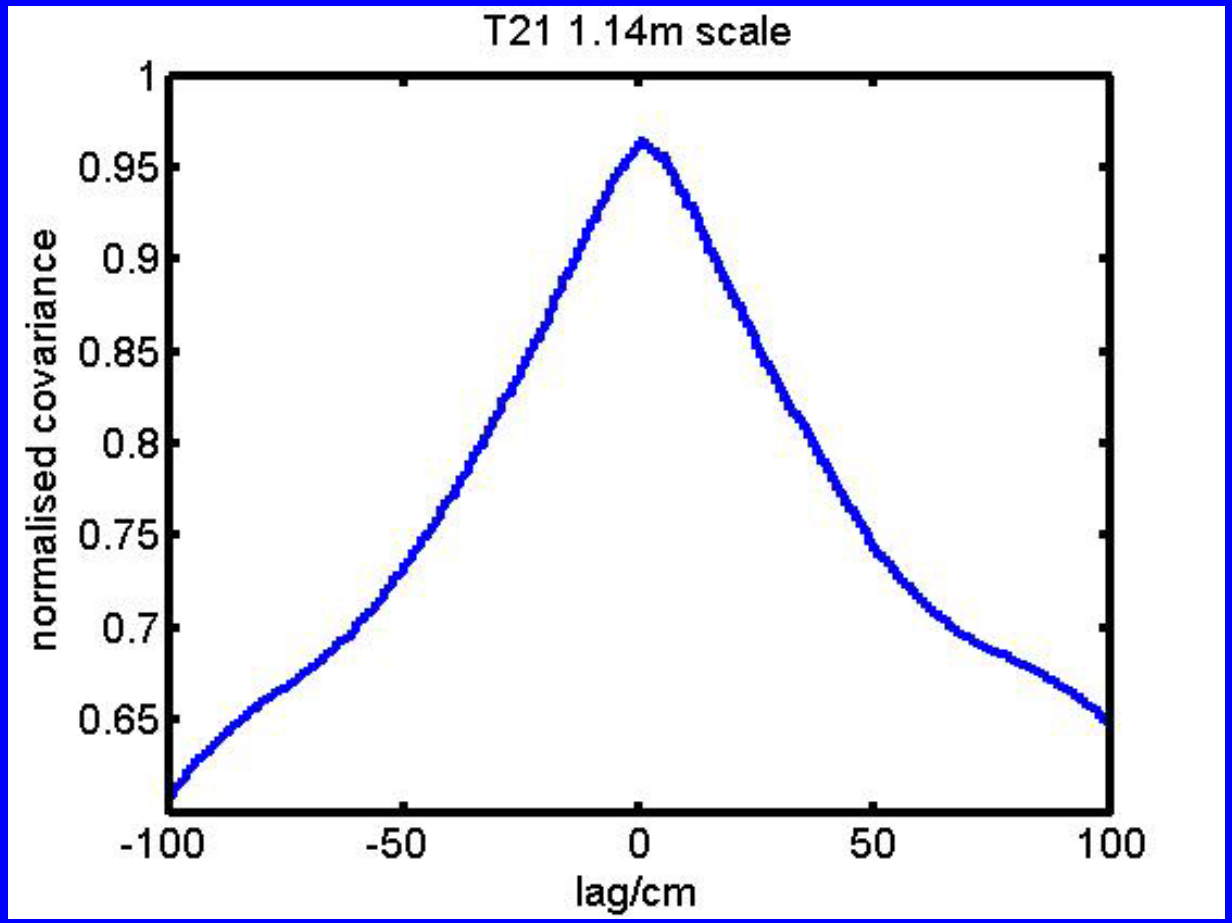
Neutron probe data at 1 cm intervals (red) density of core segments (blue)



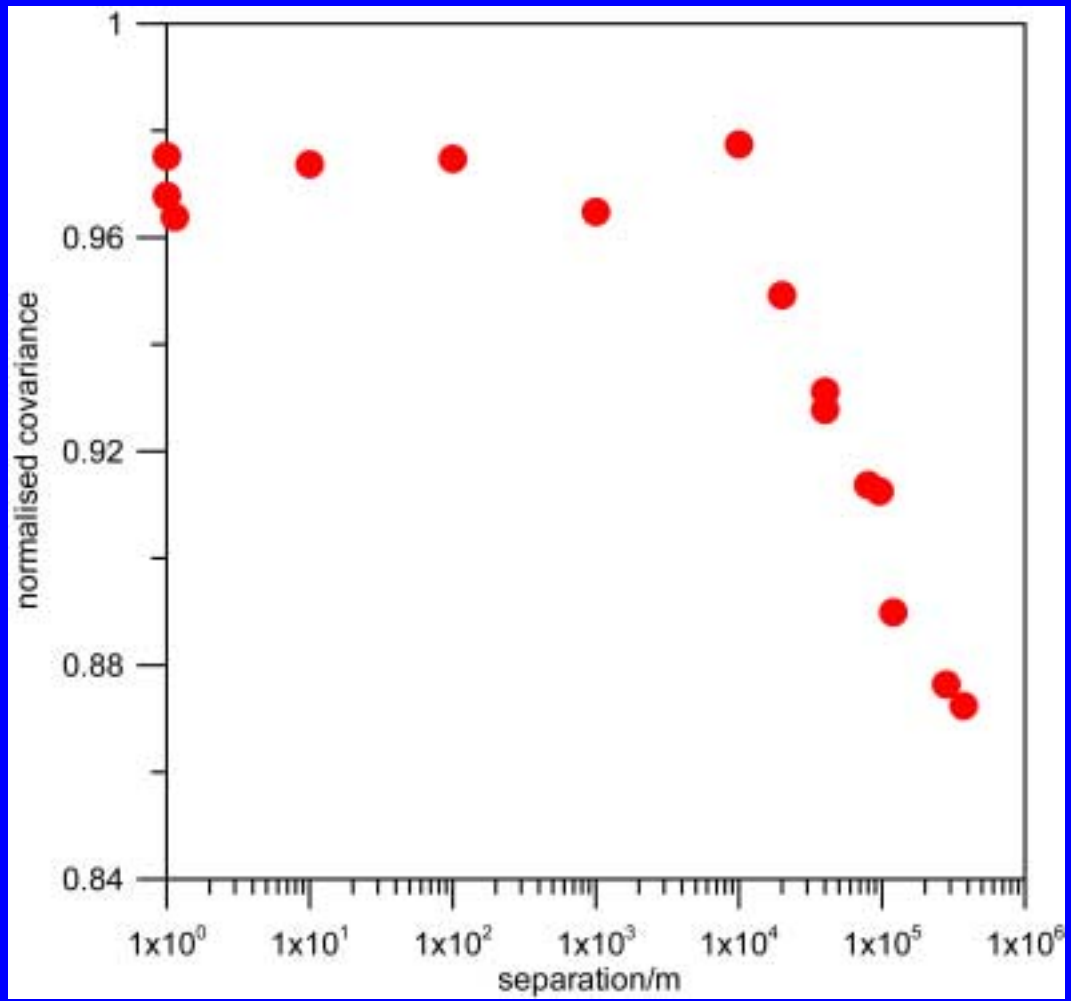
Neutron probe calibration using ice core data. Theoretical analysis and lab experiments to extend equation for low densities are in progress



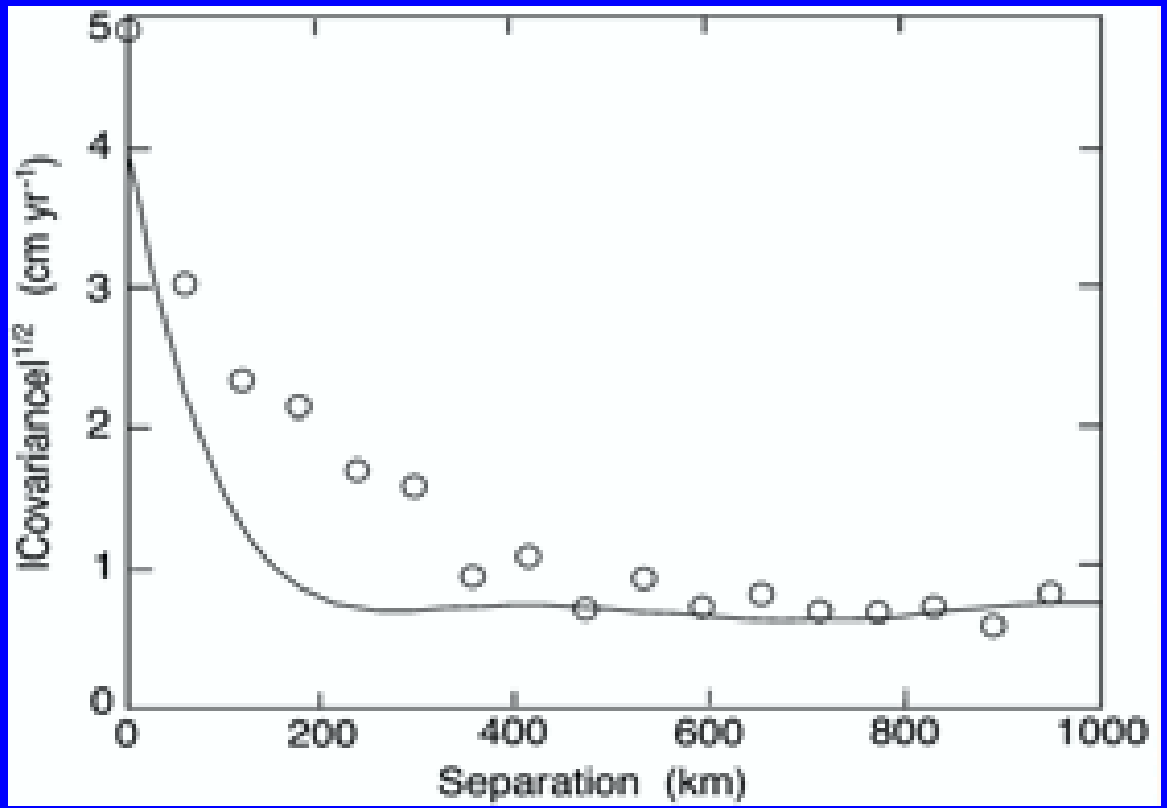
The spatial variation of density on the 1 km scale



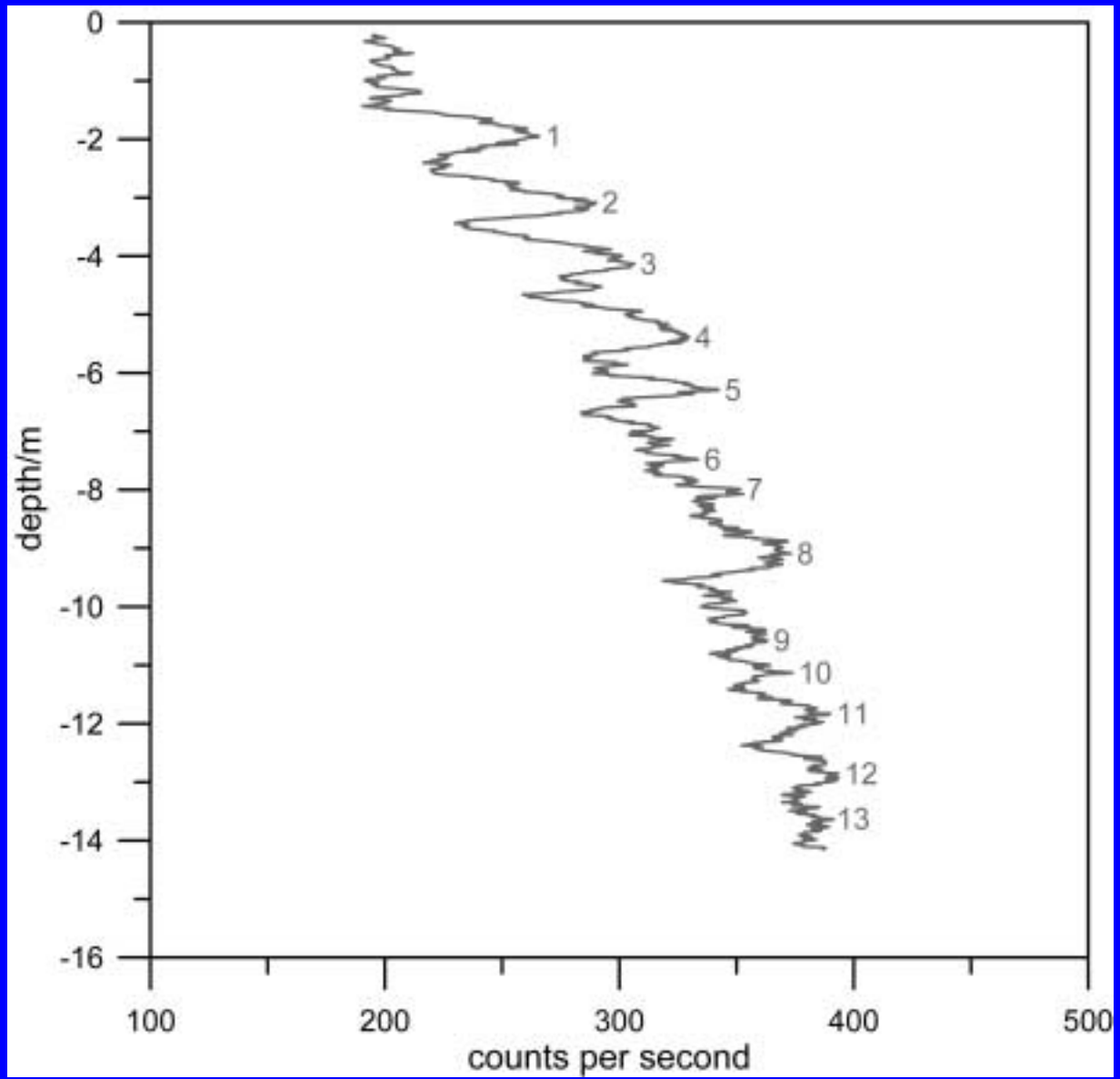
The normalised covariance between two density profiles as a function of lag



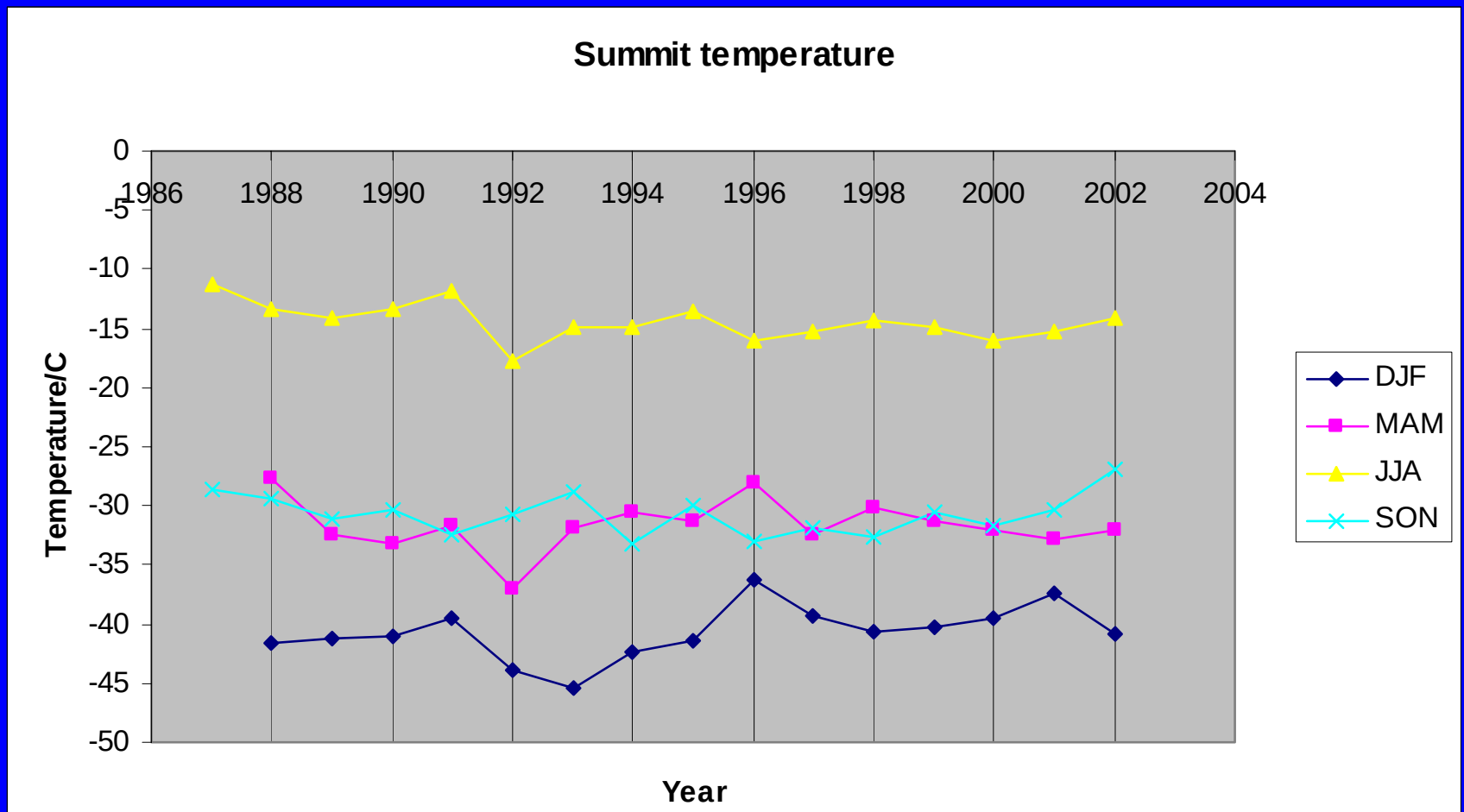
Normalised co-variance of density fluctuations as a function of separation of sites.
Range is 1m to 1000 km



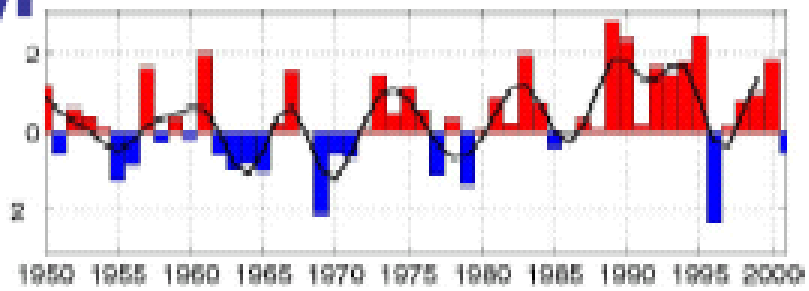
The measured covariance (o) and estimated error covariance (solid line) of the trend in Antarctic Ice Sheet elevation 1992-1996 measured by the ERS altimeters. (from Wingham *et al*. 1998)

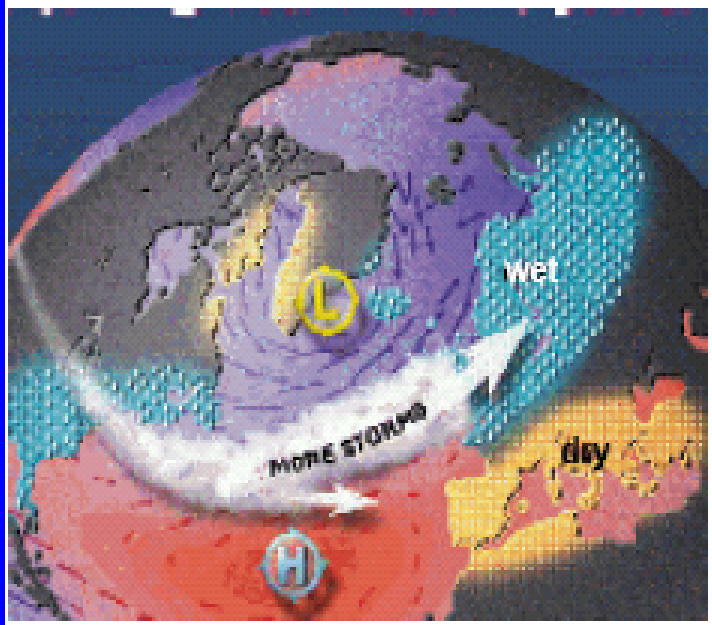


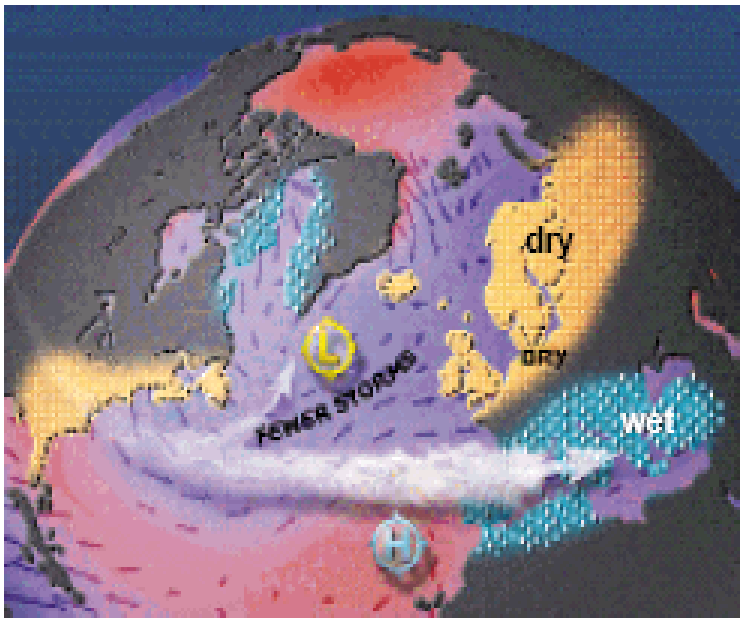
Annual peaks in density can be identified peak 8 = 1996


Summit temperature
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
Temperature/C
Year
DJF
MAM
JJA
SON

Natural variability: the North Atlantic Oscillation

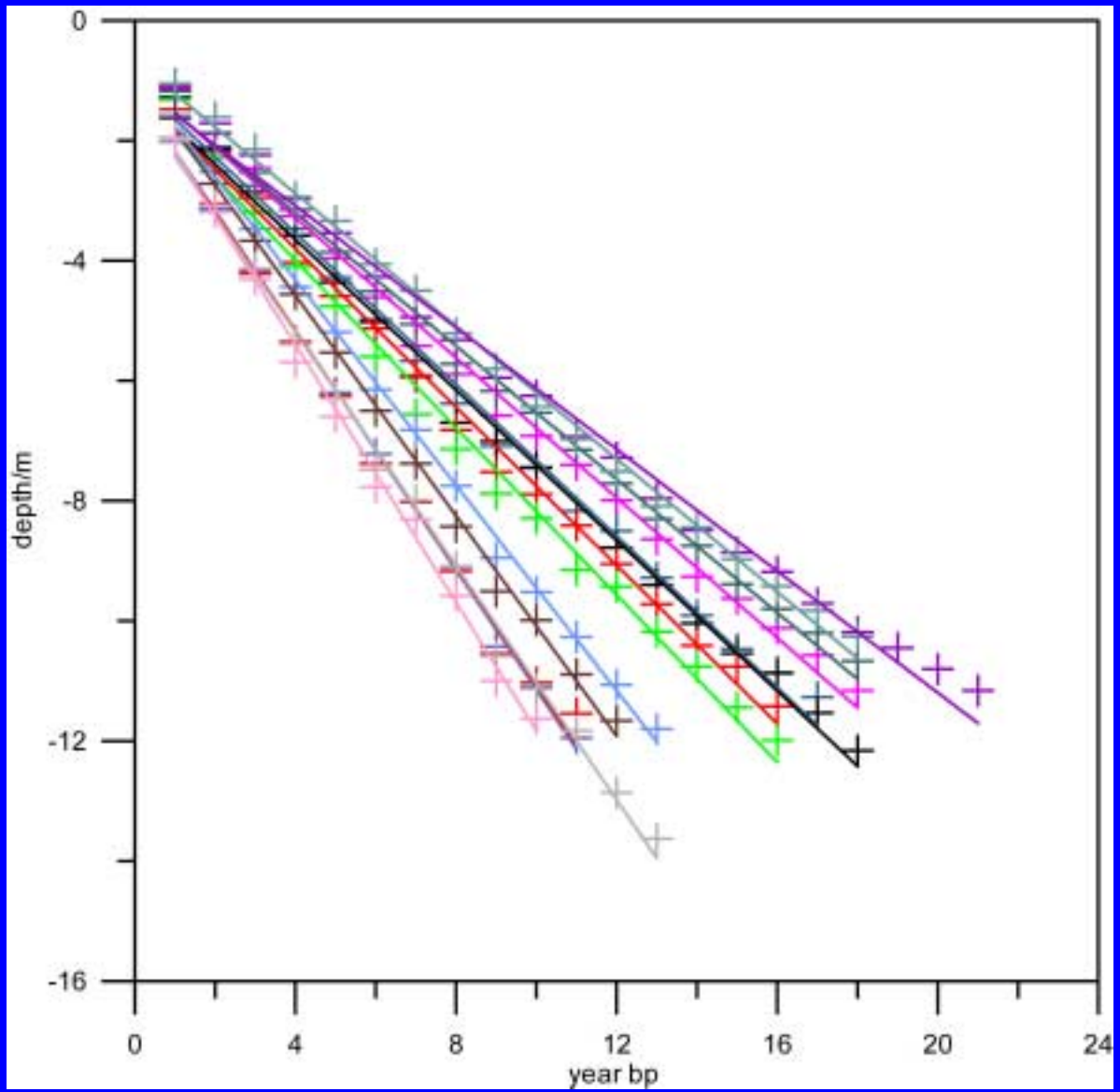




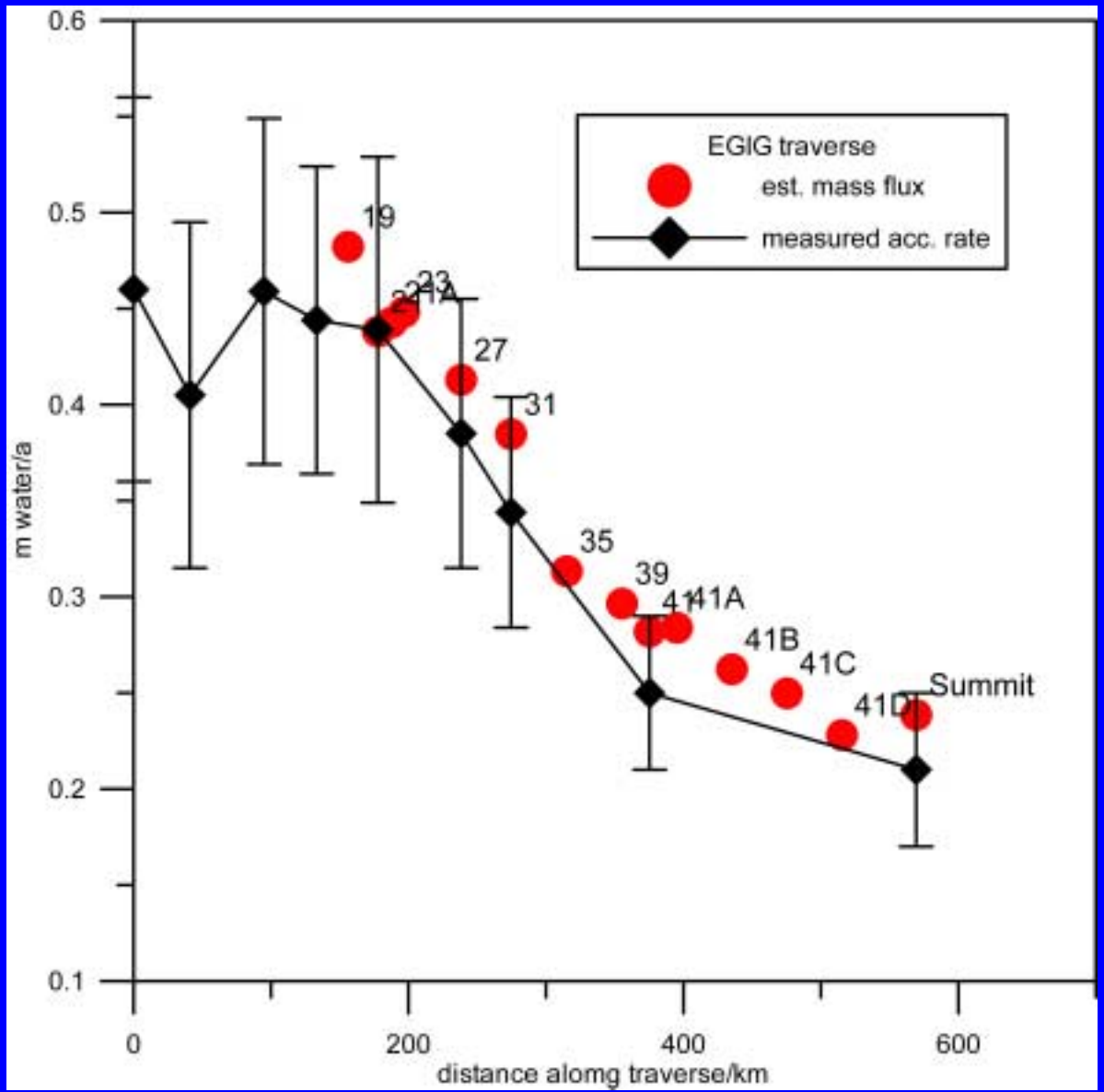


Positive NAO index Source: M. Visbeck Negative NAO index

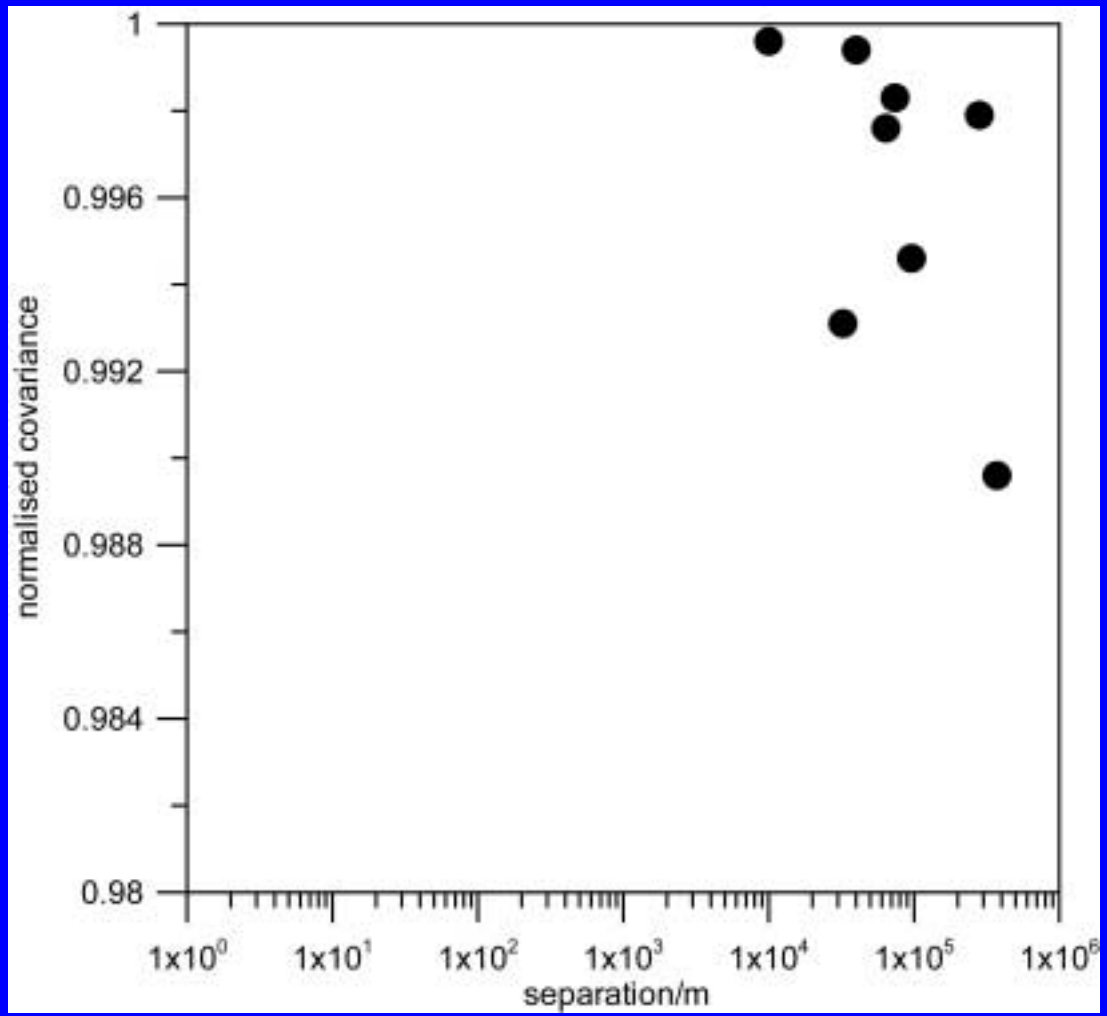
Nansen Environmental and Remote Sensing Center



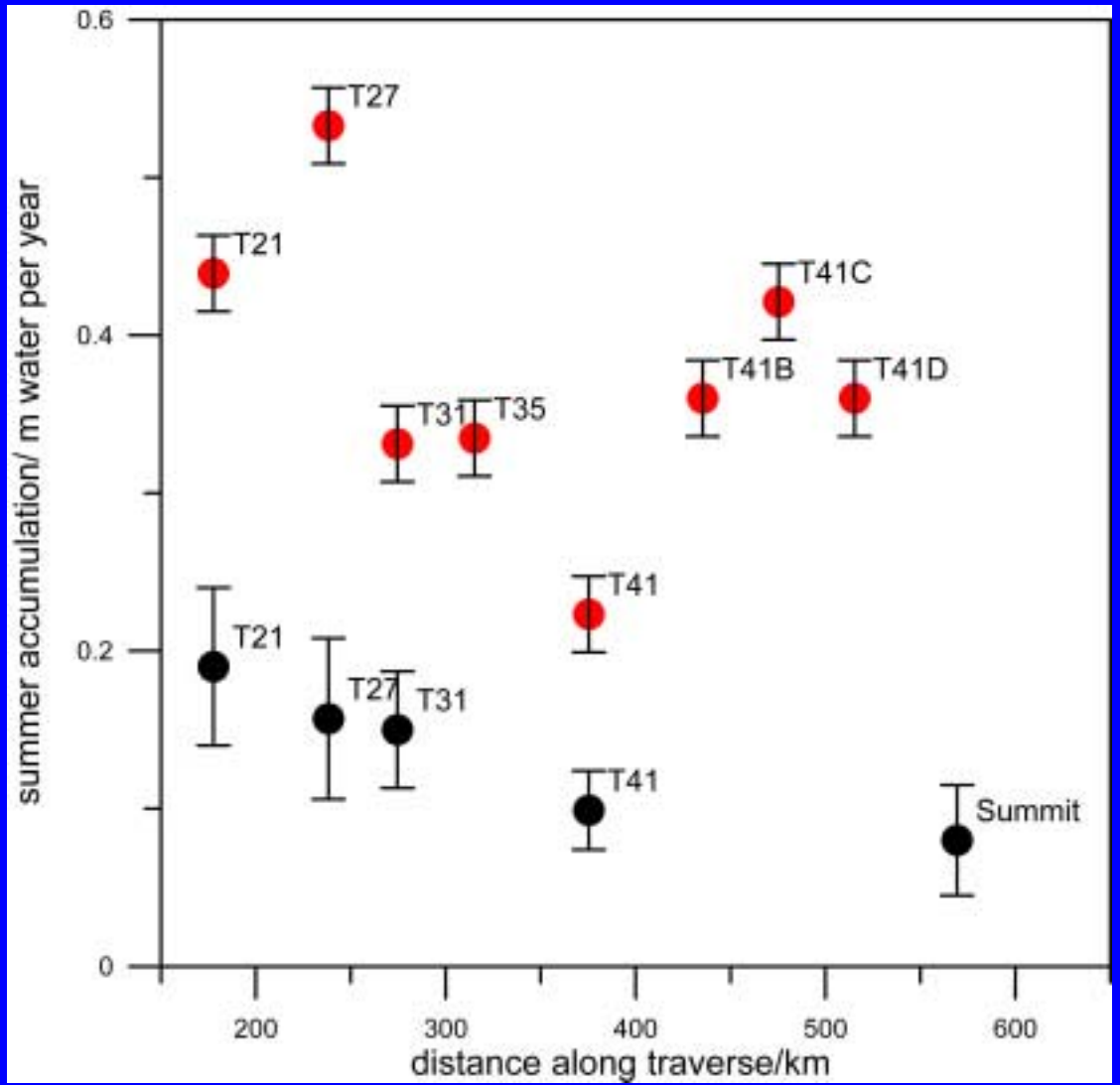
The average downward velocity of winter peaks decreases with altitude



The mass flux estimated from the average downward velocity is consistent with the mean annual accumulation rate from firn cores

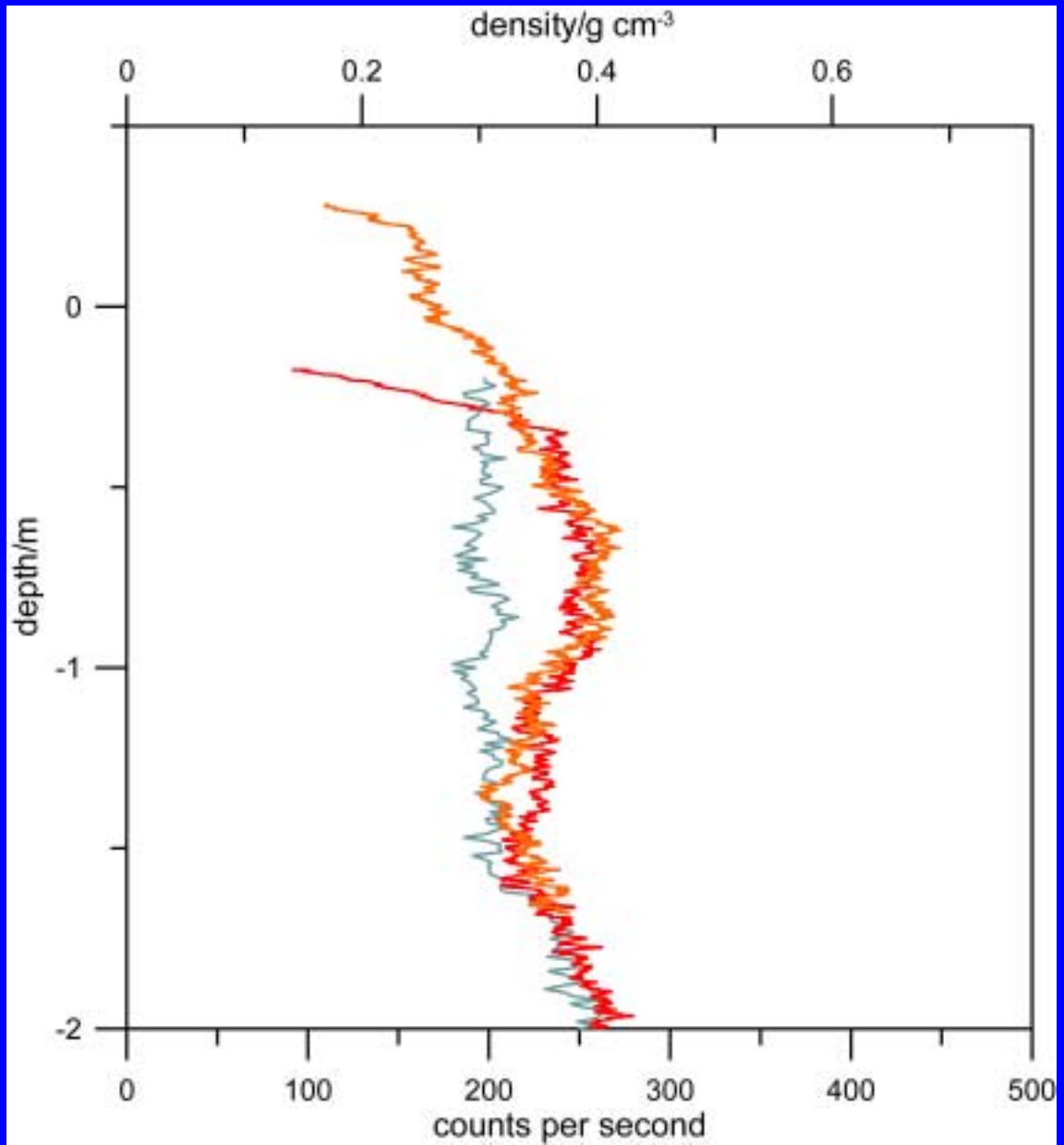


Normalised covariance of surface height fluctuations remains high up to 400 km scale



Accumulation rate over100 d in 2004 (red) is greater than summer accumulation over 183 d from firn cores taken in 1990 (black)


Surface hoar at T31



Density profiles at T21

7th May and 13th Sept show densification of the winter layer and the addition of a low density summer layer

Results so far

- Ground truth measurements have been obtained at T21 at the time of ASIRAS over-flights in spring and autumn
- Density profiles have been measured over a wide area in spring and autumn
- Mean annual accumulation has been determined from the density profiles
- summer accumulation has been determined from stake measurements

In progress

- Improve neutron probe calibration equation
- Compare ground data with ASIRAS data
- Calculate covariance of height and mass fluctuations
- Radar and density work on Devon Island 2005
- Repeat traverse in 2006