



Snowdrift event detection at Princess Elisabeth station

Comparison of
Ground-based and spaceborne remote sensing



How much snow is transported?

Surface mass balance (SMB) component

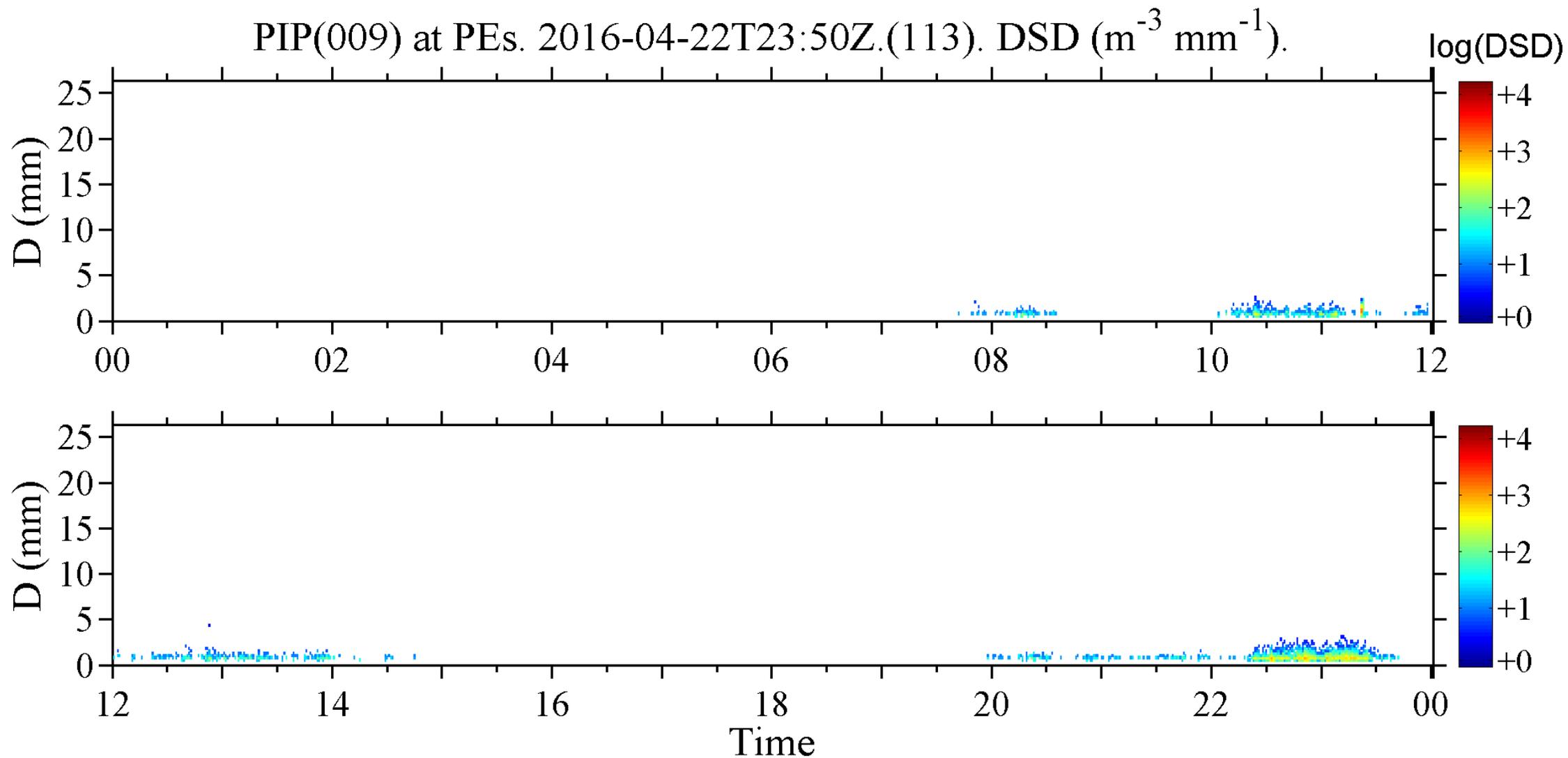
$$\text{SMB} = P_{\text{in}} + M_{\text{out}} + (S_{\text{out}} + S_{\text{d, out}}) + E_{\text{r,d}}$$



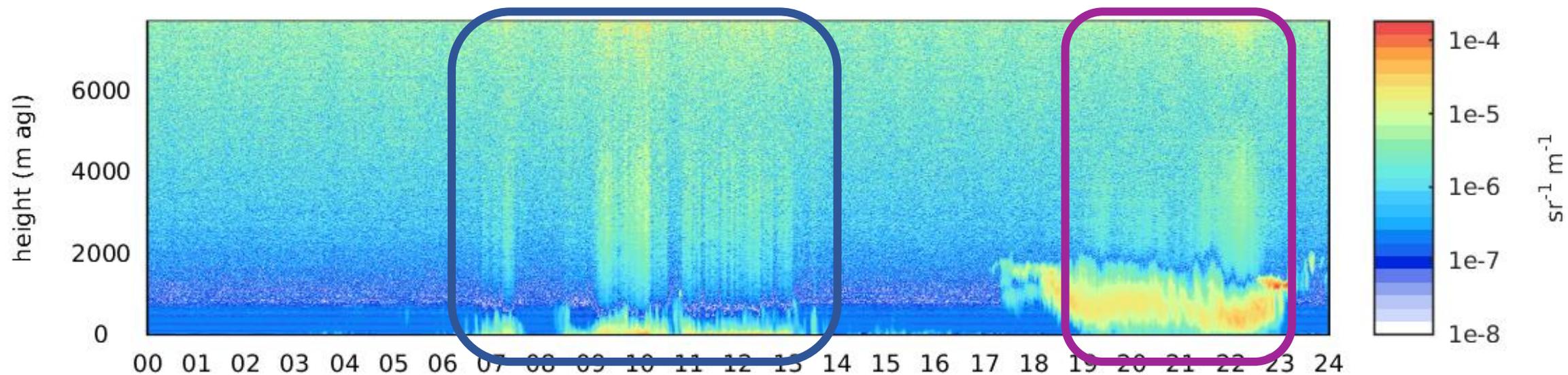
Webcam image
22.04.2015

Snowflake visualisation imager

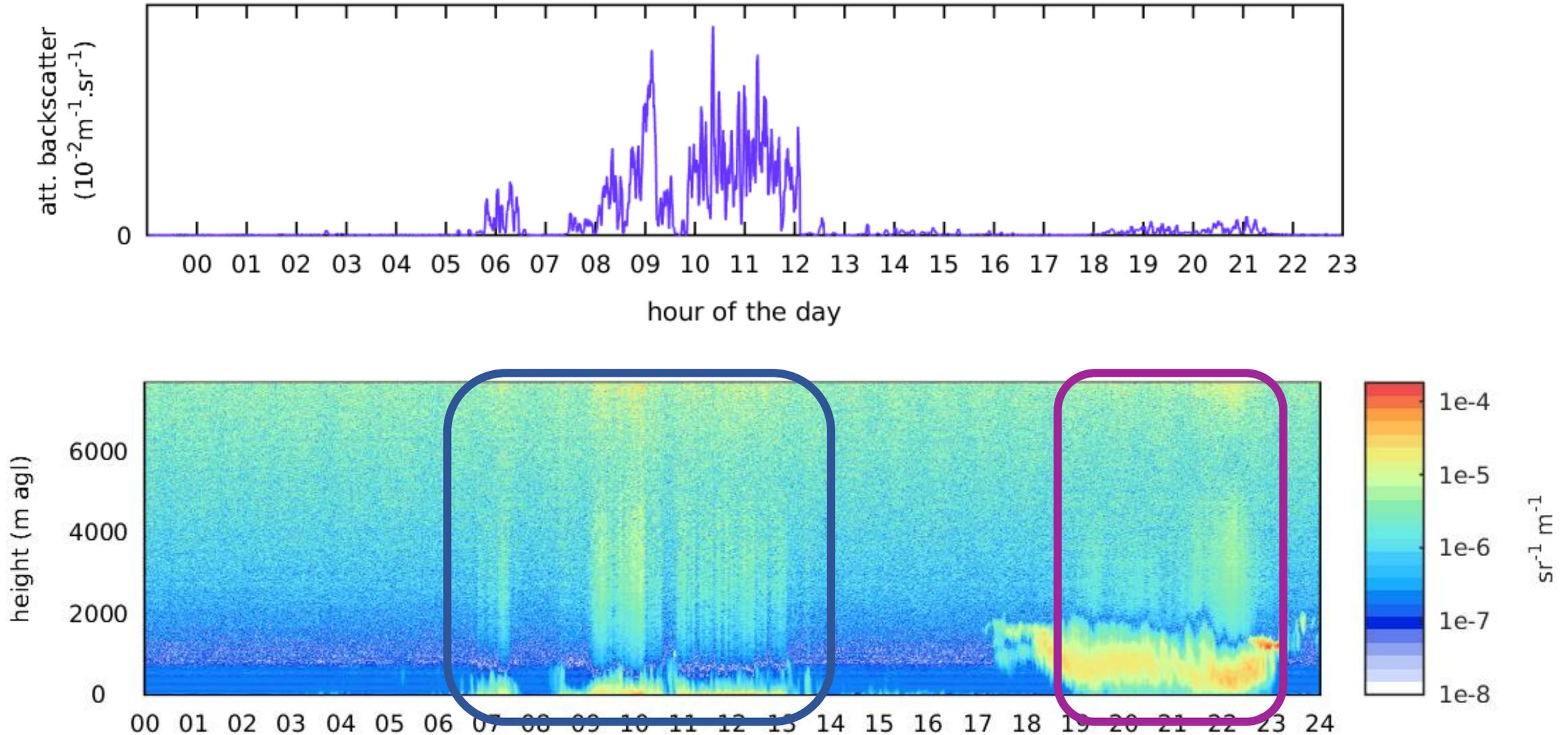
PIP(009) at PEs. 2016-04-22T23:50Z.(113). DSD ($\text{m}^{-3} \text{mm}^{-1}$).



Ceilometer attenuated backscatter

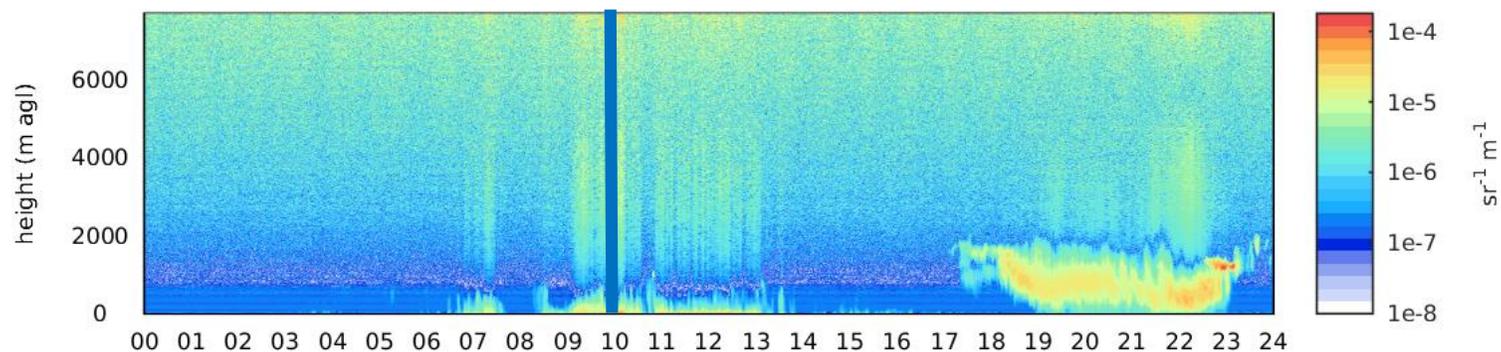
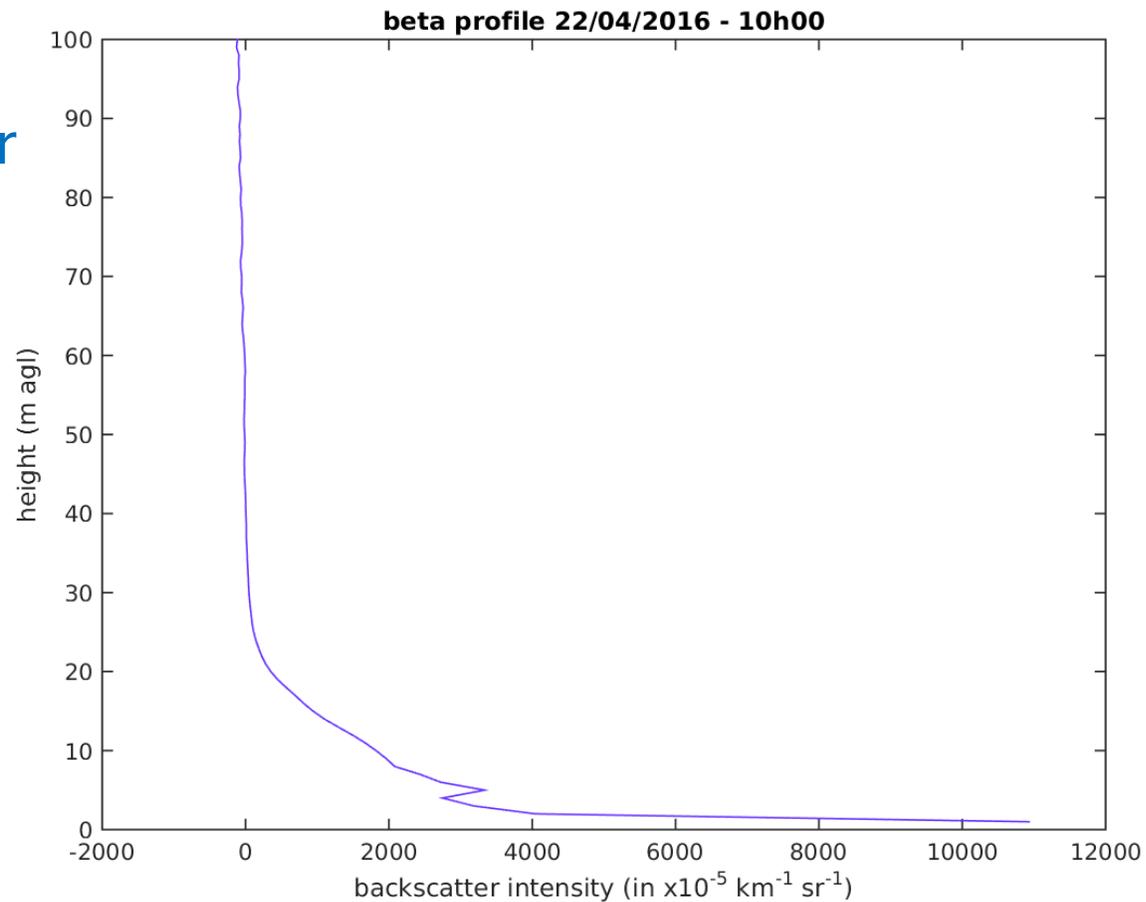


Ceilometer attenuated backscatter



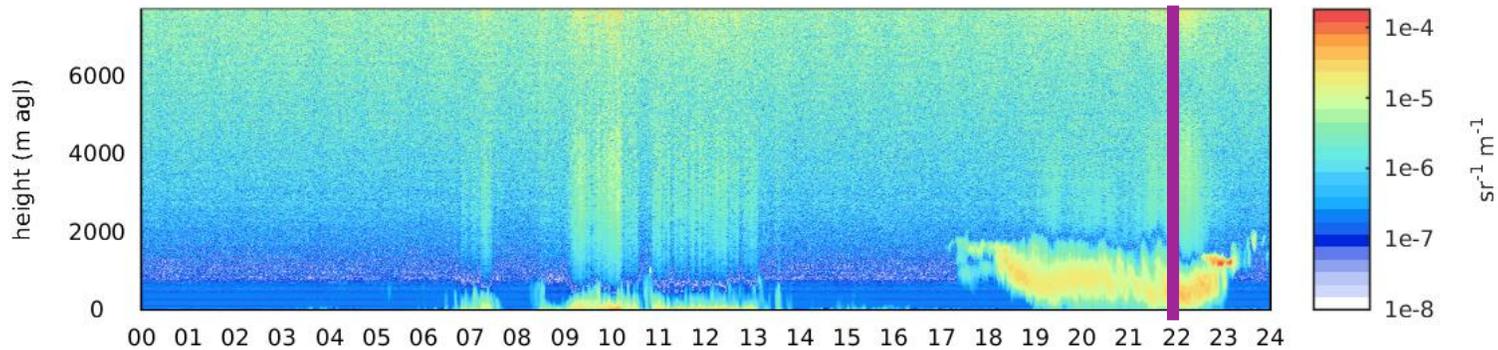
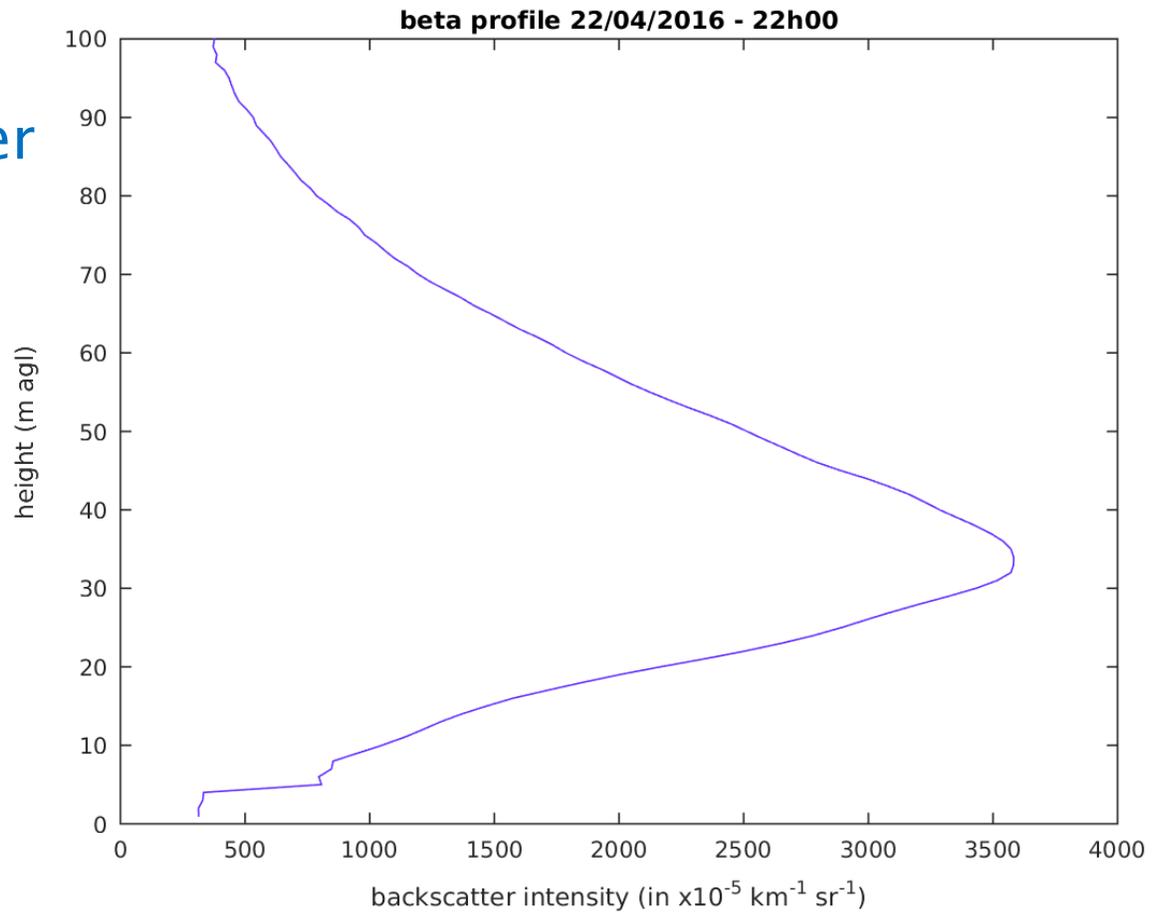
Ceilometer attenuated backscatter

blowing snow



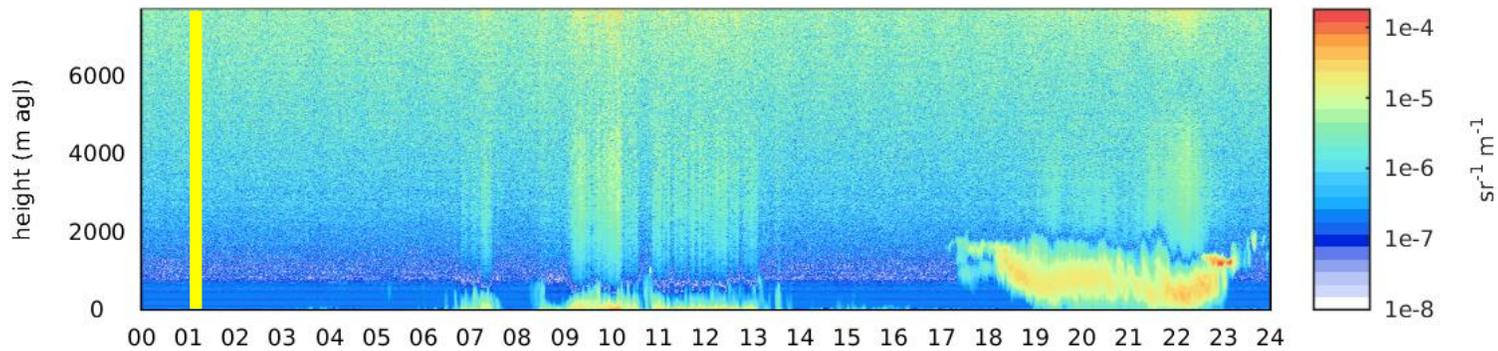
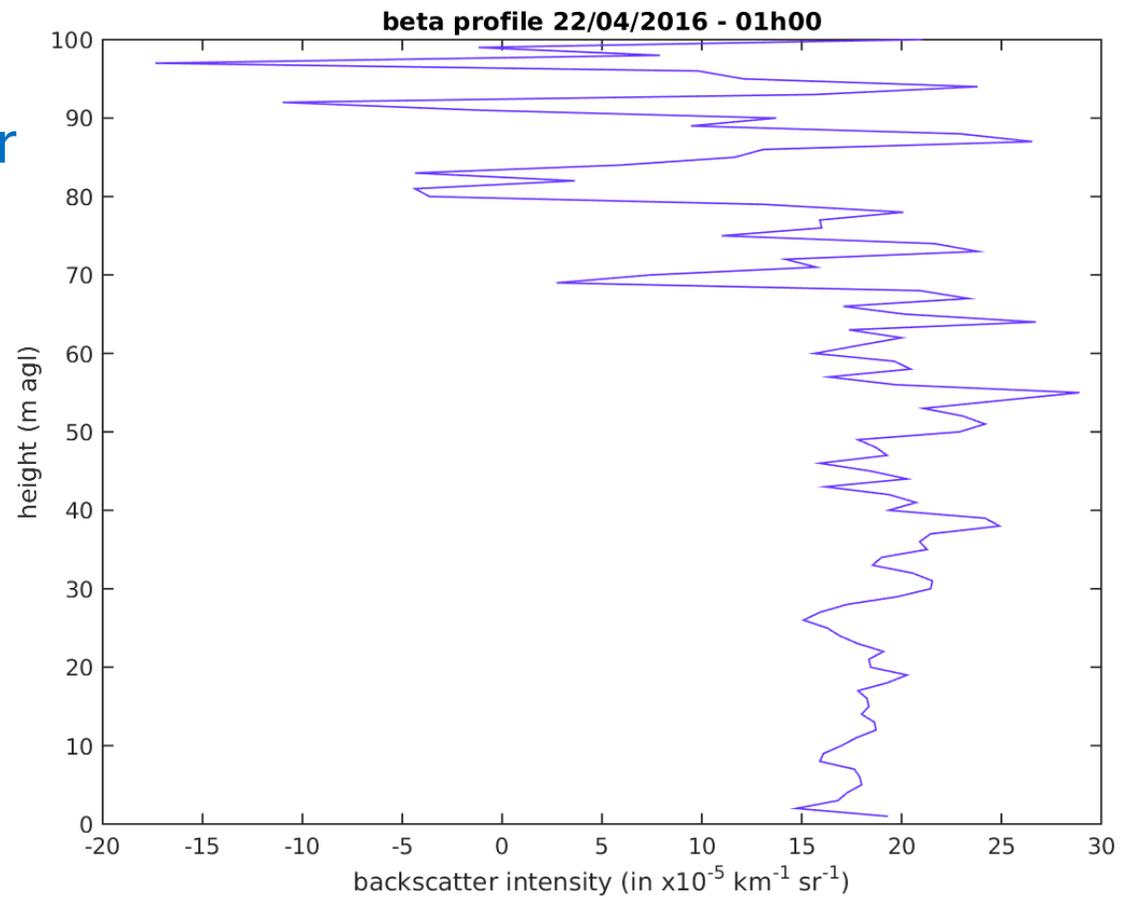
Ceilometer attenuated backscatter

cloud

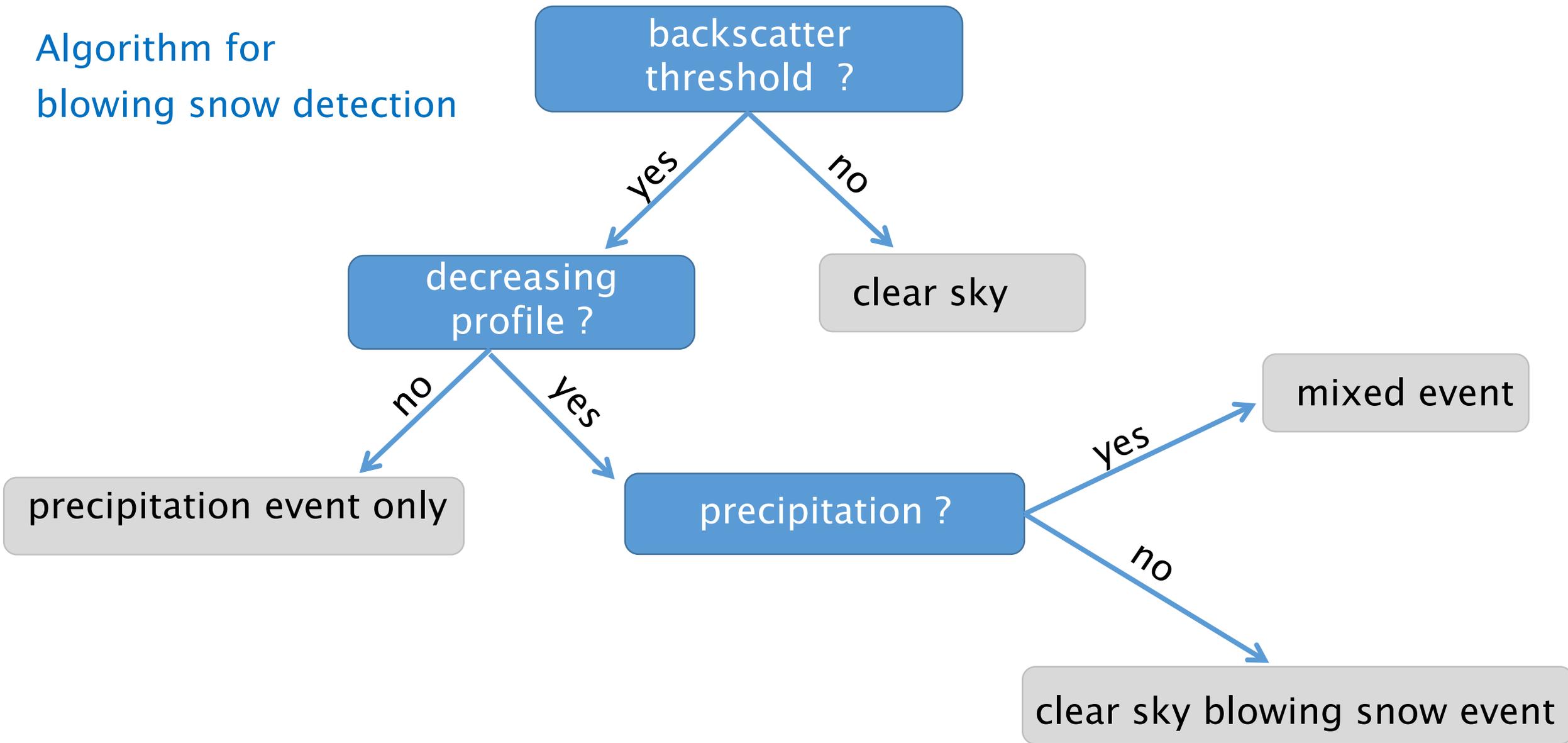


Ceilometer attenuated backscatter

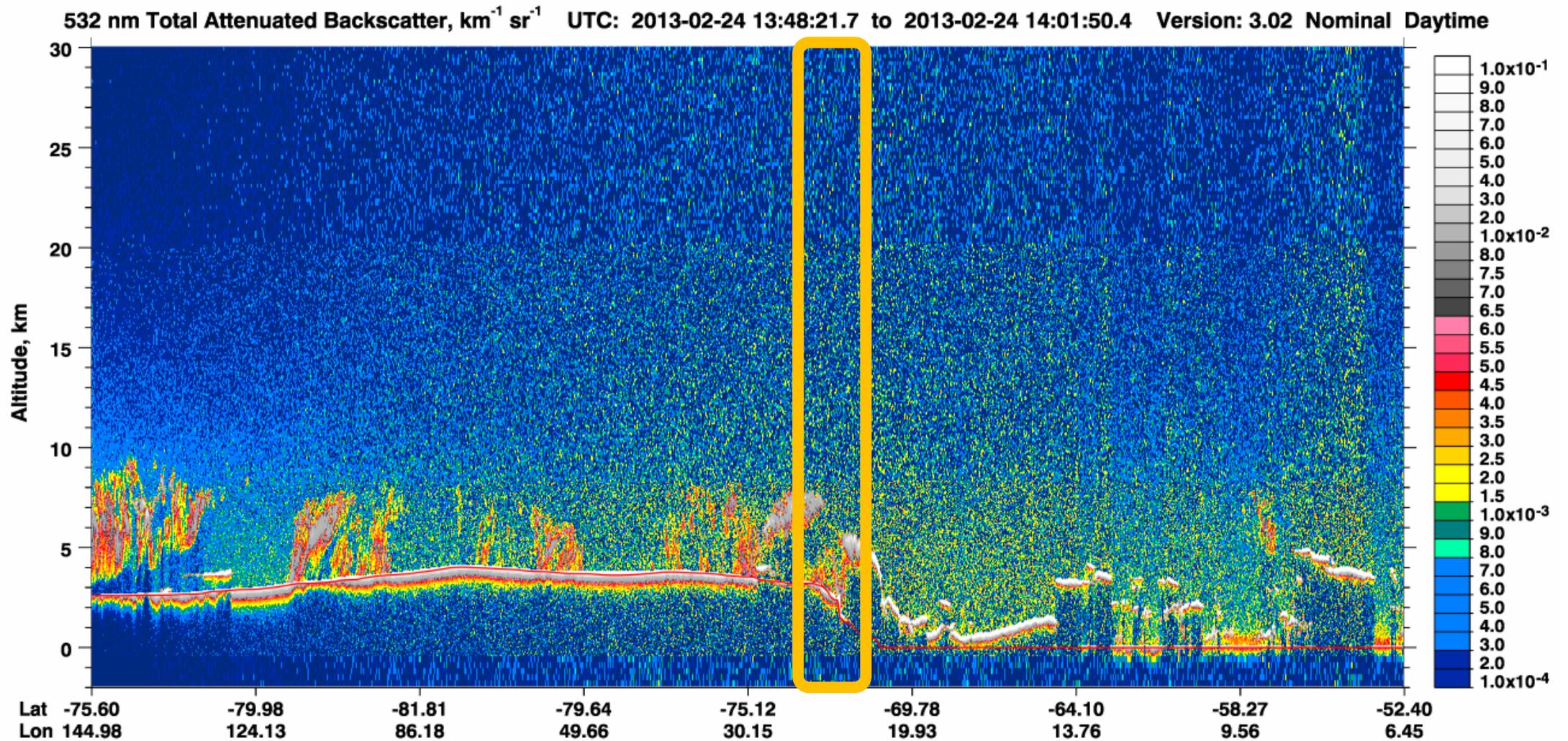
clear-sky



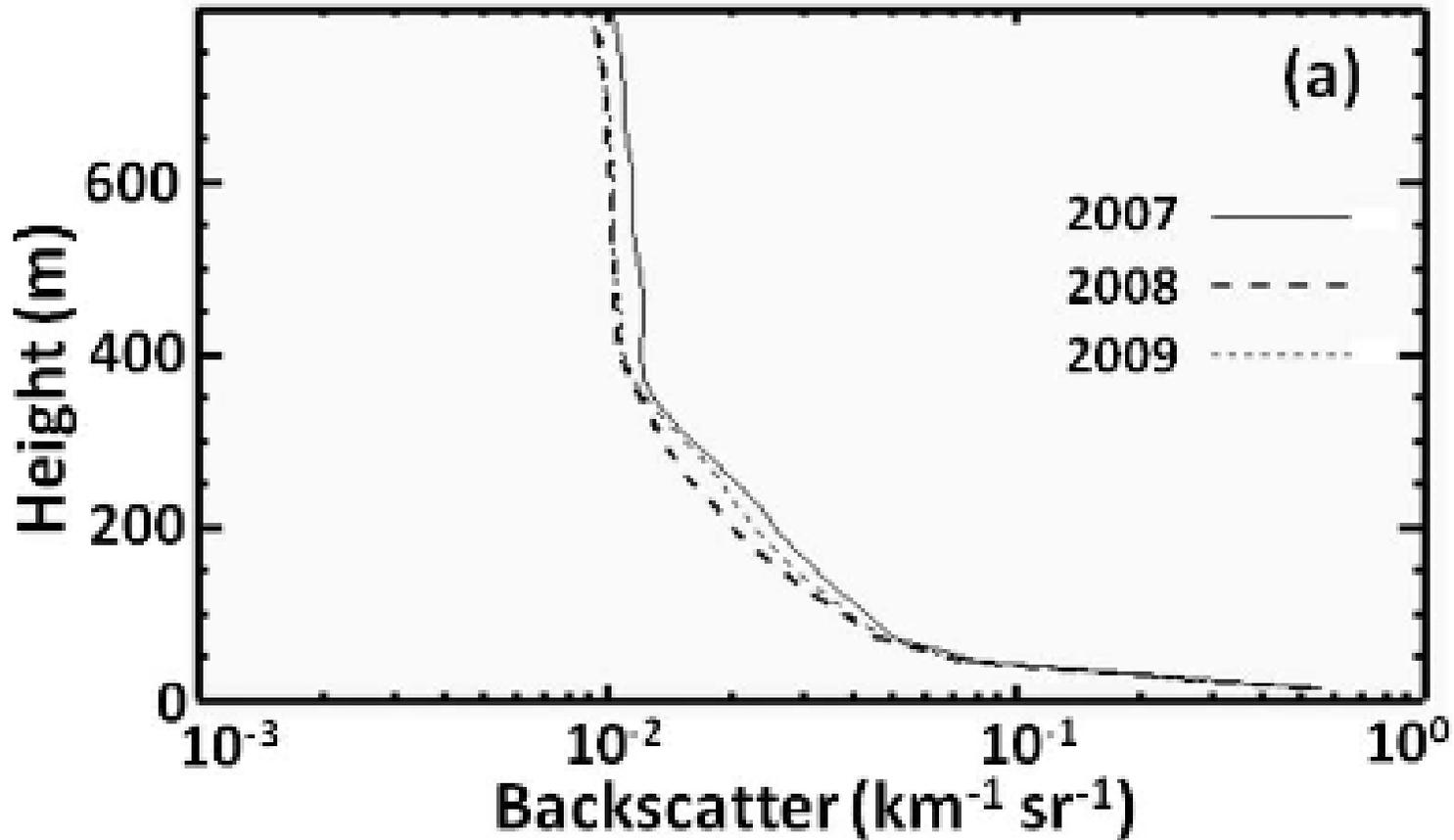
Algorithm for blowing snow detection



Palm et al (2011): routine to estimate blowing snow

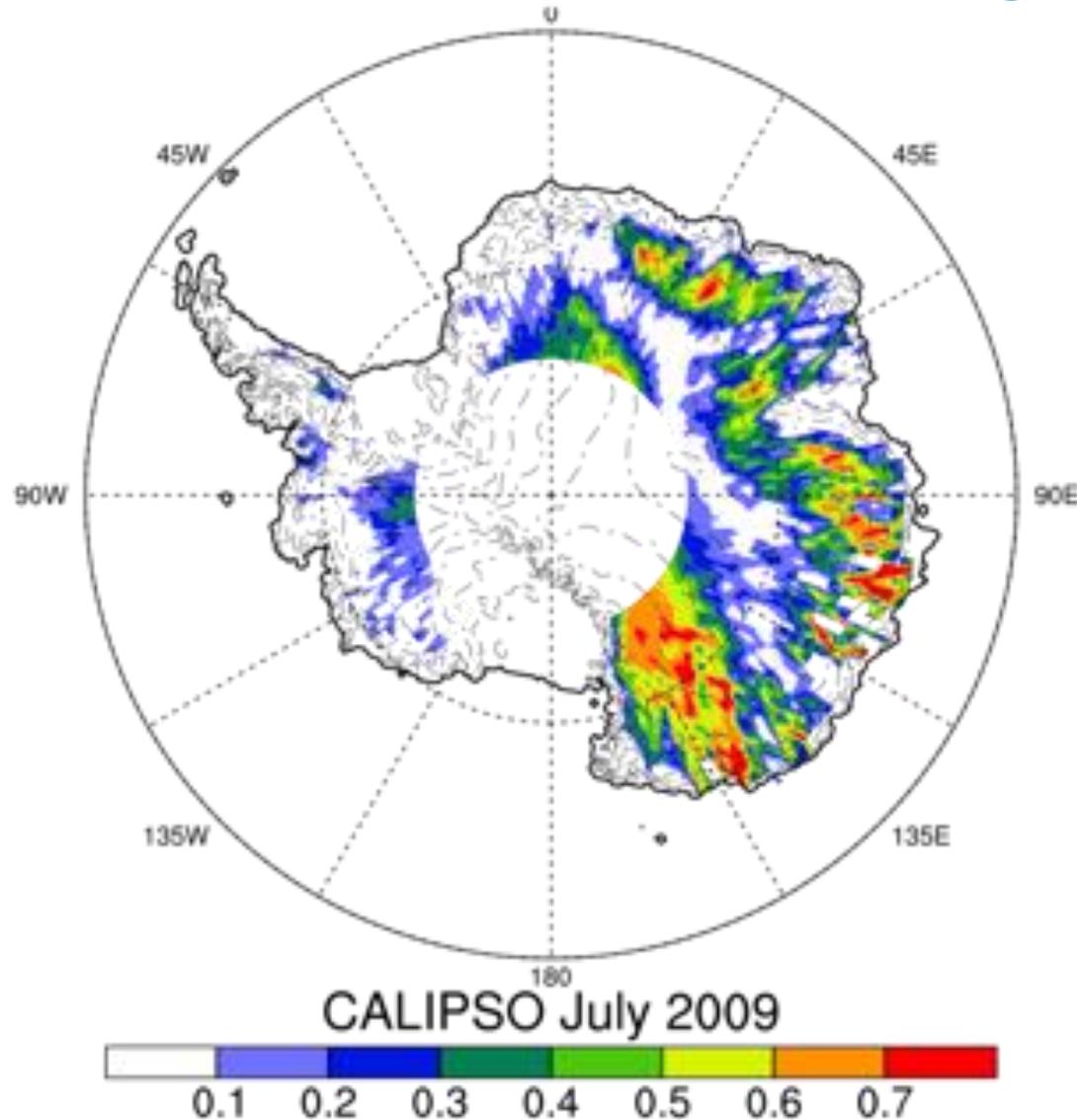


Palm et al (2011): routine to estimate blowing snow



The average (April through October) attenuated backscatter profile through all blowing snow layers detected over the megadune region for 2007, 2008 and 2009 (Palm et al., 2011)

Palm et al (2011): routine to detect blowing snow



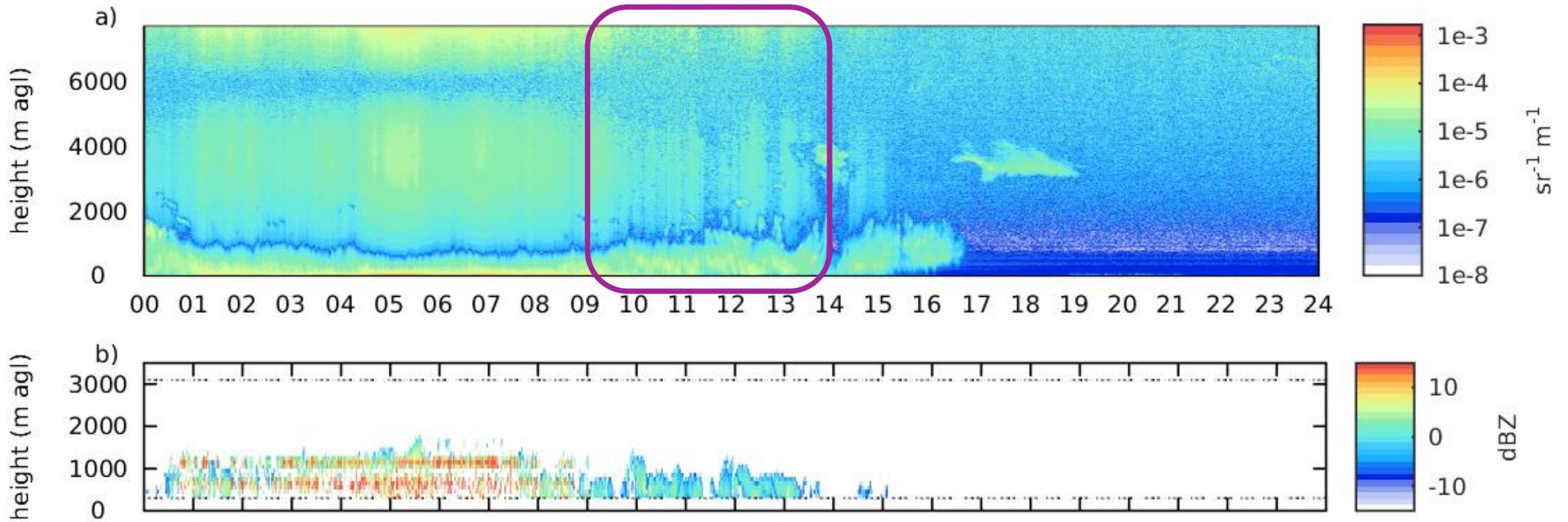
The blowing snow frequency (fraction) and spatial distribution for June 2009 as determined from analysis of CALIPSO data (courtesy of J.Lenaerts)

Mixed event



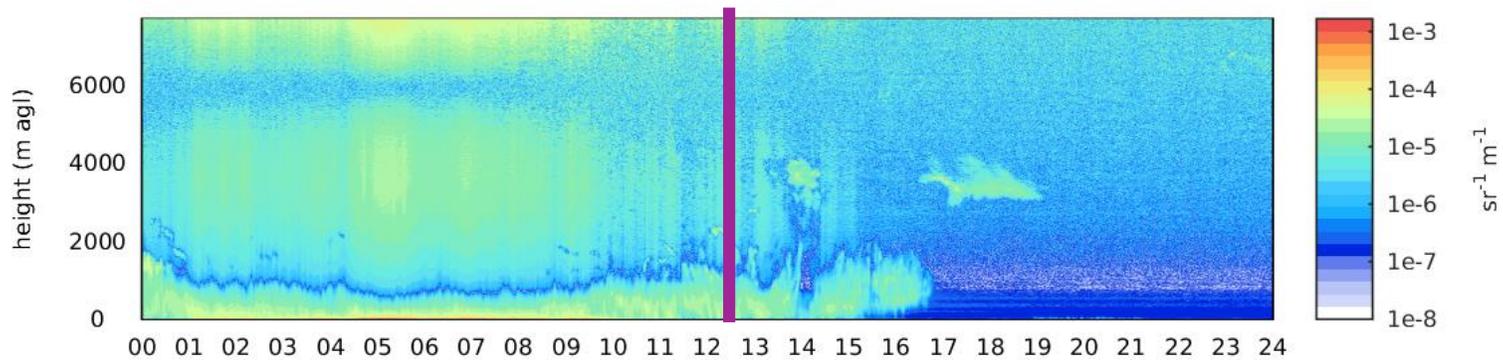
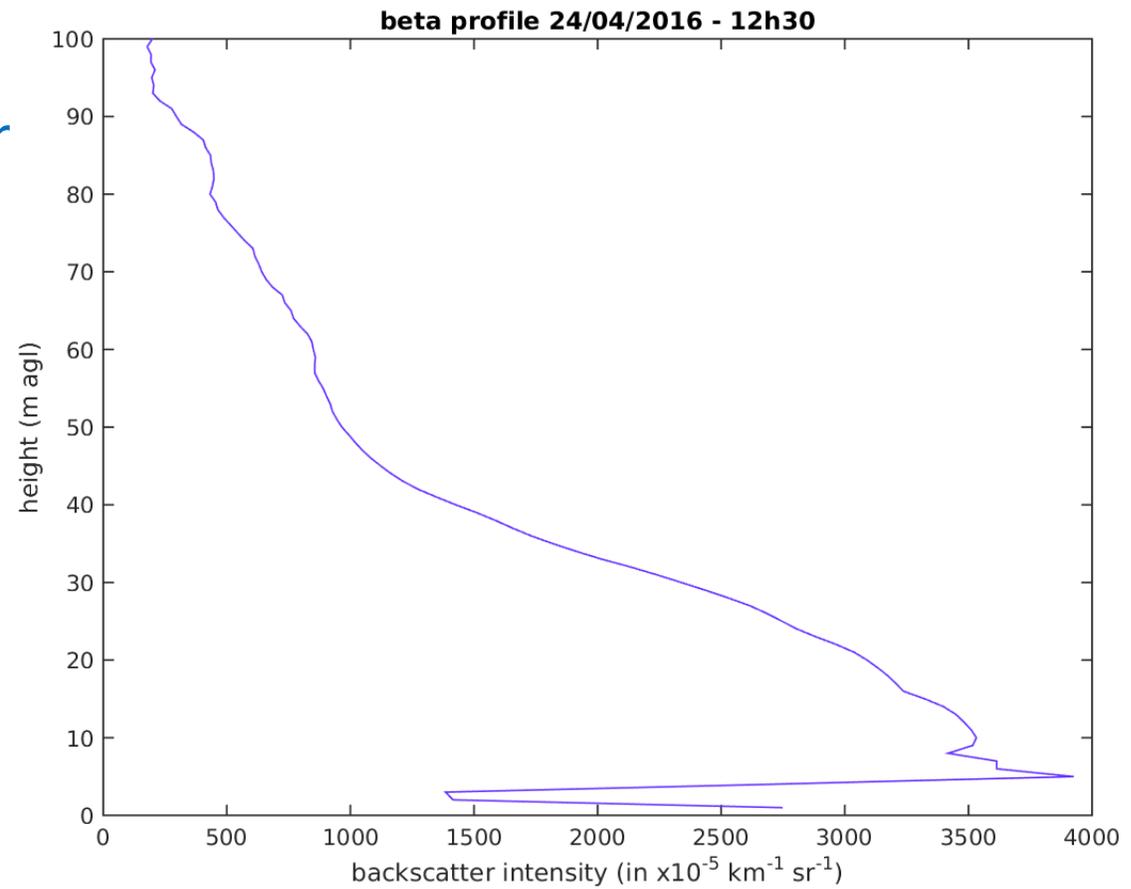
Ceilometer attenuated backscatter

mixed event



Ceilometer attenuated backscatter

mixed event



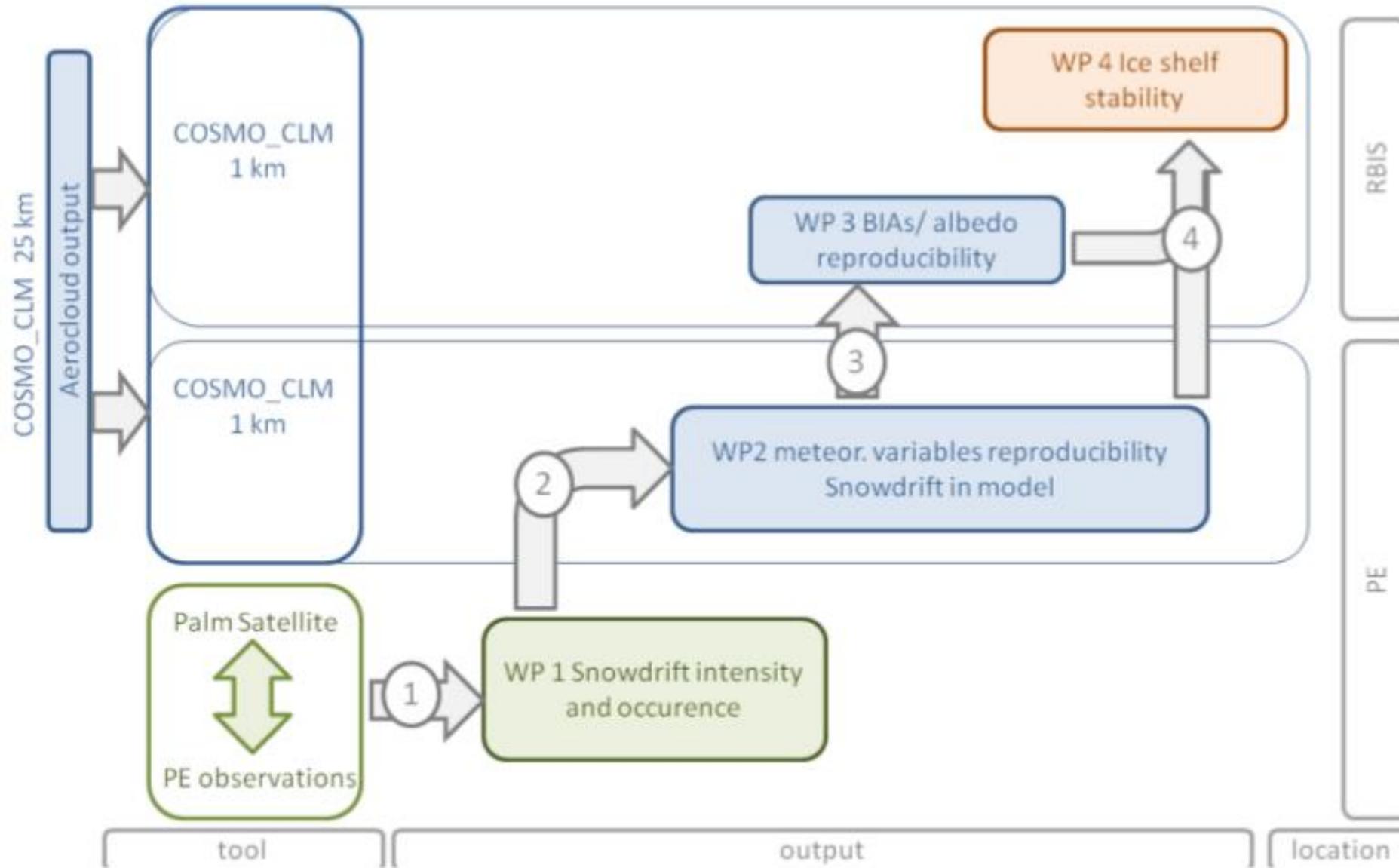
Advantages

- closer to the ground
- not limited to clear sky conditions
- other qualitative data

Work in progress

- snow threshold determination
- sensitivity of the instrument
- attenuation of the backscatter signal

The whole project



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Hydrant (2008-2015)

AEROCLOUD

How do aerosols and clouds affect the East Antarctic climate?

The Setting : Princess Elisabeth Polar research station

The Belgian Princess Elisabeth (PE) research station is erected on the Utsteinen Ridge (71°57'S - 23°21'E) and hosts campaigns since 2009. The station is situated 173 km inland from the former Belgian Roi Baudouin base, built in 1958 on the ice shelf at Breid Bay in Dronning Maud Land. PE station stands at the foot of the Sør Rondane Mountains, Dronning Maud Land, and 55 km from the former Japanese Asuka station (1986 – 1992). Positioned halfway between Syowa station (684 km) and the Russian station Novolazarevskaya (431 km) it fills in a 1072 km unoccupied stretch between these two stations in one of the least occupied sectors of Antarctica

NEWSFLASH





References

- Gorodetskaya I.V., S. Kneifel, M.Maahn, K. Van Tricht, W. Thiery, J.H. Schween, A. Mangold, S. Crewell, and N.P.M. van Lipzig (2015), Cloud and precipitations properties from ground-based remote sensing instruments in East Antarctica, *The Cryosphere*, 9,285–304, doi:10.5194/tc-9-285-2015.
- Palm S.P., Y. Yang, J.D. Spinhirne and A. Marshak (2011), Satellite remote sensing of blowing snow properties over Antarctica, *Journal of Geophysical Research*, 116,D16123,doi:10.1029/2011JD015828.
- Newmann A.J., P.A. Kucera; L.F. Bilven(2009), Presenting the Snowflake Video Imager (SVI), *Journal of Atmospheric and Oceanographic Technology*, 26,2,167–179,doi:10.1175/2008/TECHA1148.1.
- Maahn M. and P. Kollias (2012), Improved Micro Rain Radar snow measurements using Doppler spectra post-processing, *Atmospheric Measurement Techniques*, 5,2661–2673,doi:10.5194/amt-5-2661-2012