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Supplement of

Temporal and spectral cloud screening of polar winter aerosol optical depth (AOD): impact of homogeneous and inhomogeneous clouds and crystal layers on climatological-scale AODs

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Figure captions for the supplementary information

Figure S1 : Sample SDA (individual) retrievals in the cases of (a) a robust fine mode event at Eureka on Mar. 29, 2012 and (b) a moderately robust fine mode event in the presence of thin cloud and/or or LICs. UT time is for a 24 hour clock.

Figure S2 : CALIOP (Mar. 5, 2012) nightime vertical profiles, accompanied by pan Arctic AODs estimated using GEOS-Chem simulations (left-hand polar image) retrieved by the CALIOP processing algorithm (right-hand polar image). The CALIOP profiles show a strong and low-altitude, PBL event along the chosen CALIOP orbit line (the red ellipses show the general location of the event on both the profile and AOD plots). The GEOS-Chem AOD simulation (which is dominated by fine-mode sea-salt, appears to roughly capture the CALIOP AOD event along a 1000 km orbit path segment sandwiched between masses of clouds).

Figure S3 : General description as in Figure S2 but for Dec. 10 2011 (Dec. 10, 2011 being around the center of the November to January, apparently continuous, fine mode disturbance, evident in Figure 2c). The GEOS-Chem simulation seems at best, marginal, in capturing this broad event. This type of low PBL event was observed a number of times during the late November to early January period encompassing the Dec 10 event.

Figure S4 : General description as in Figure S2 but for the beginning, on Nov. 25, 2011, of the November to January, apparently continuous fine mode disturbance, evident in Figure 2c. The low DR, PBL feature is just NE of Ny-Ålesund and shows the effects of significant cloud / precipitation contamination (one can see what appear to be fall streaks of precipitating ice crystals in the lower PBL). The strong AOD feature on the GC map is sea-salt : this event peaked at Ny-Ålesund on Nov. 22, 23 and 24 and was no longer a strong influence on November 25 (at which time the predominant GC AOD was sulphate).

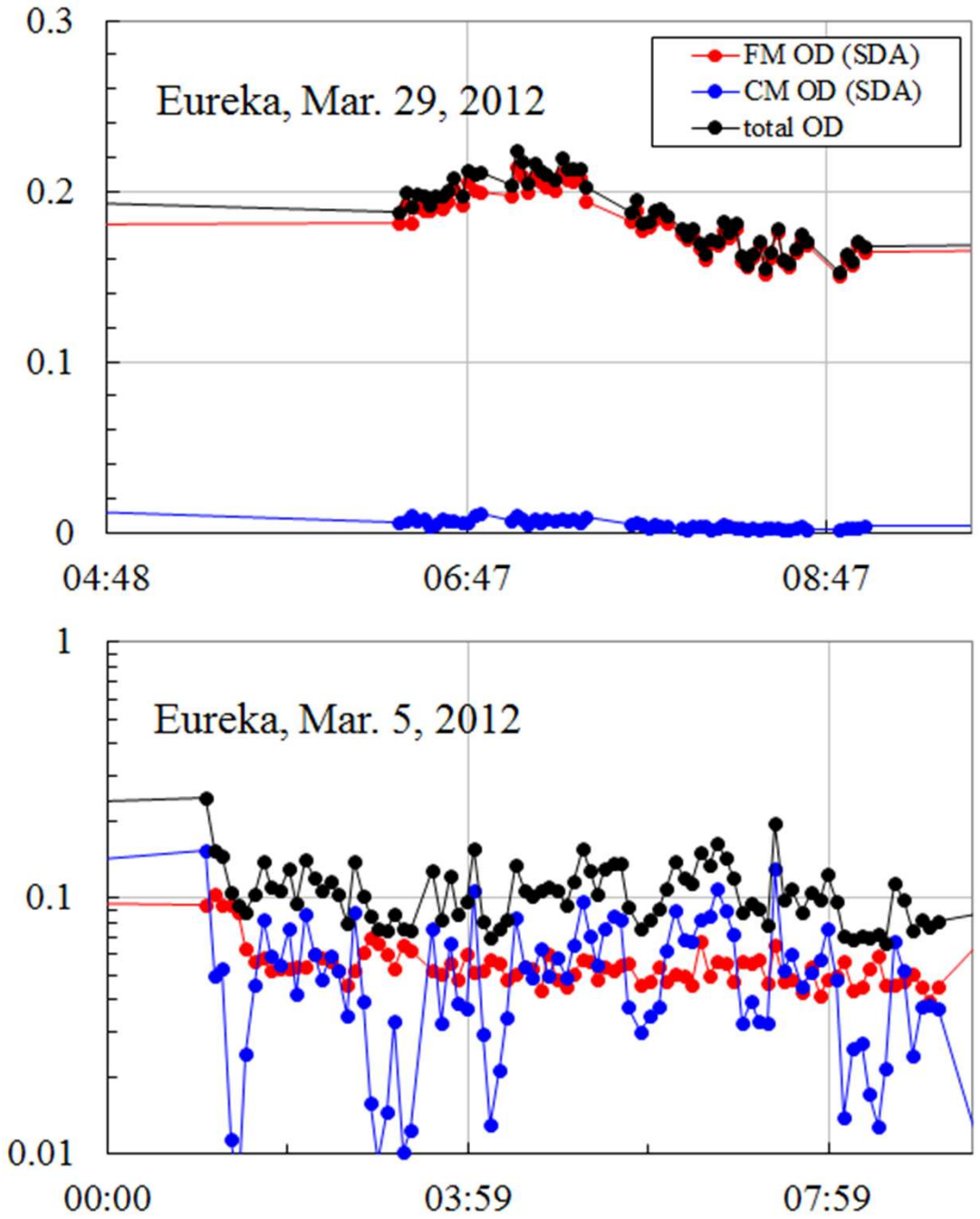
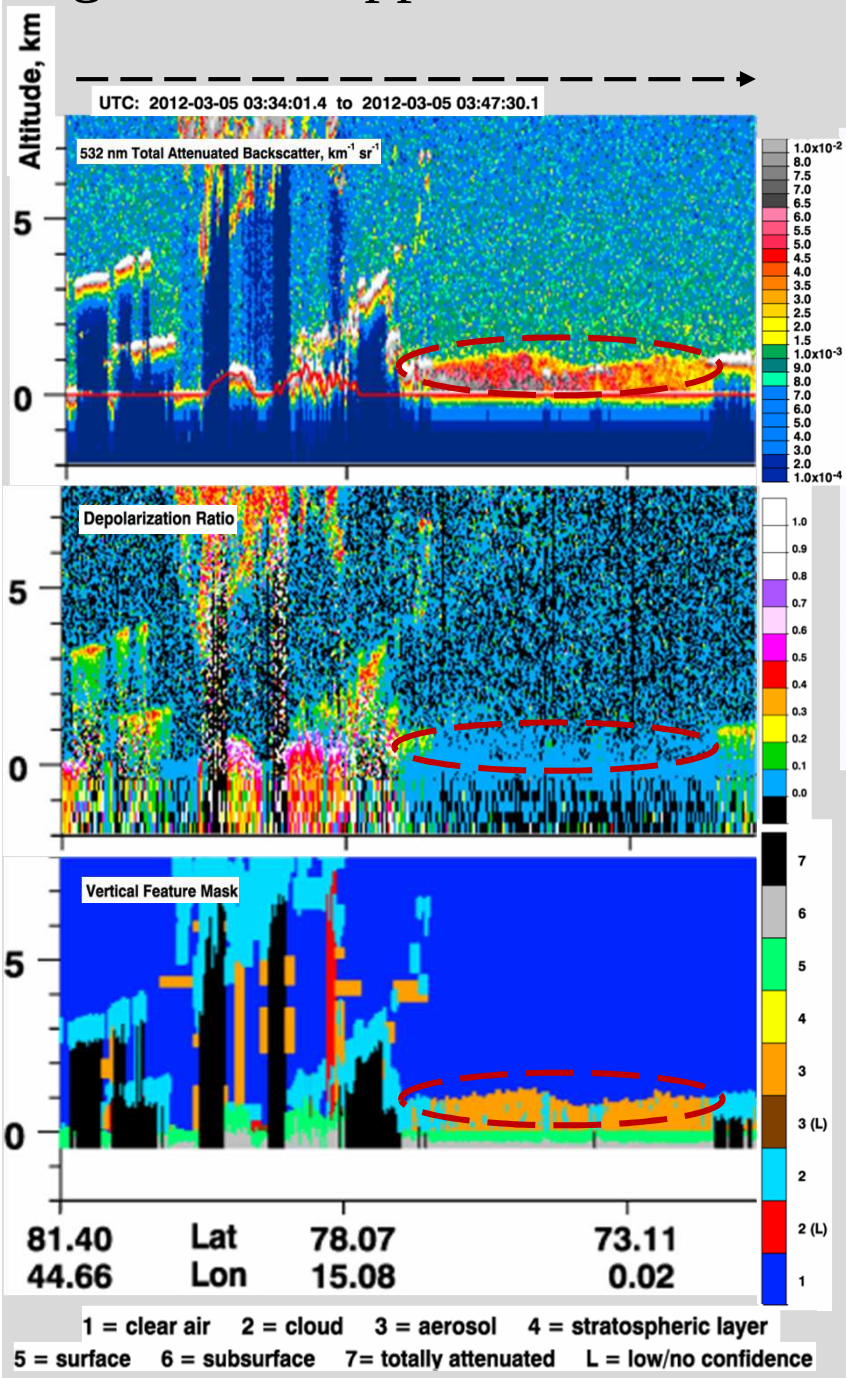
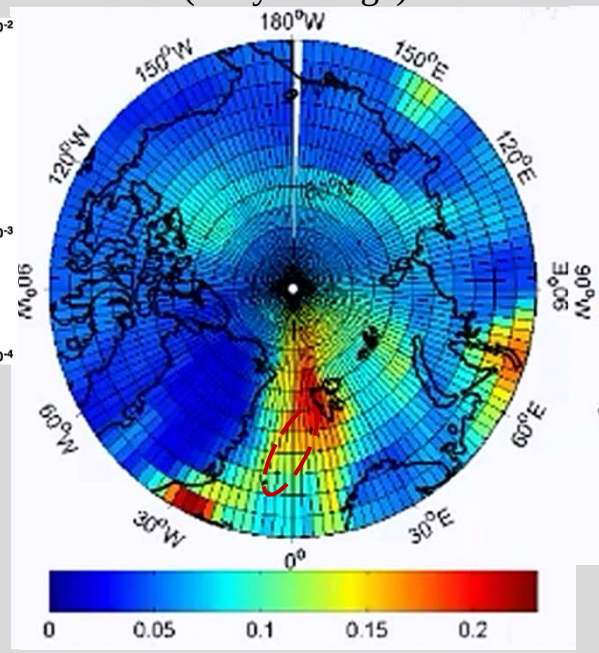

0.3
0.2
0.1
0
Eureka, Mar. 29, 2012
FM OD (SDA)
CM OD (SDA)
total OD
04:48
06:47
08:47
1
0.1
0.01
Eureka, Mar. 5, 2012
00:00
03:59
07:59

Figure S1

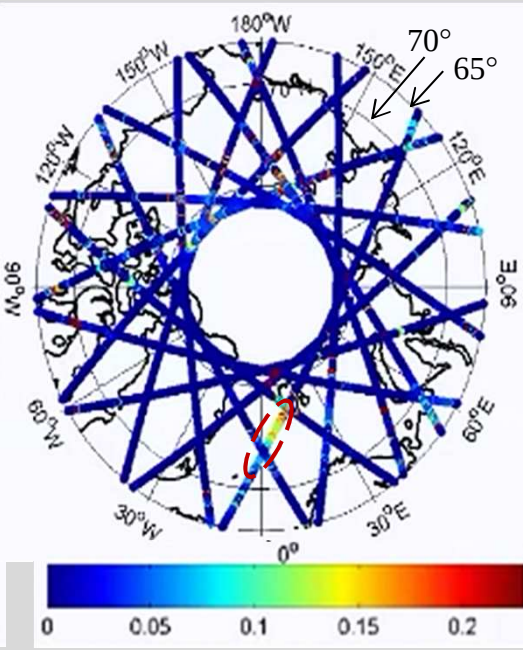
Figure S2 - Apparent sea-salt event of Mar. 5, 2012

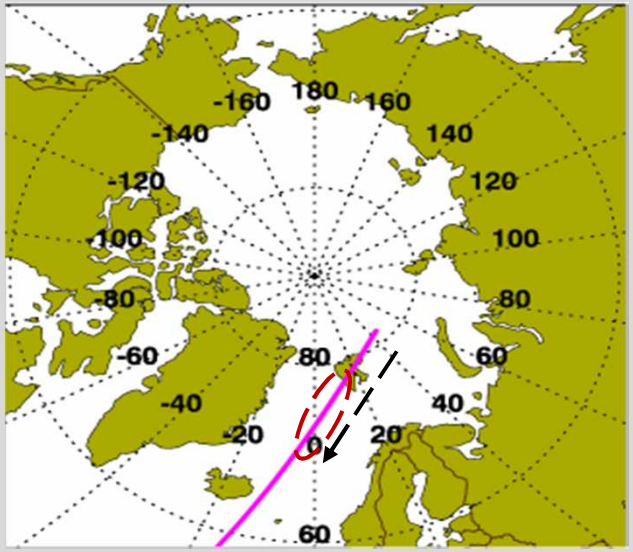


GEOS-Chem AOD
(daily average)



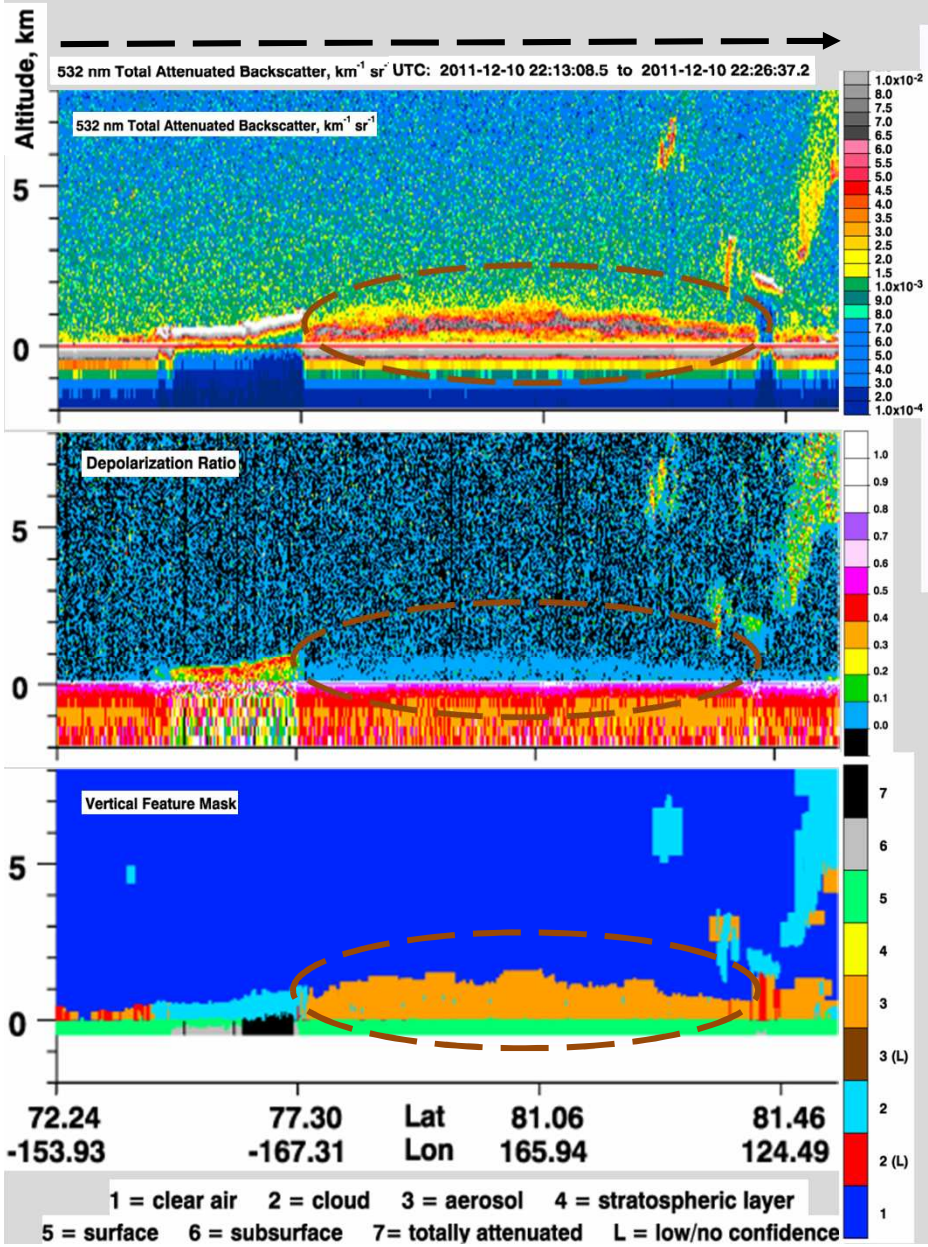
CALIOP AOD
(all orbit lines on Mar. 5)





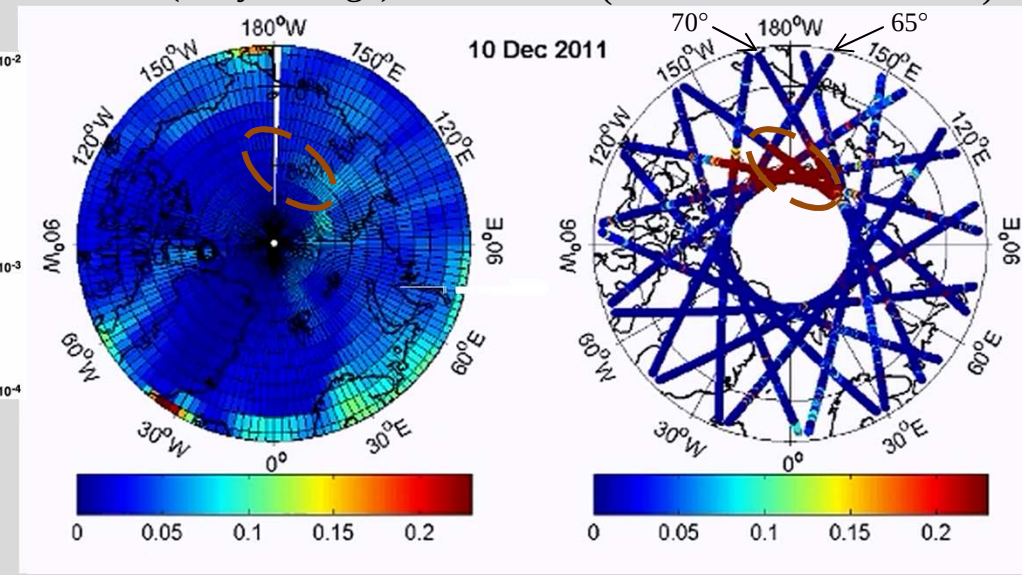
CALIOP orbit map for the profiles on the left

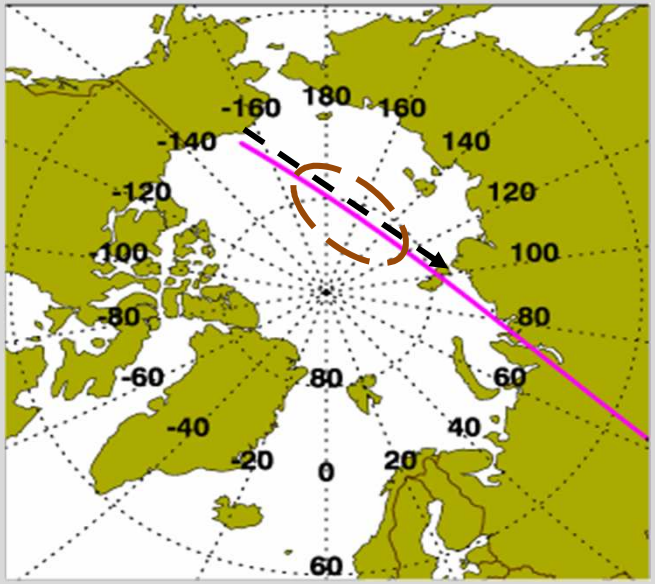
Figure S3 - PBL event of Dec. 10, 2011



GEOS-Chem AOD
(daily average)

CALIOP AOD
(all orbit lines on Dec. 10)



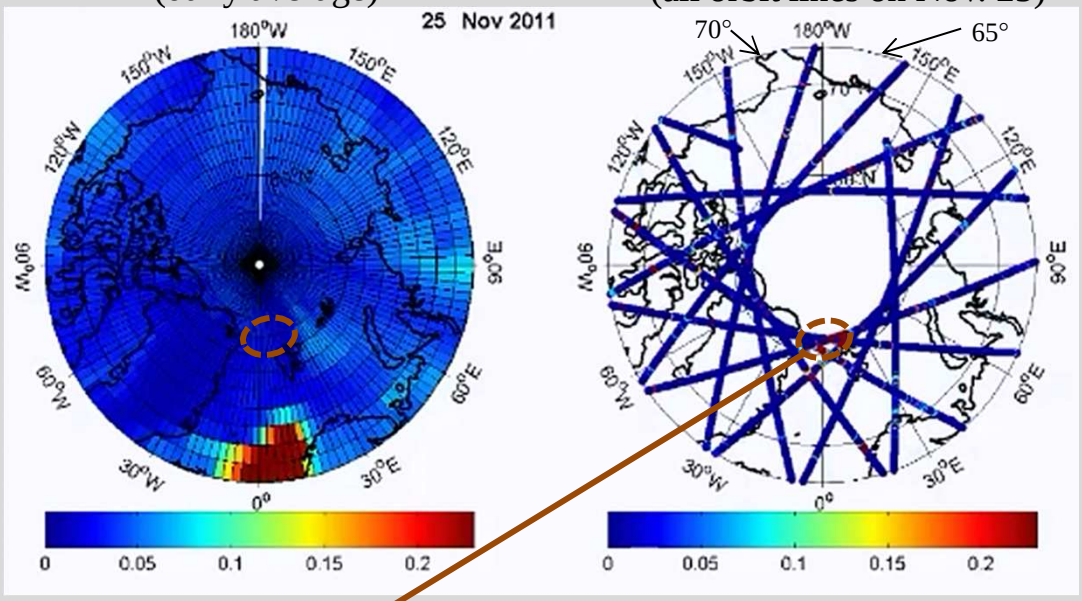


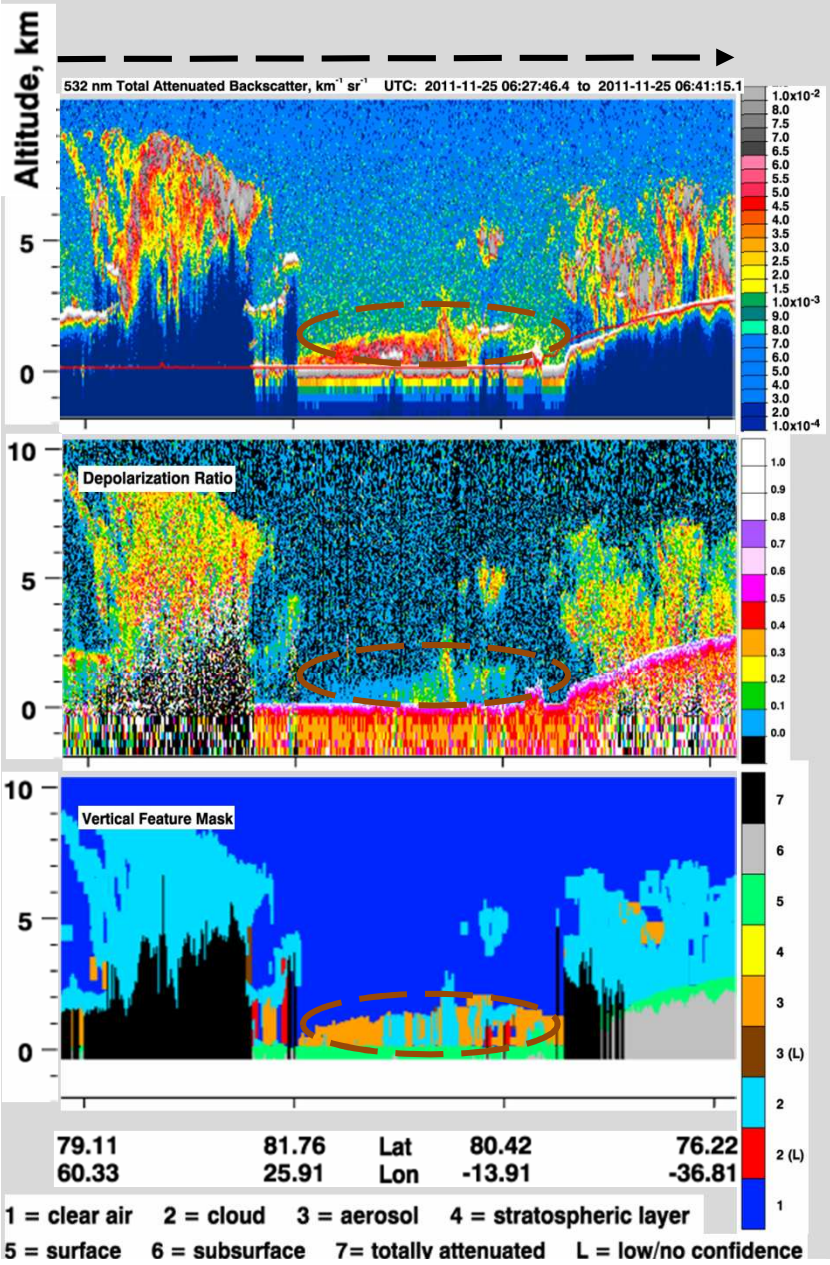
CALIOP orbit map for the profiles on the left

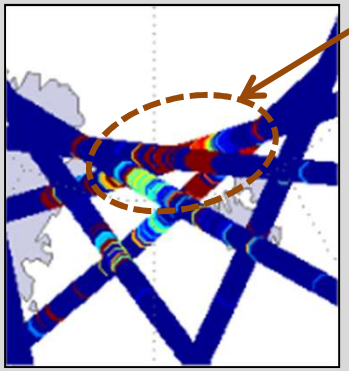
Figure S4 - PBL event of Nov. 25, 2011

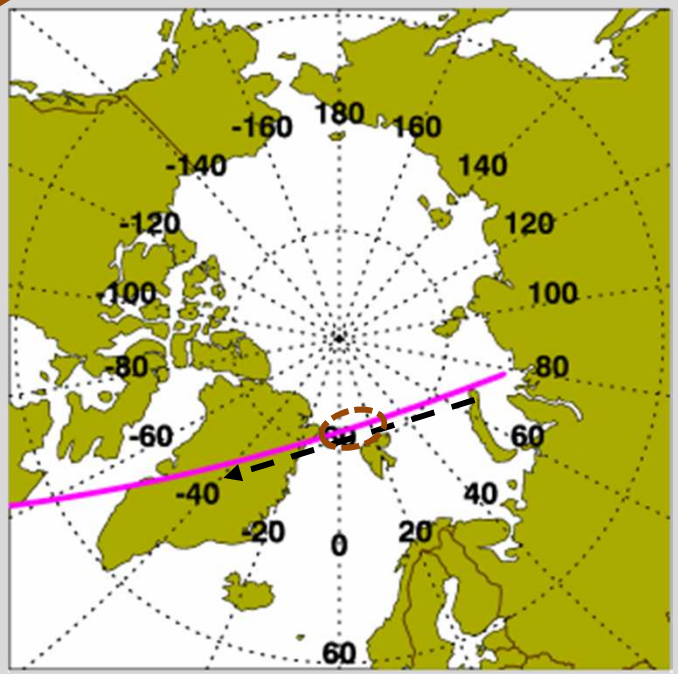
GEOS-Chem AOD
(daily average)

CALIOP AOD
(all orbit lines on Nov. 25)









CALIOP orbit map for the profiles on the left