Multi-band radar altimetry to study hydrology of boreal wetlands and estuaries

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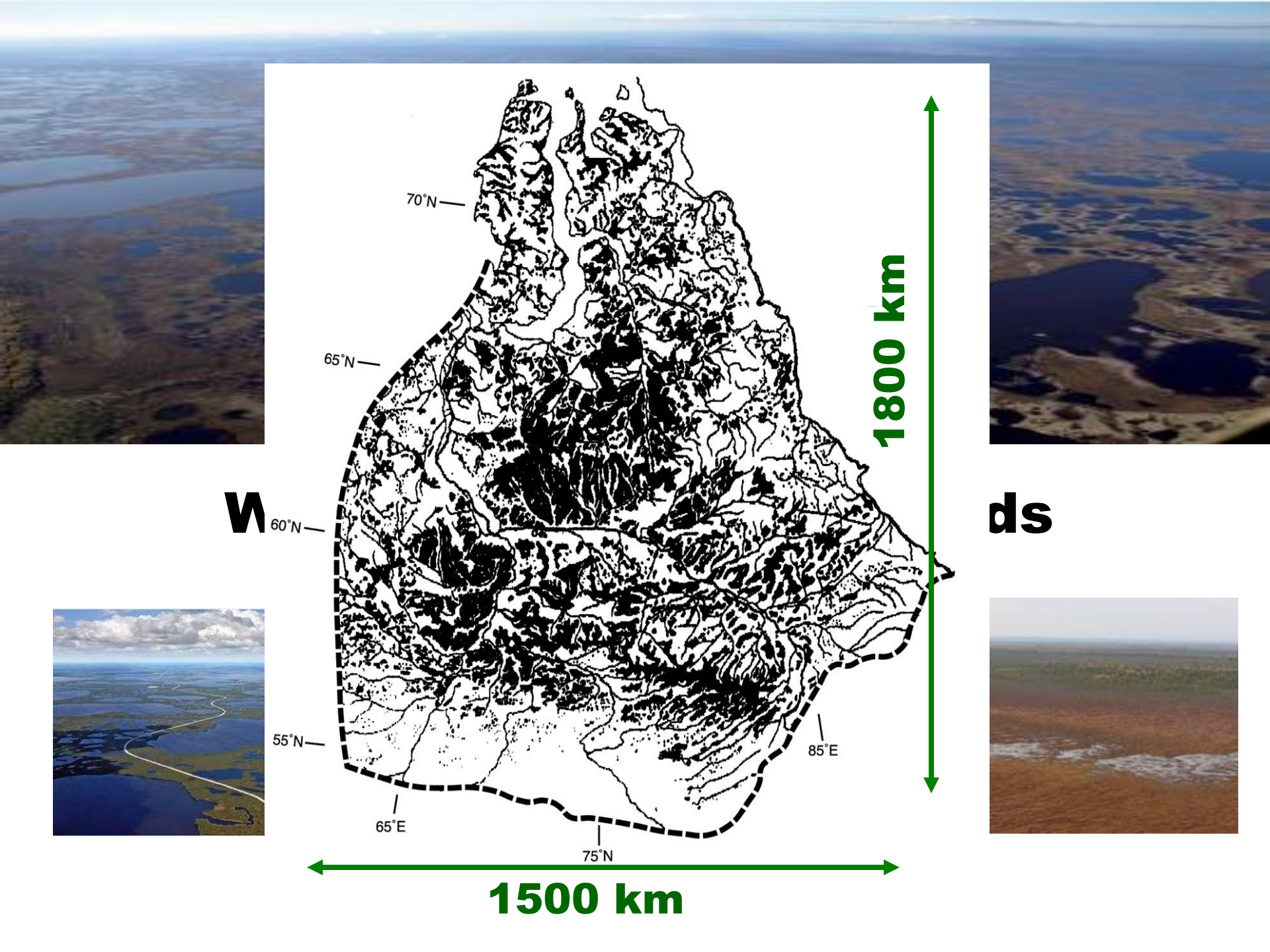
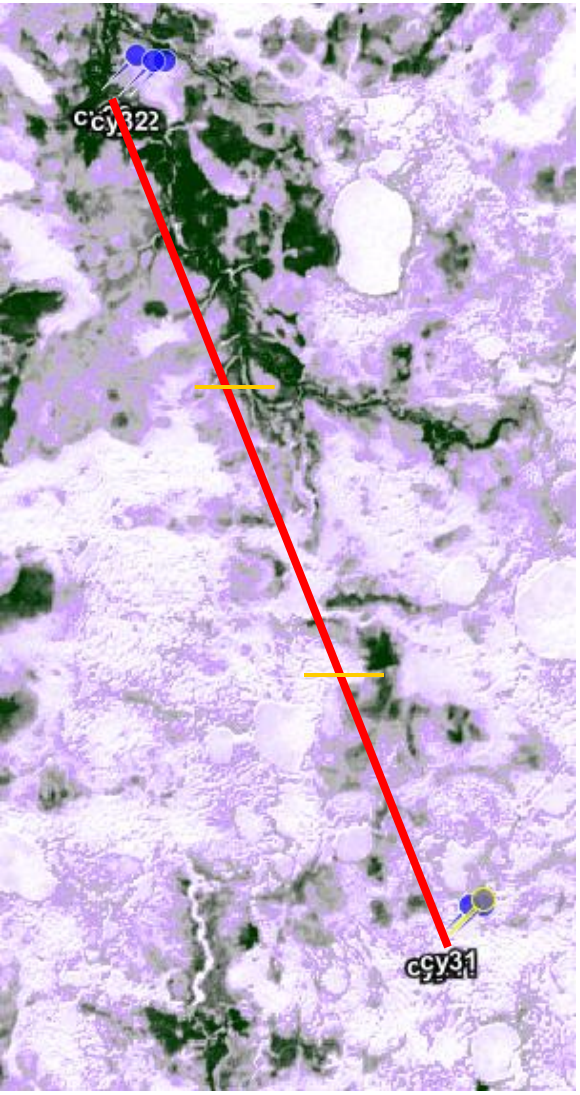
August 27-28, 2013

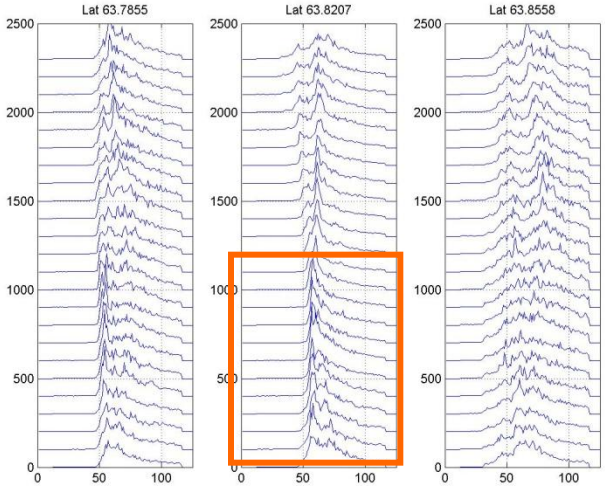

W
ds
70°N
65°N
60°N
55°N
65°E
75°N
85°E
1800 km
1500 km

ALTIKA over wetlands

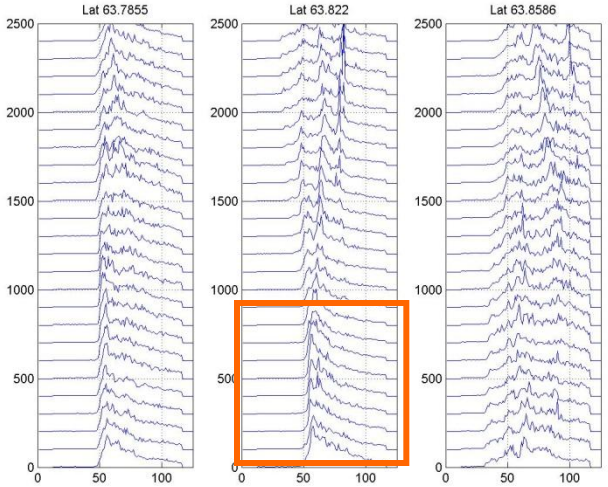


AltiKa waveforms
track 51

cycle 1, snowy



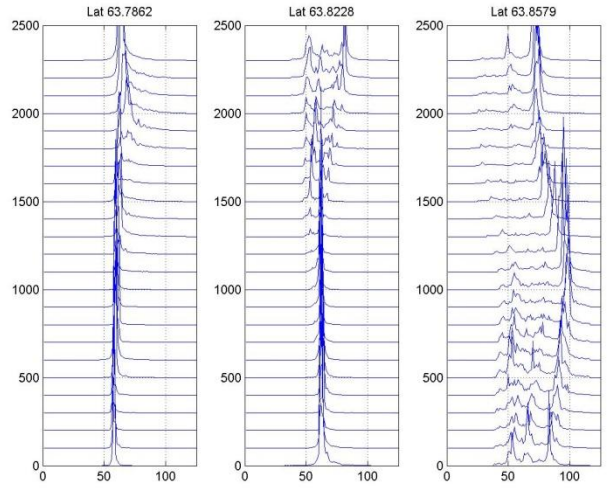
cycle 2, snowy



Water/ice dominated footprints - specula waveforms

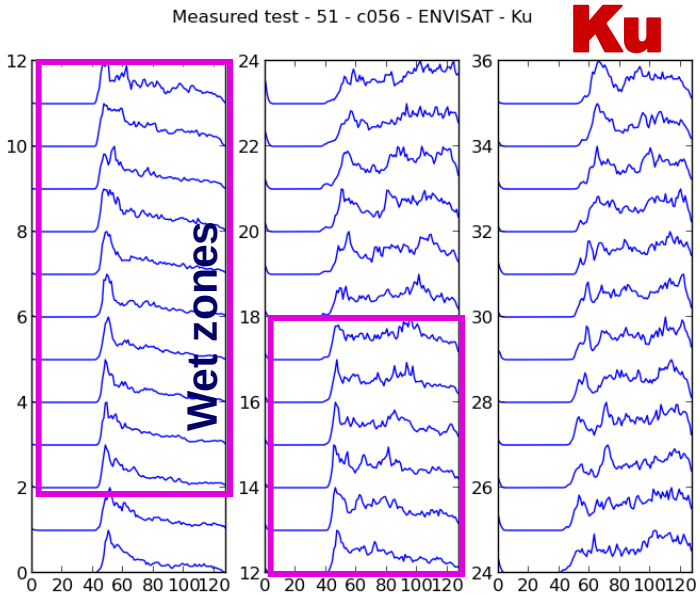
possibility of freeze/wetness/level studies

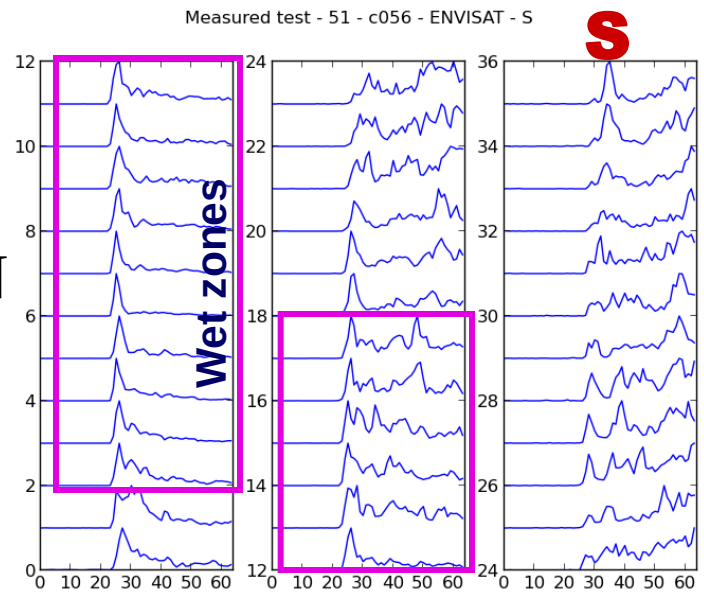
cycle 3, melting



ALTIKA - ENVISAT over snowy/icy wetlands

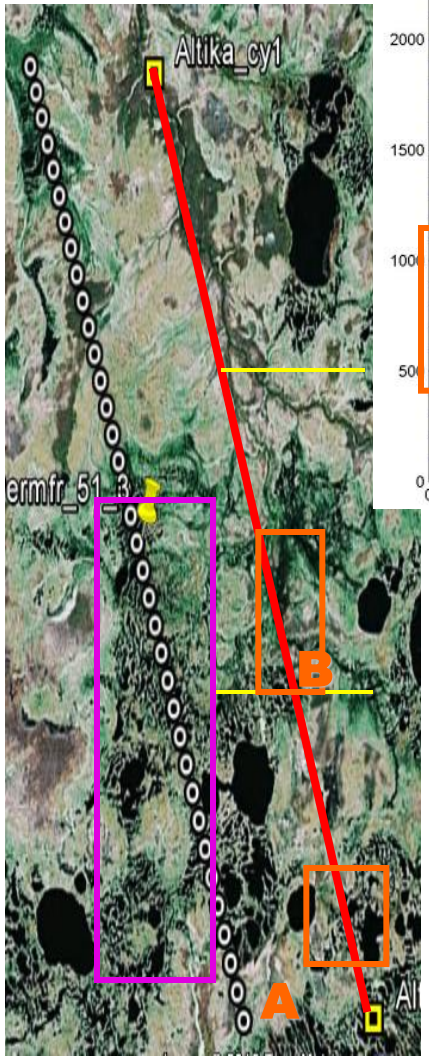
ENVISAT, February



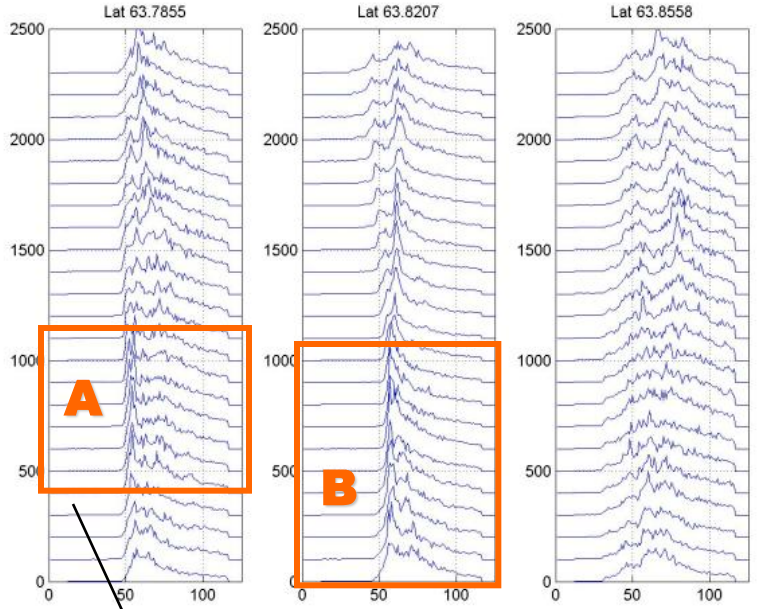


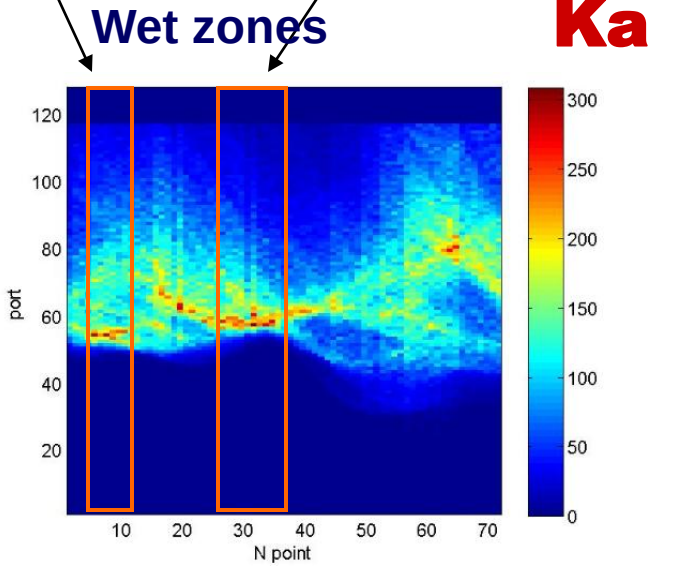
N

S



ALTIKA, April

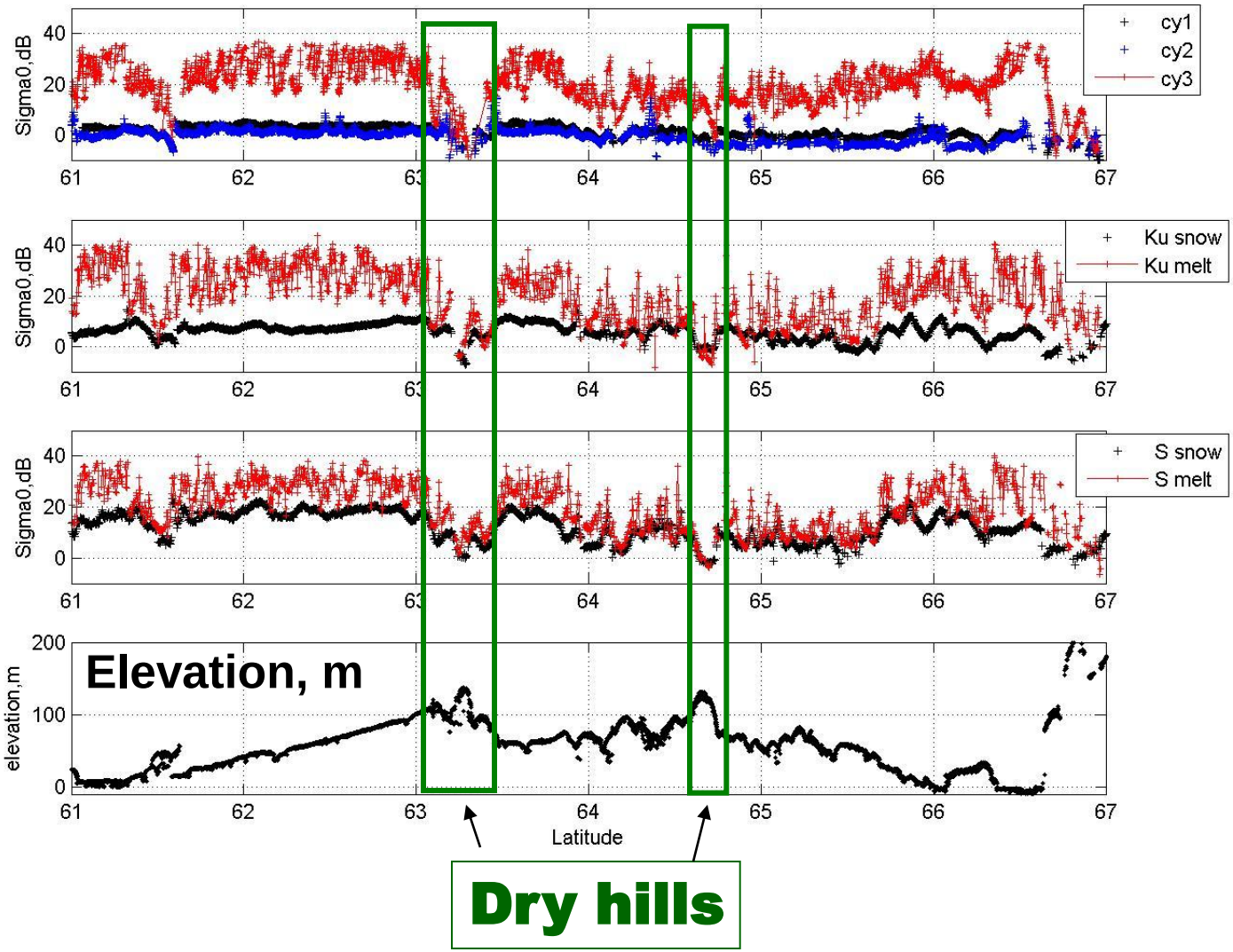




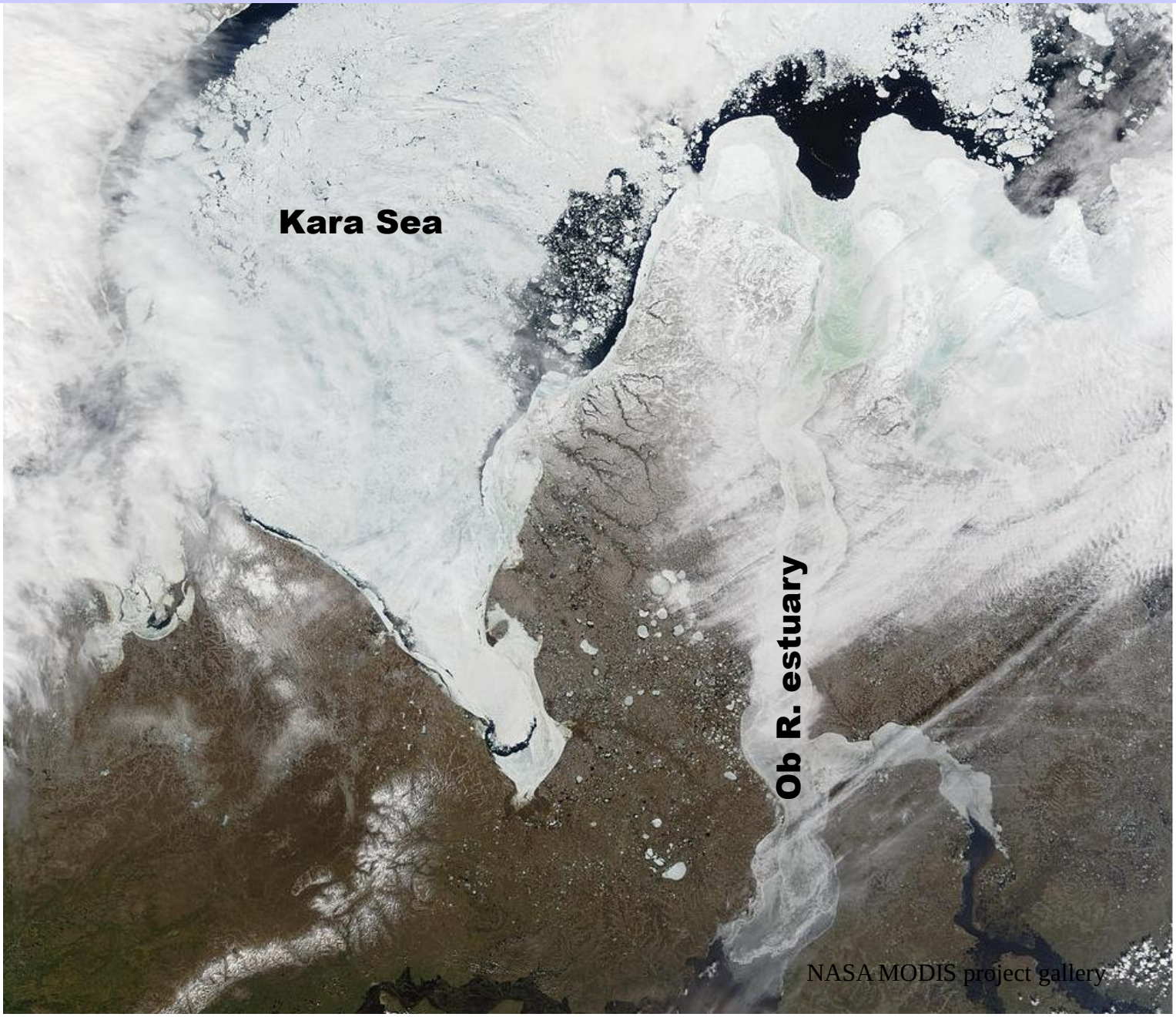
ALTIKA - ENVISAT over wetlands

April to June

This is not noise - these are bogs/lakes



ALTIKA over Kara Sea

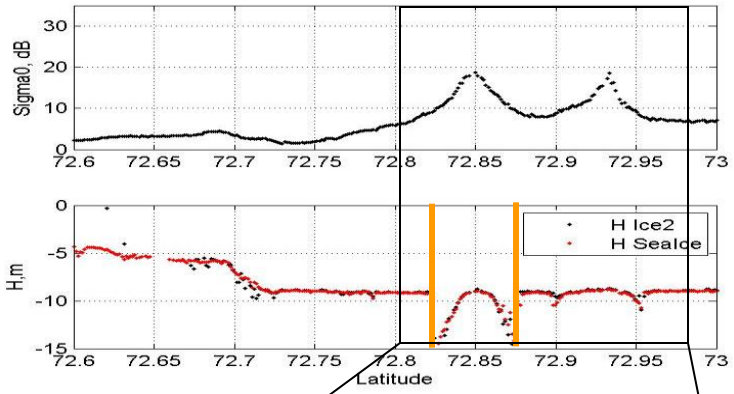


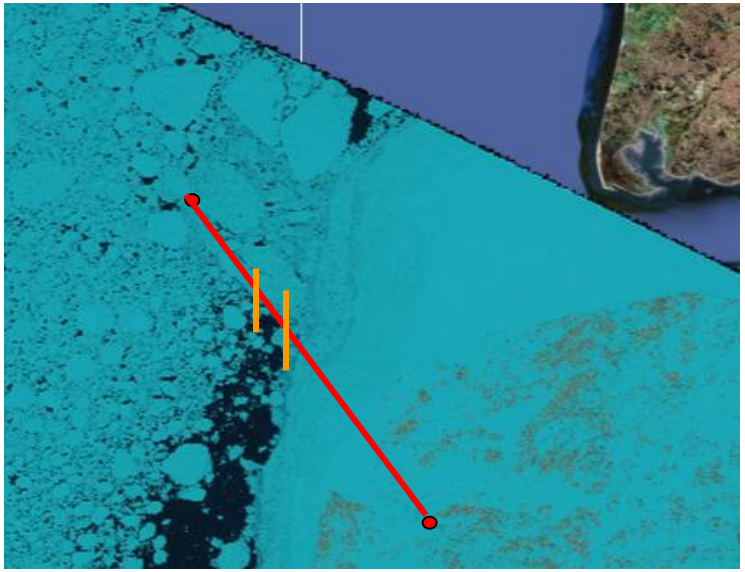
Kara Sea

ALTIKA over Kara Sea: Sigma and Height

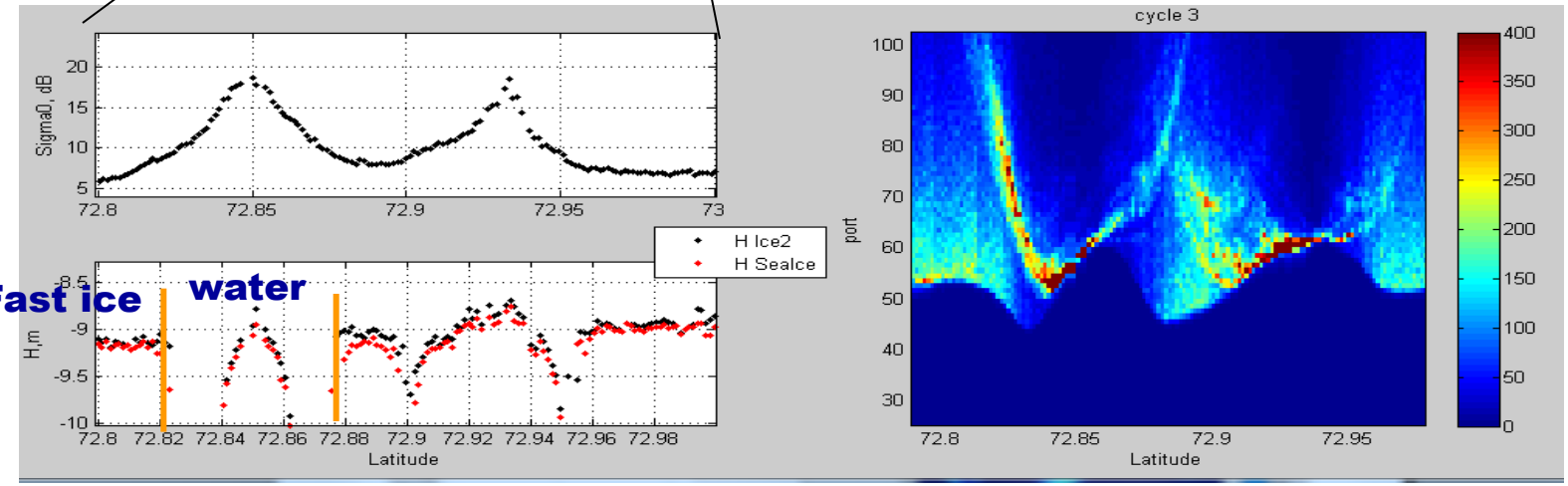
Cycle 3, 7 June

Landsat 8 June 2013



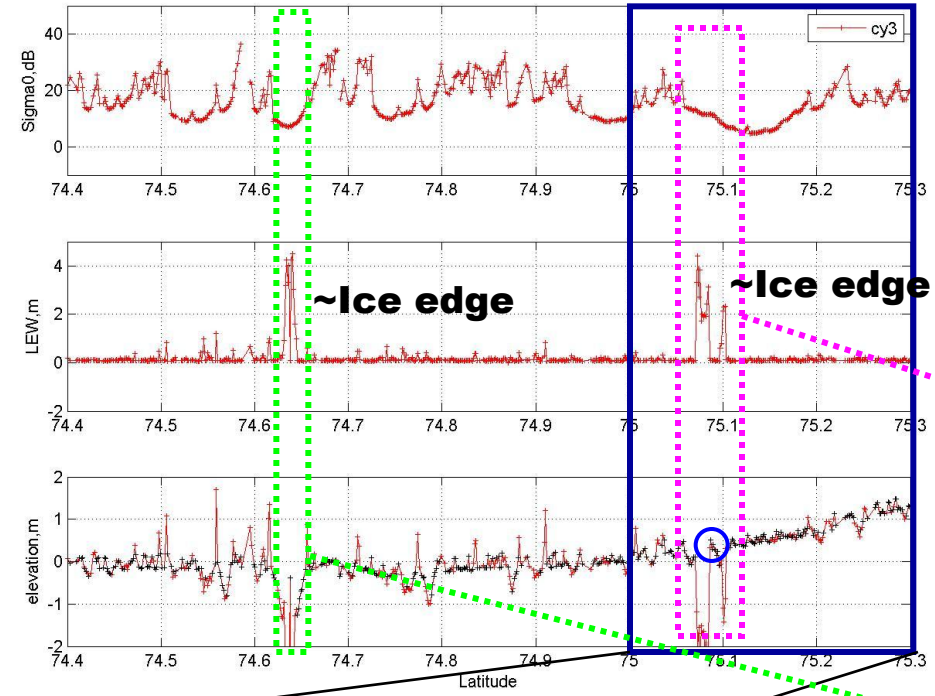


zoom



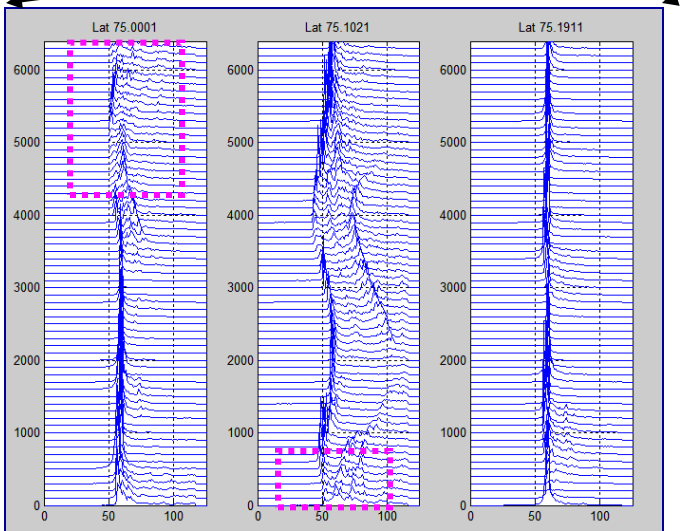
For height,
no geophysical corrections

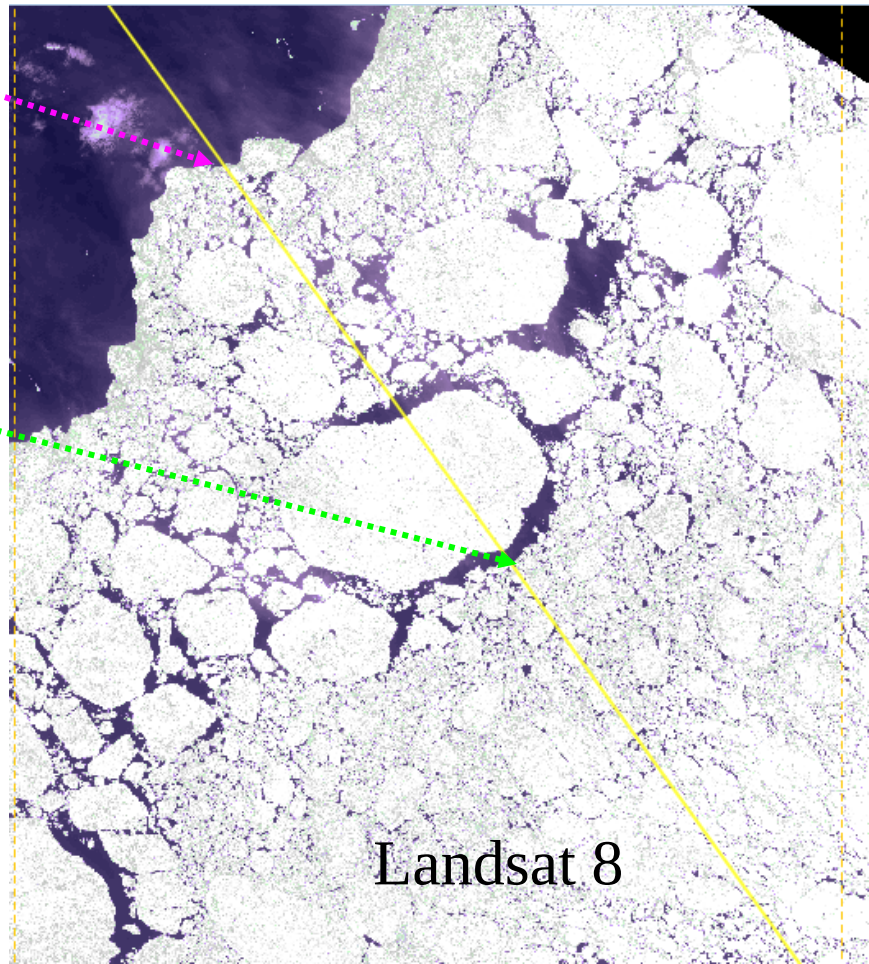
ALTIKA over Kara Sea: Sigma and Height



2 days timelag

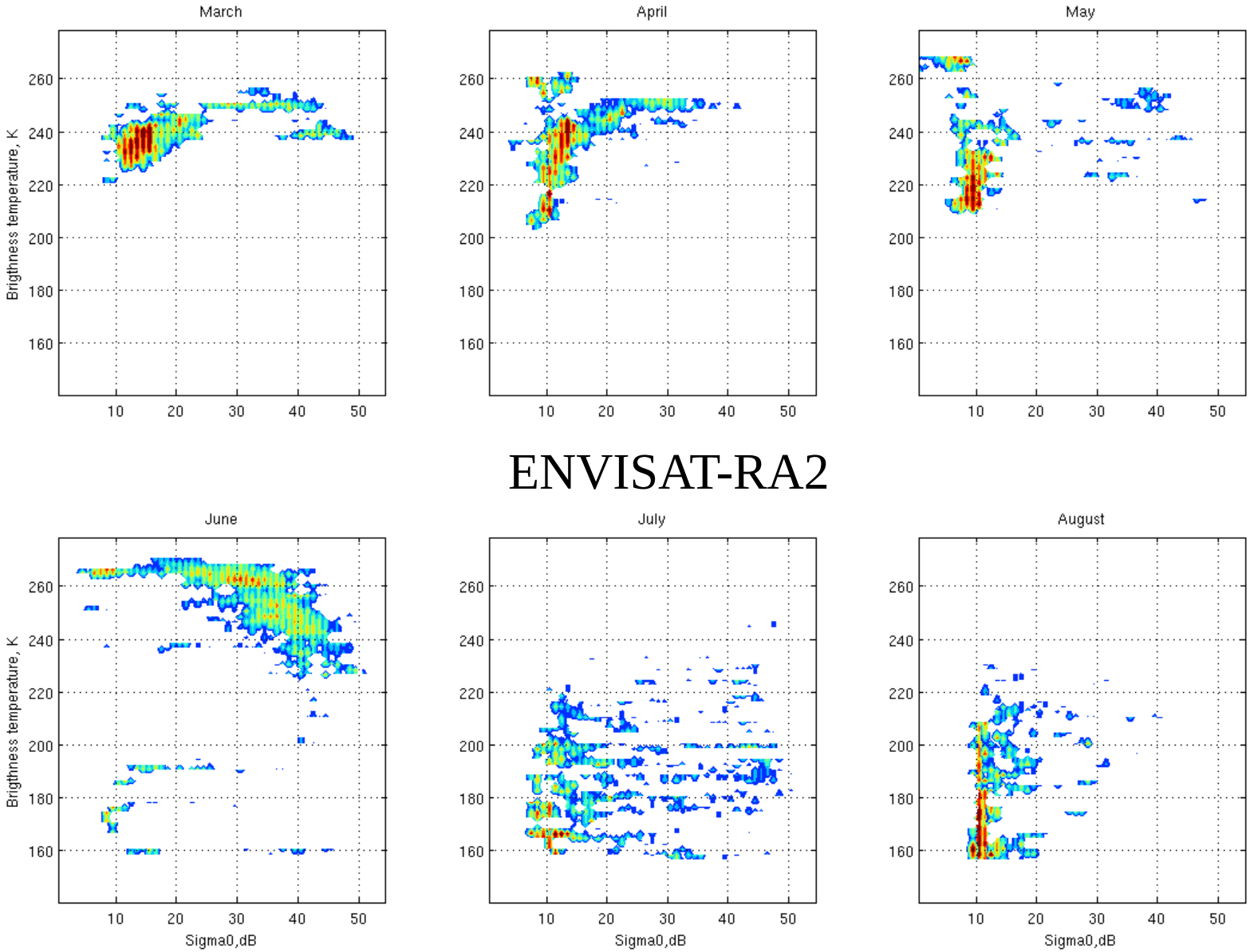
Very dynamic ice fields:
difficult to accurately validate the ice extent





The Ob' estuary

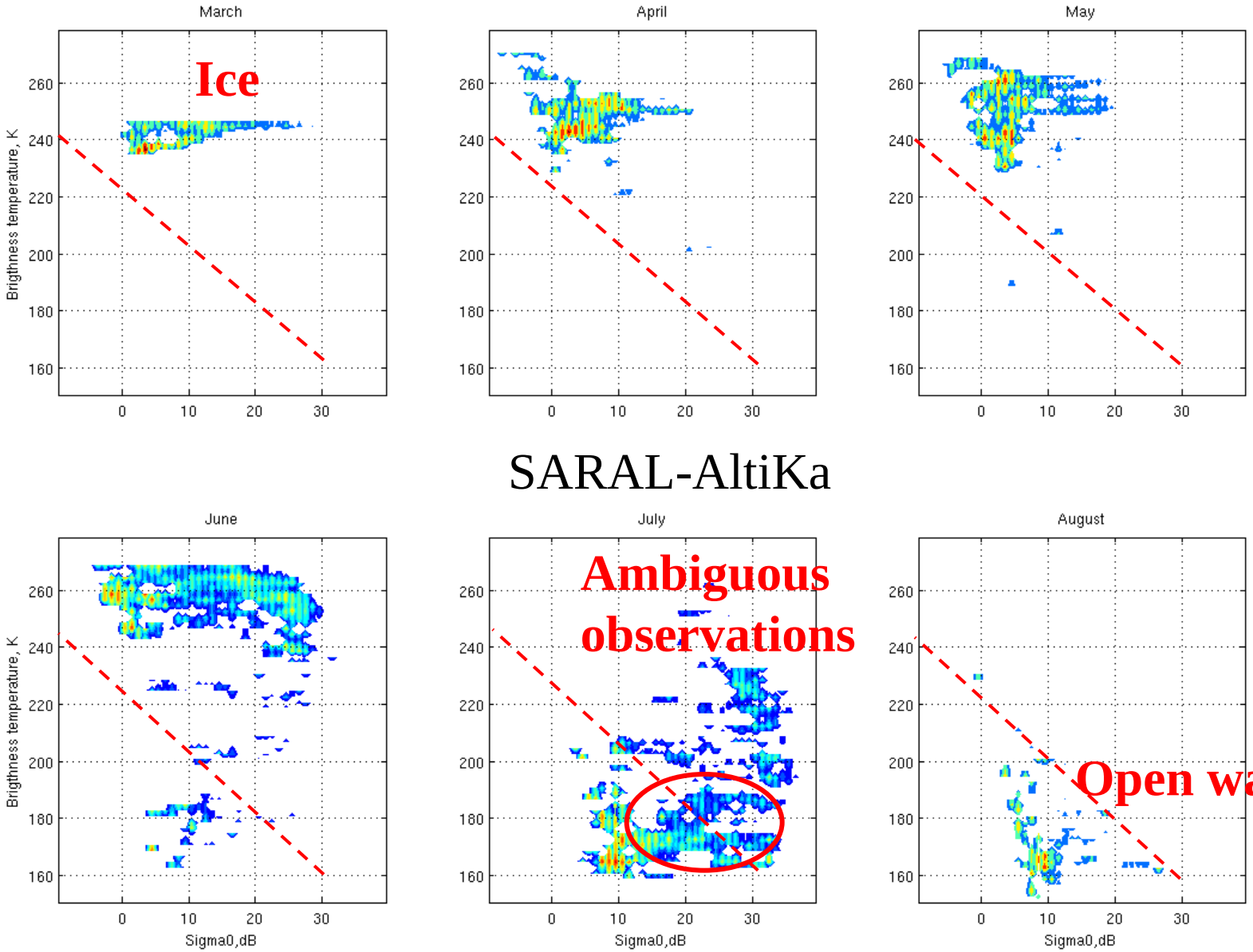
ALTIKA - ENVISAT over estuary



ENVISAT-RA2

An empirical algorithm of ice differentiation

ALTIKA - ENVISAT over estuary



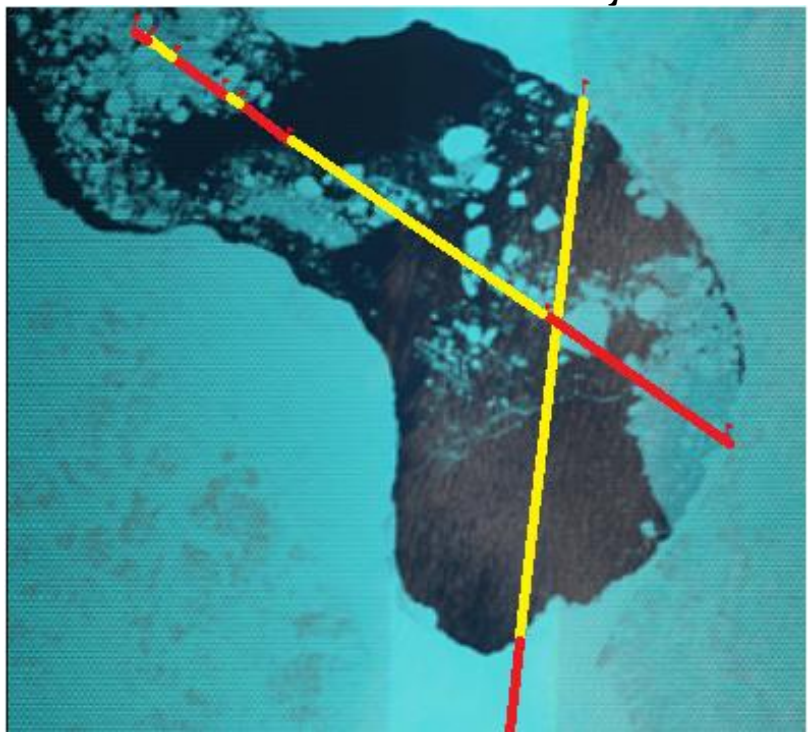
SARAL-AltiKa

An empirical algorithm of ice differentiation

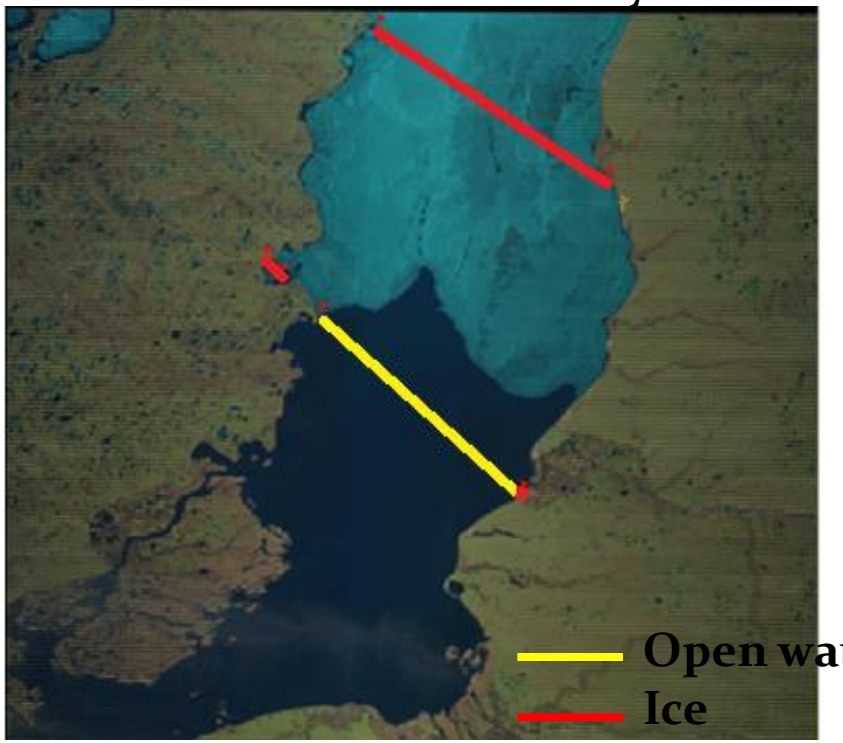
ALTIKA - ENVISAT over estuary

Validation

North of Ob' estuary



South of Ob' estuary



Good tool for small scale ice differentiation!

ALTIKA - ENVISAT over sea ice

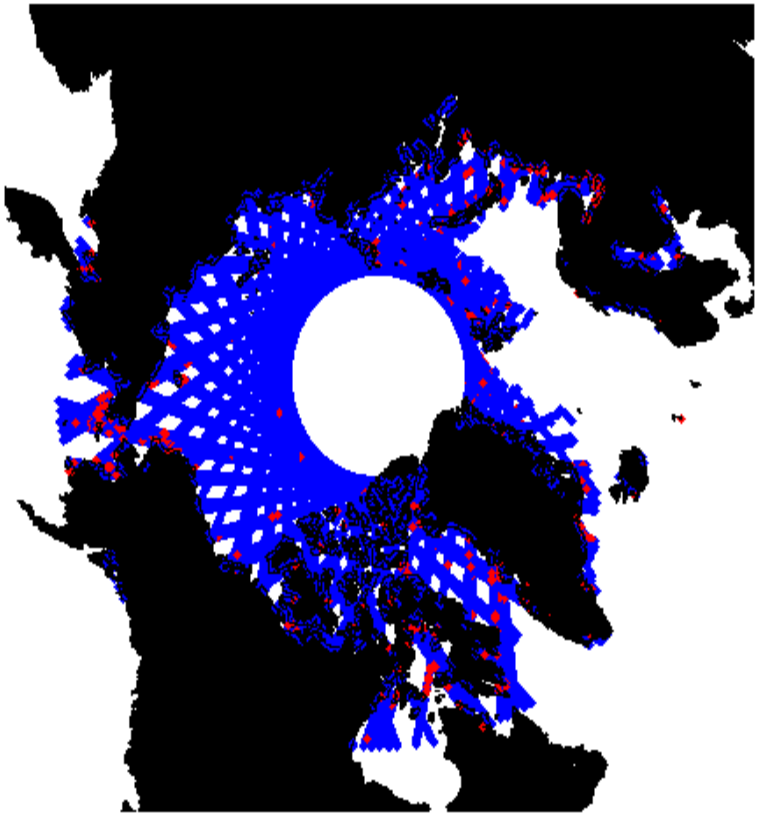
What about larger scales ?

ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

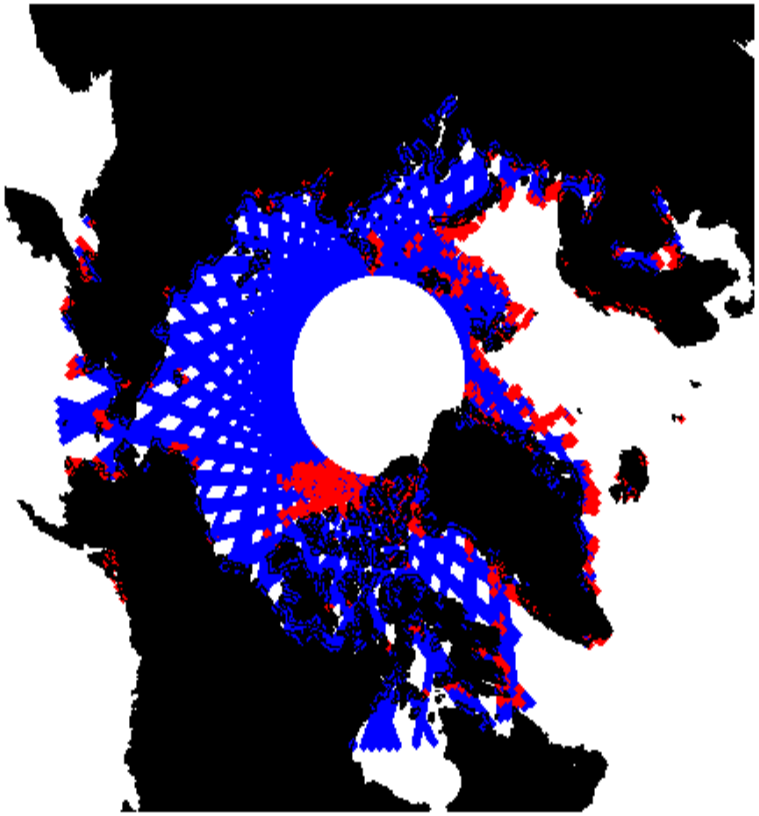
cycle 1 & subcycle 1 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 1 & subcycle 1 with Brightness temp<230K

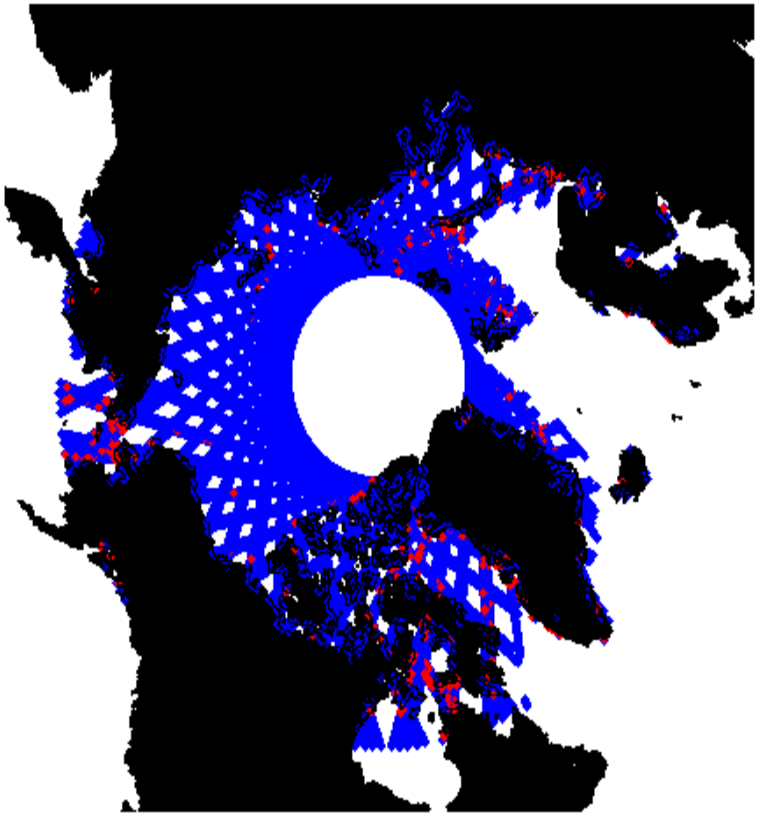


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

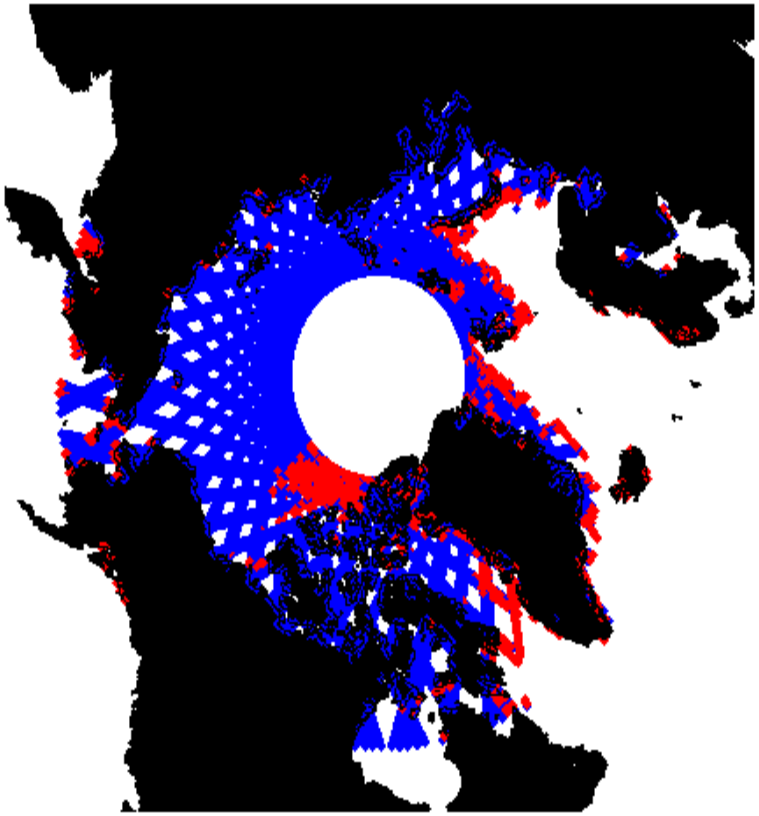
cycle 1 & subcycle 2 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 1 & subcycle 2 with Brightness temp<230K

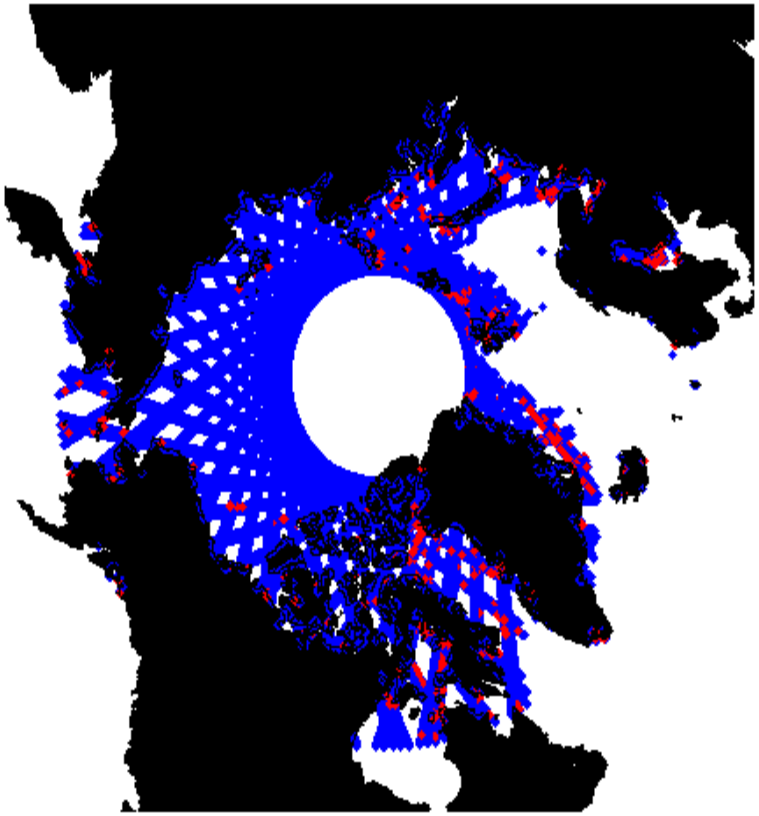


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

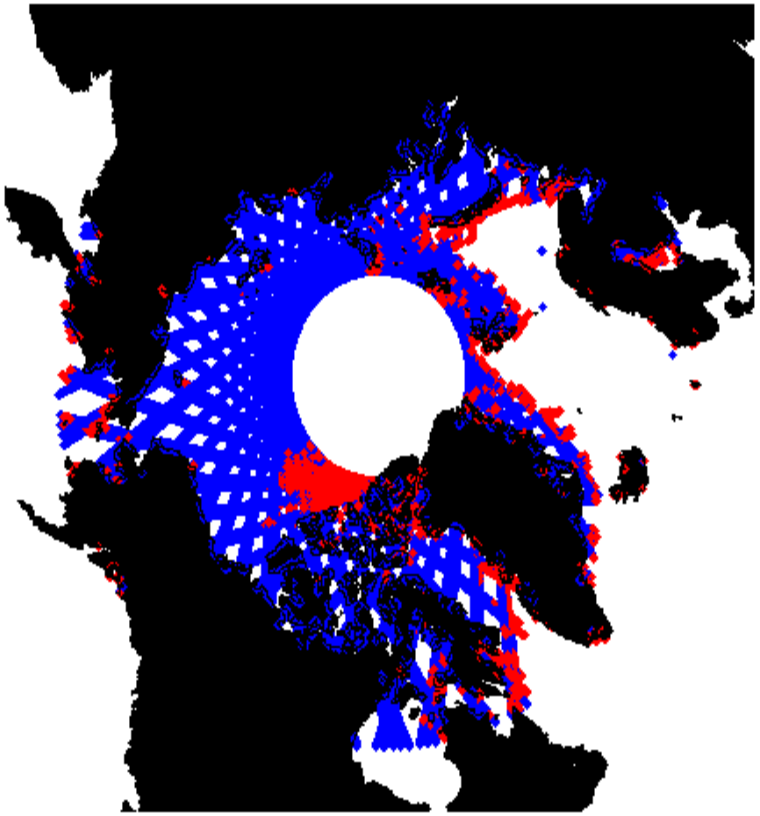
cycle 1 & subcycle 3 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 1 & subcycle 3 with Brightness temp<230K

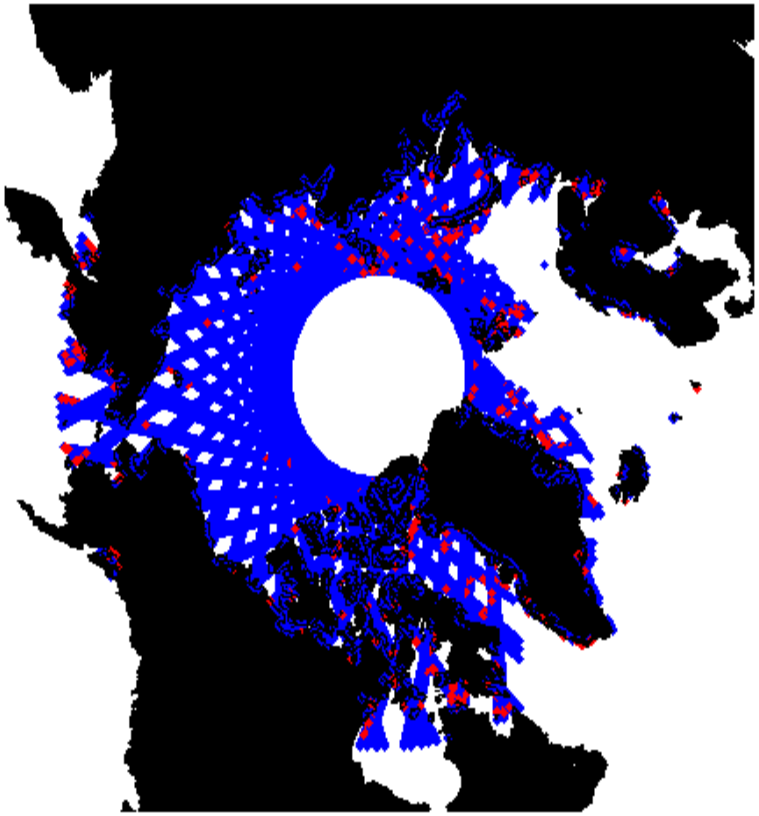


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

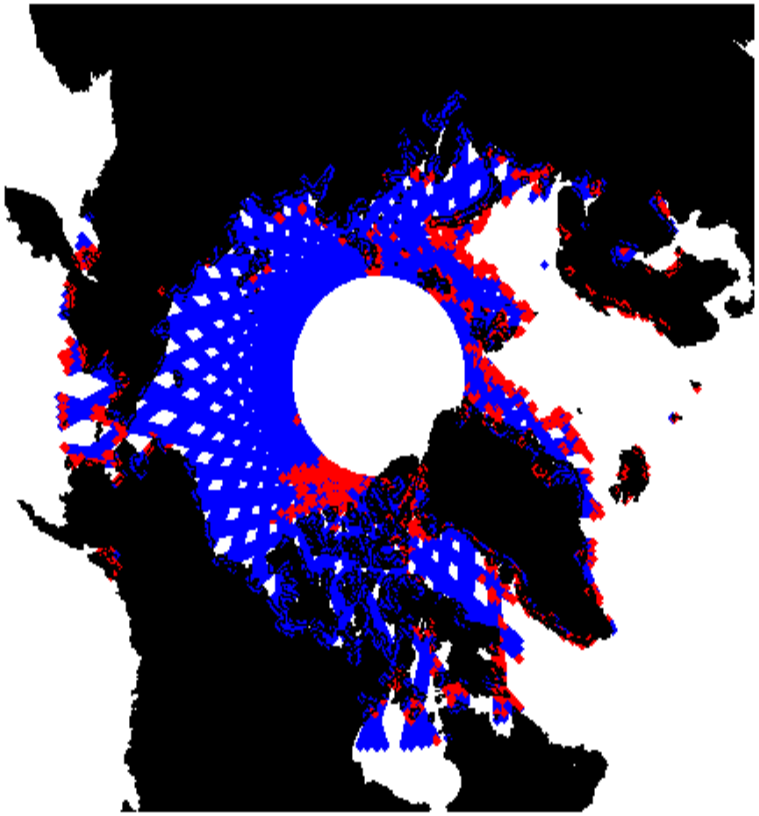
cycle 1 & subcycle 4 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 1 & subcycle 4 with Brightness temp<230K

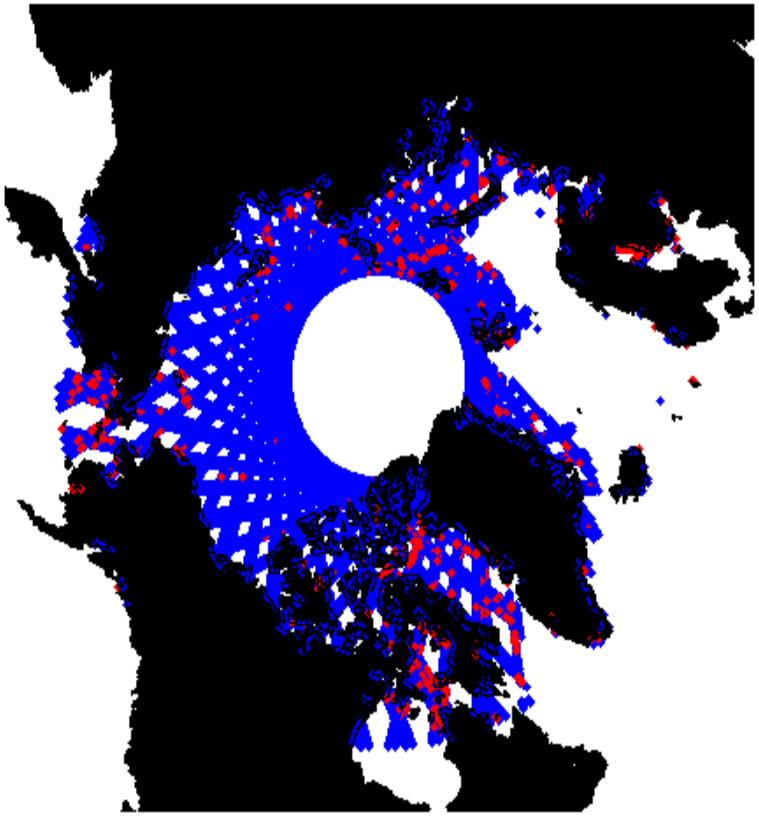


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

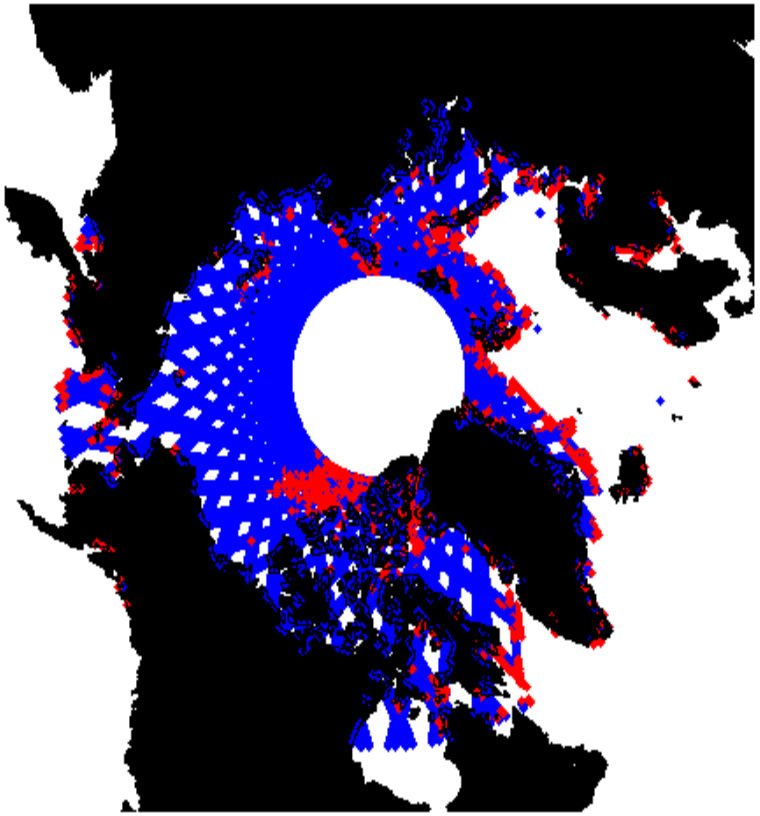
cycle 1 & subcycle 5 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 1 & subcycle 5 with Brightness temp<230K

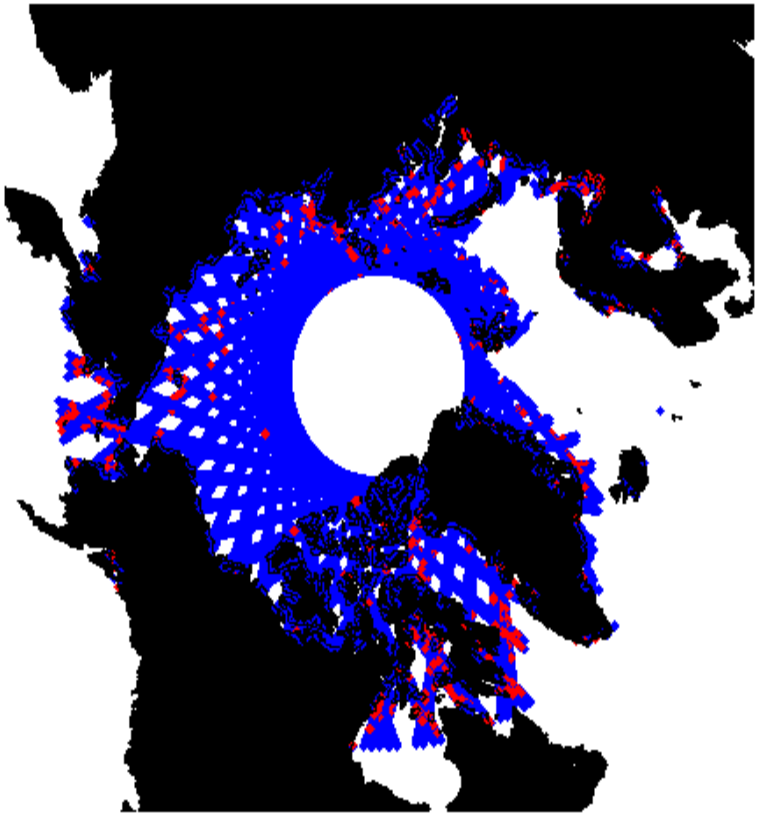


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

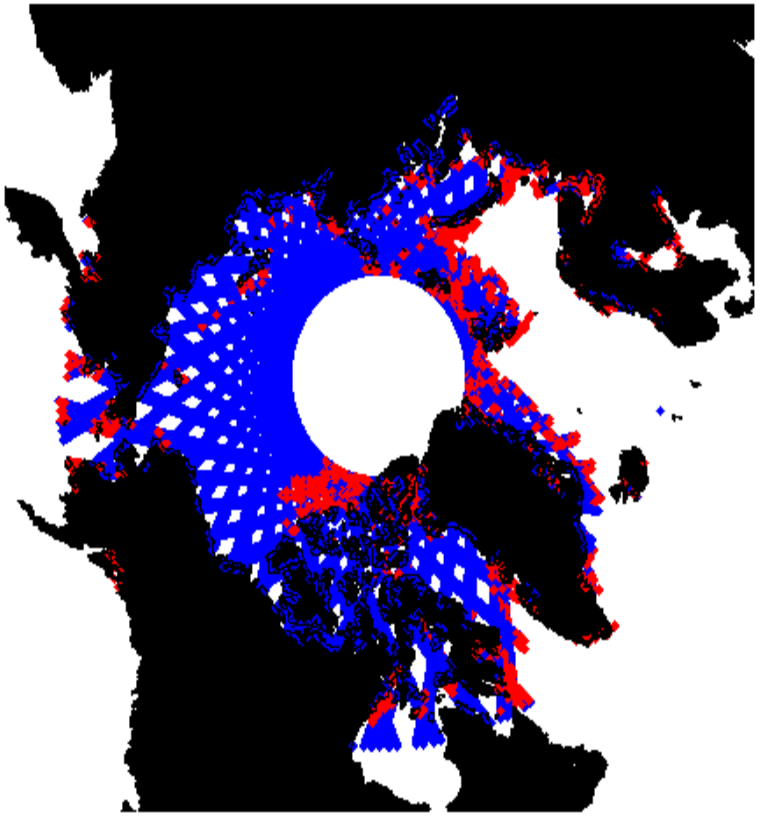
cycle 2 & subcycle 1 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 2 & subcycle 1 with Brightness temp<230K

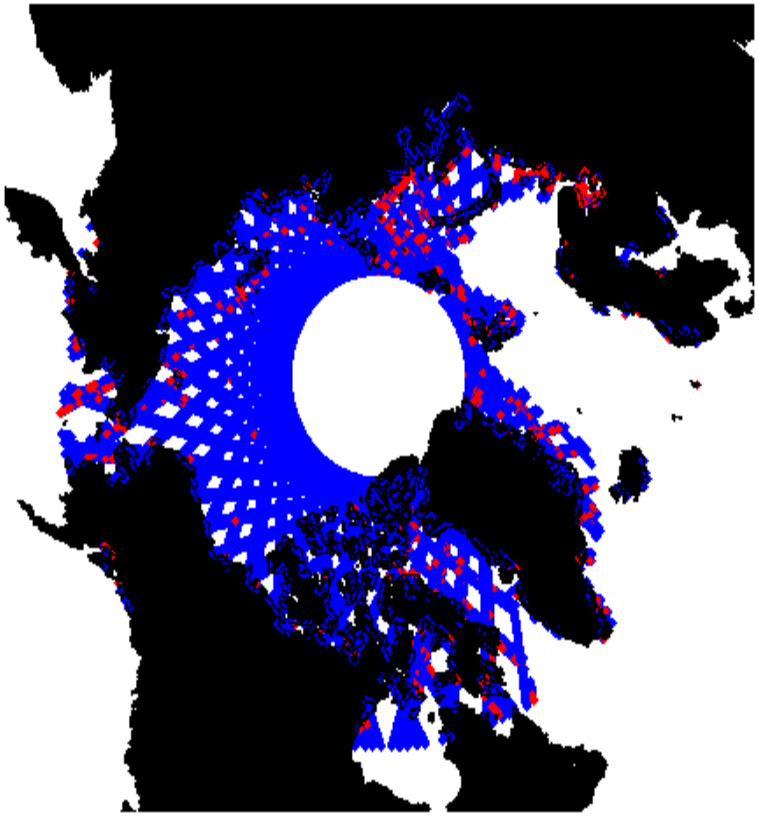


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

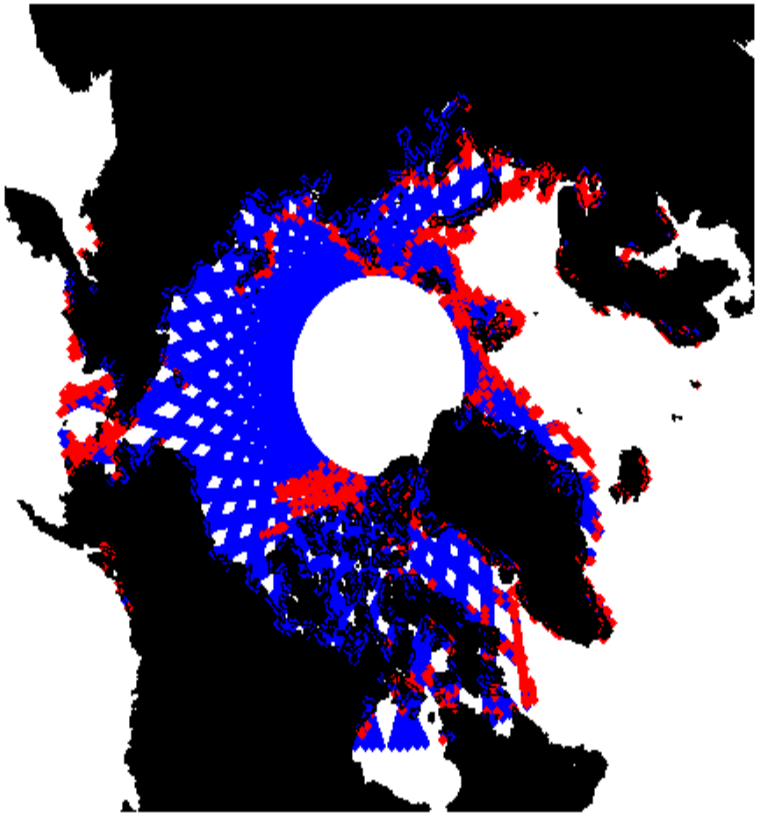
cycle 2 & subcycle 2 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 2 & subcycle 2 with Brightness temp<230K

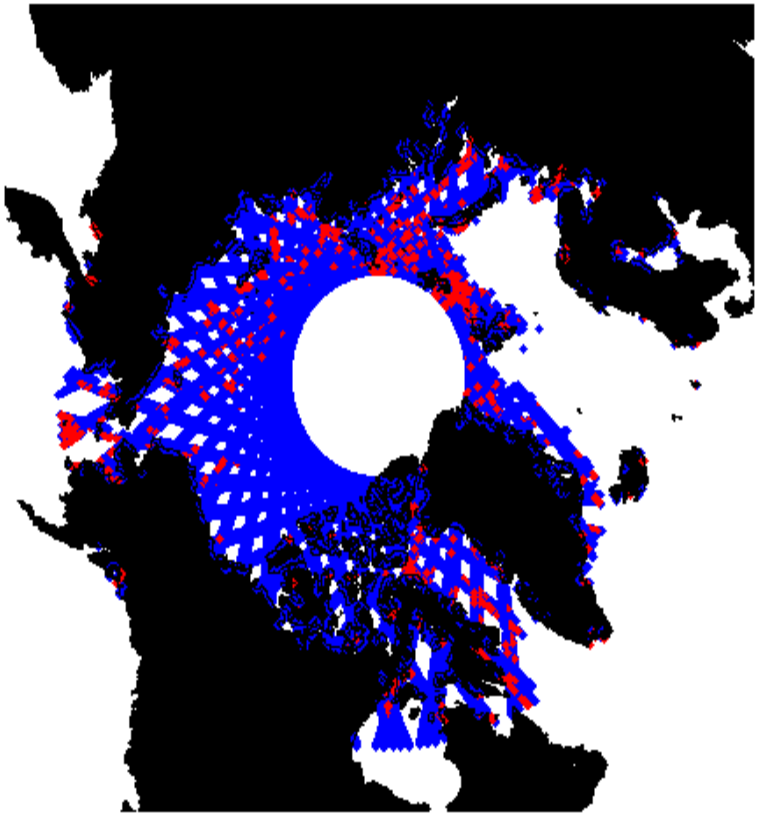


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

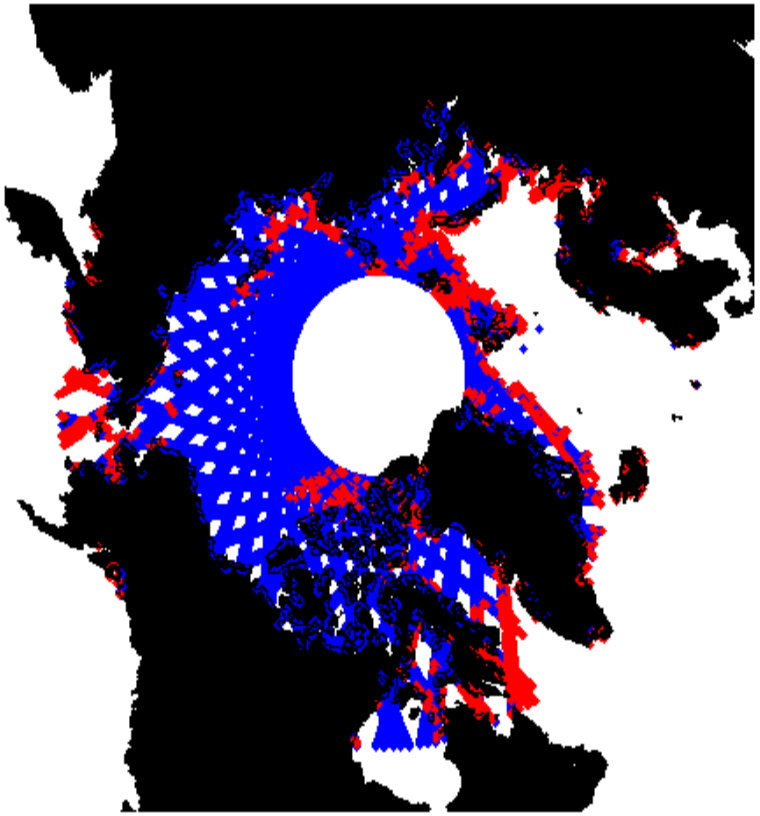
cycle 2 & subcycle 3 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 2 & subcycle 3 with Brightness temp<230K

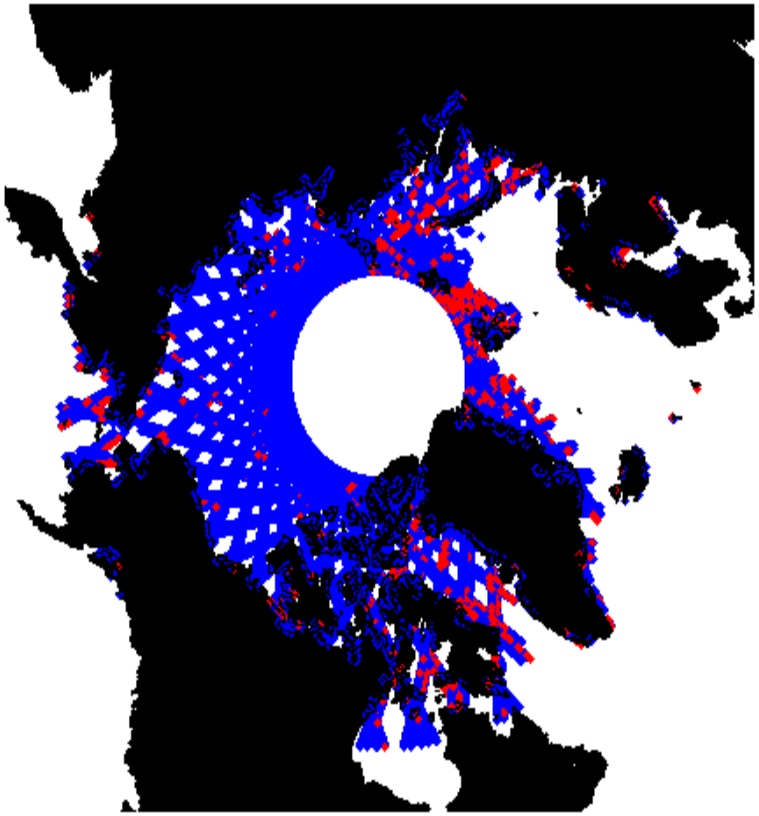


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

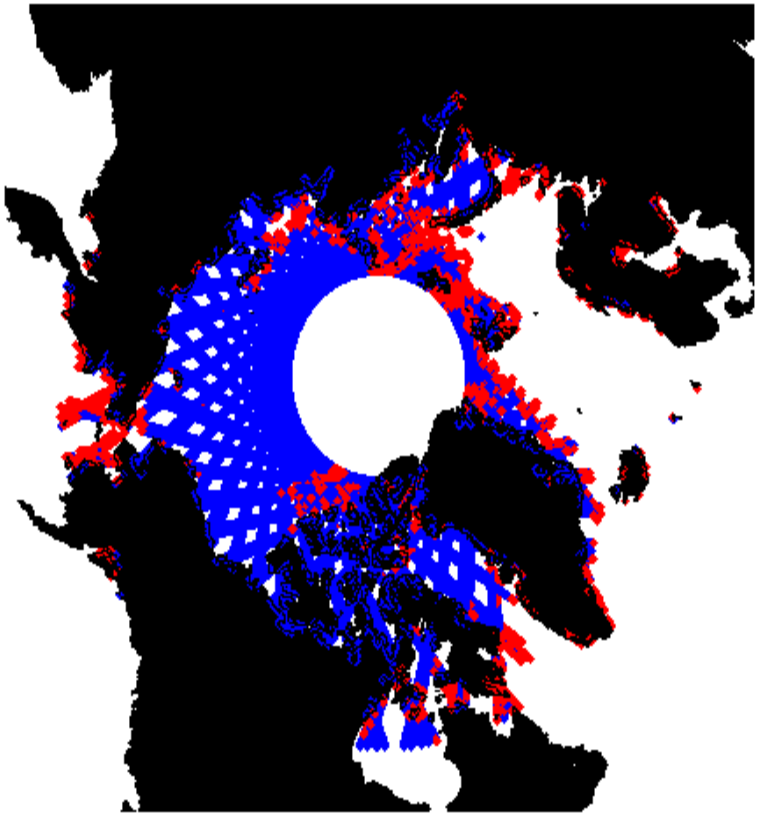
cycle 2 & subcycle 4 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 2 & subcycle 4 with Brightness temp<230K

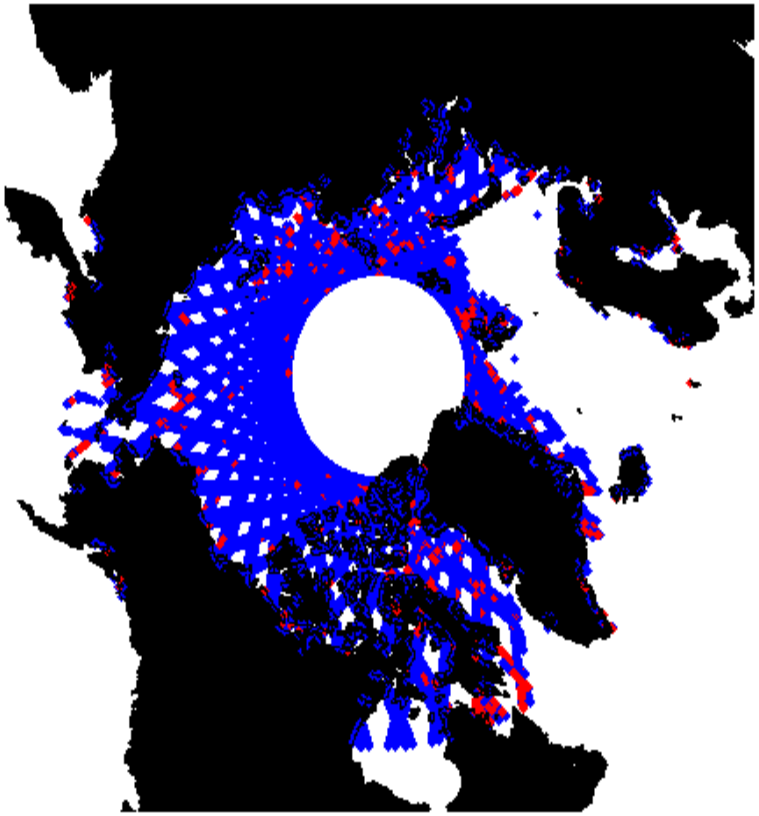


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

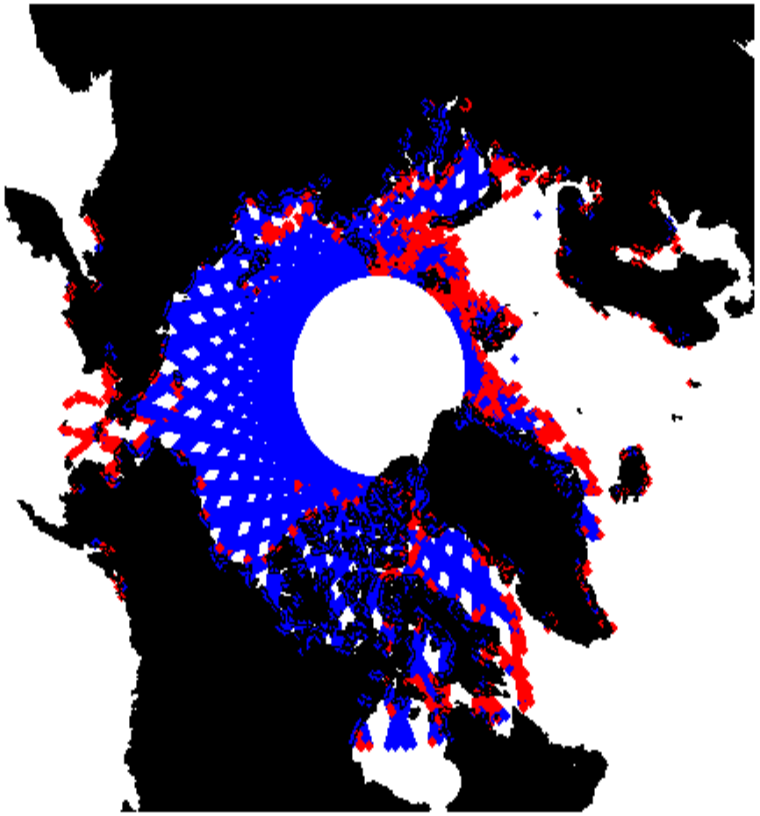
cycle 2 & subcycle 5 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 2 & subcycle 5 with Brightness temp<230K

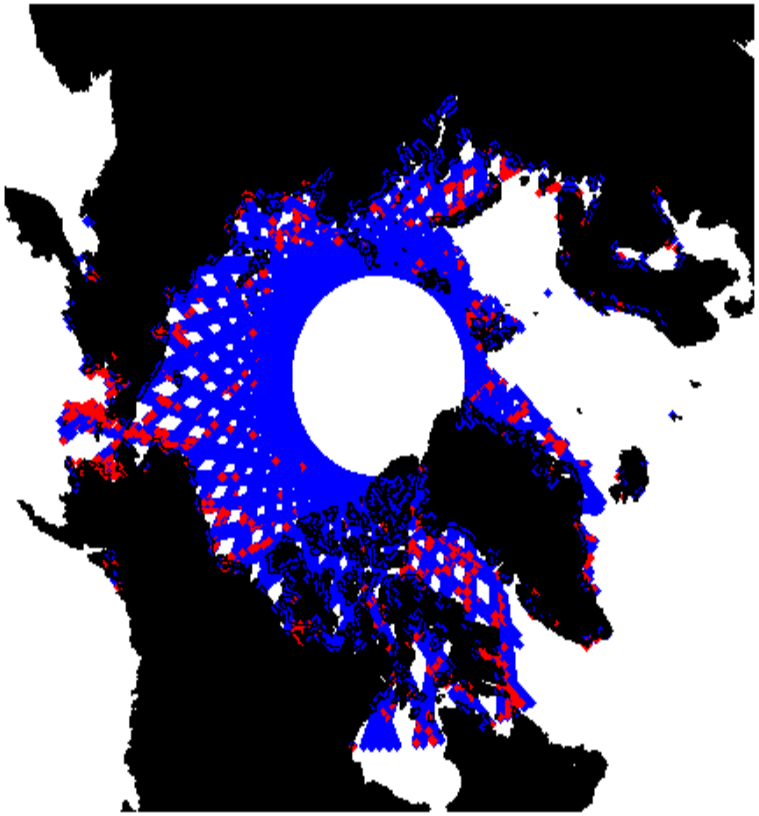


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

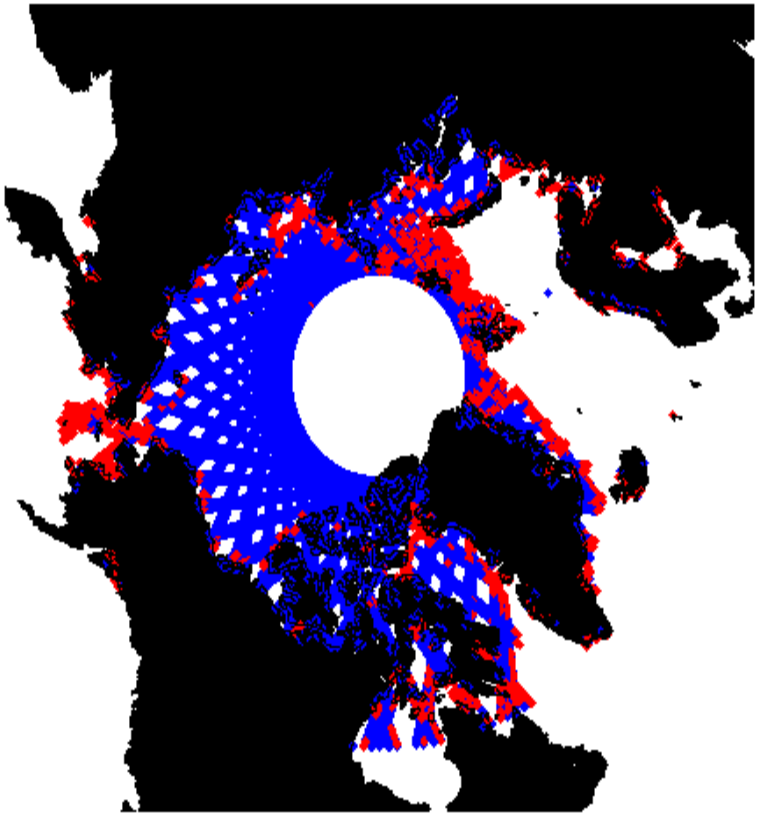
cycle 3 & subcycle 1 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 3 & subcycle 1 with Brightness temp<230K

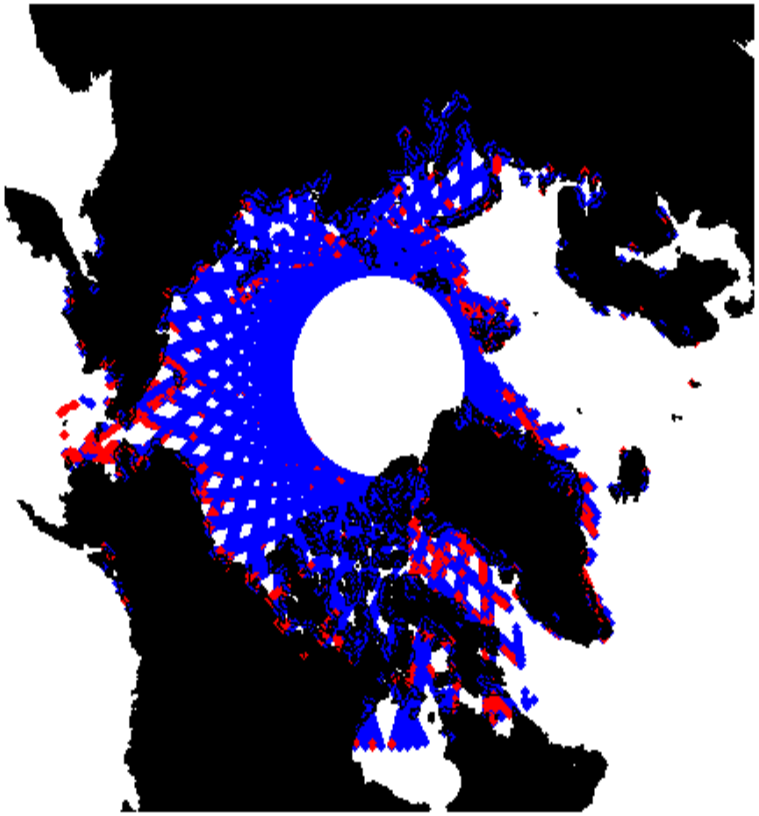


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

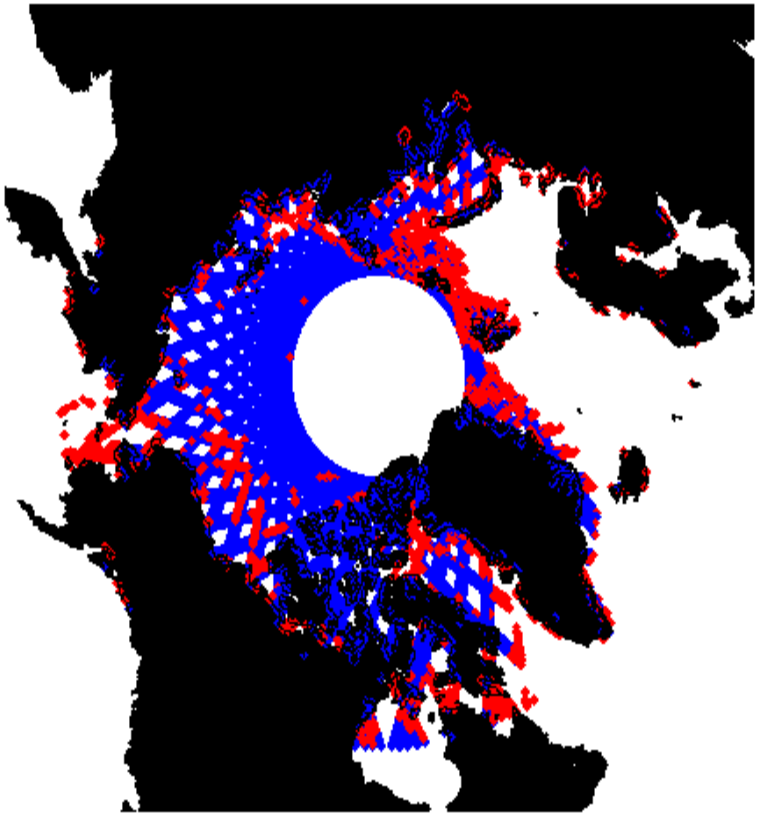
cycle 3 & subcycle 2 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 3 & subcycle 2 with Brightness temp<230K

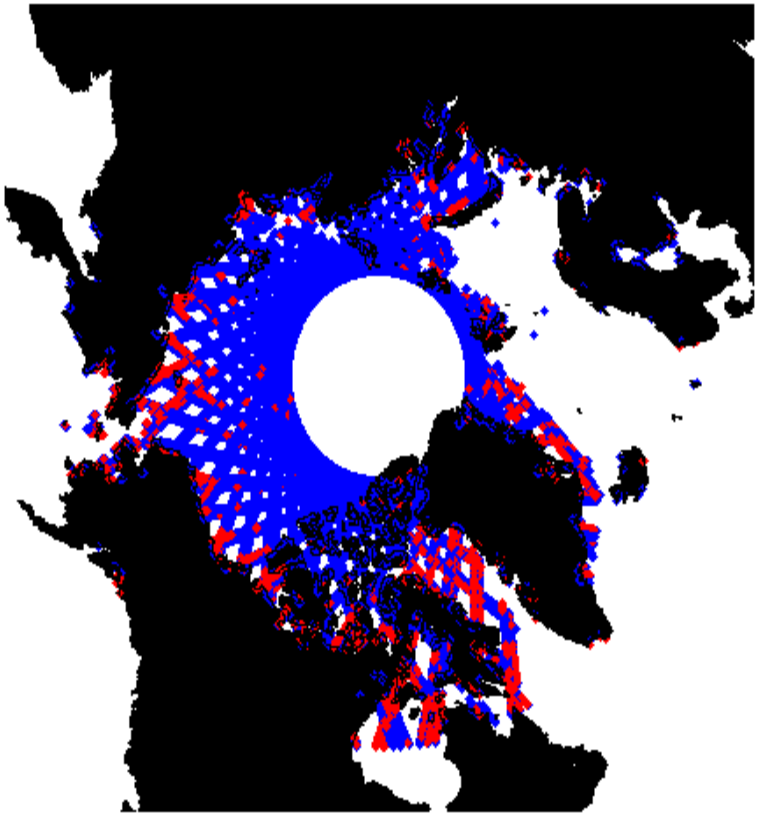


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

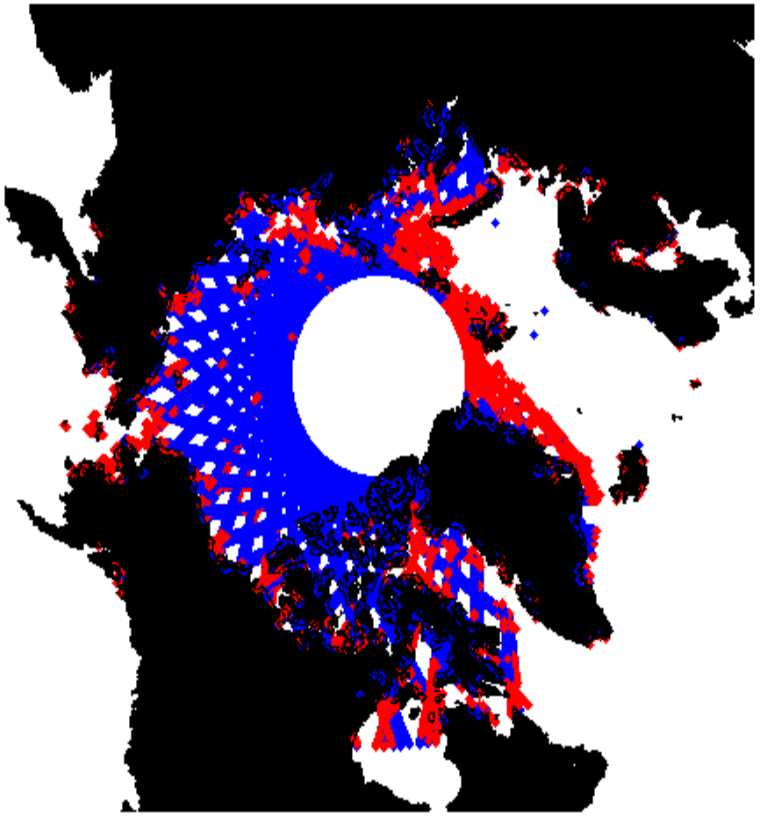
cycle 3 & subcycle 3 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 3 & subcycle 3 with Brightness temp<230K

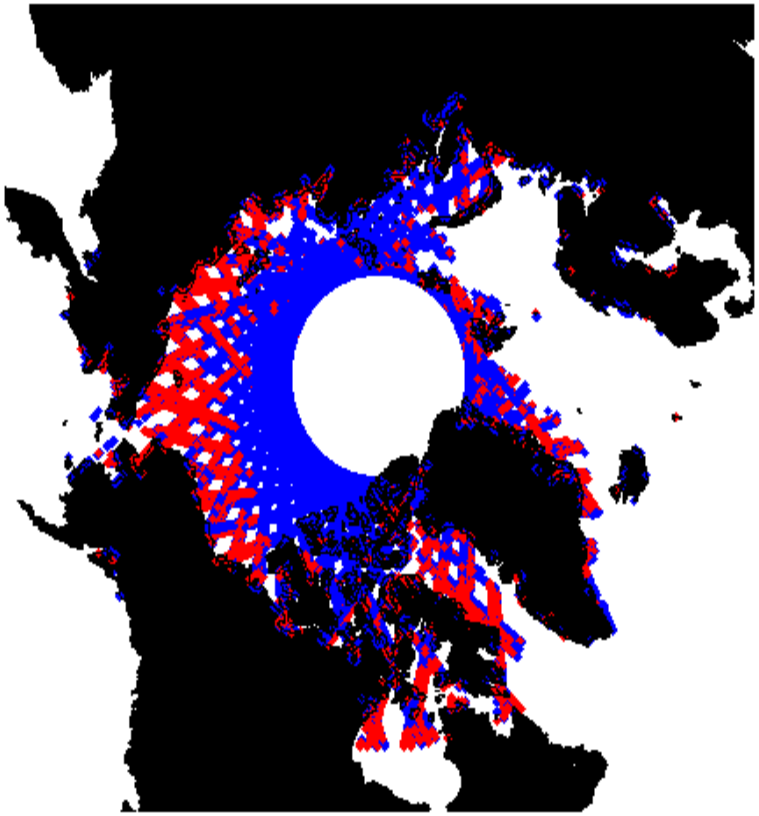


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

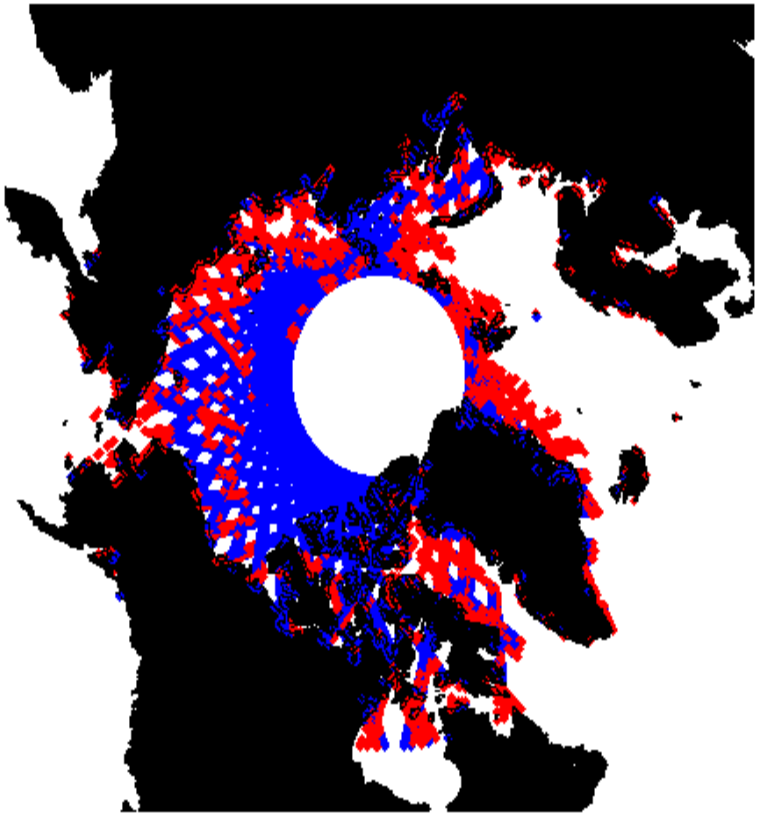
cycle 3 & subcycle 4 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 3 & subcycle 4 with Brightness temp<230K

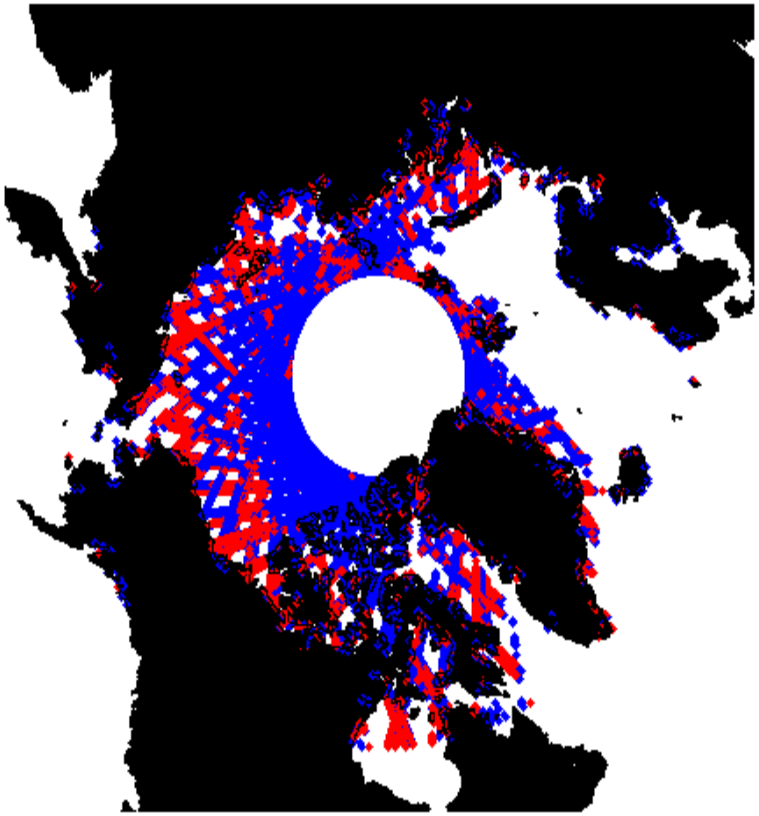


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

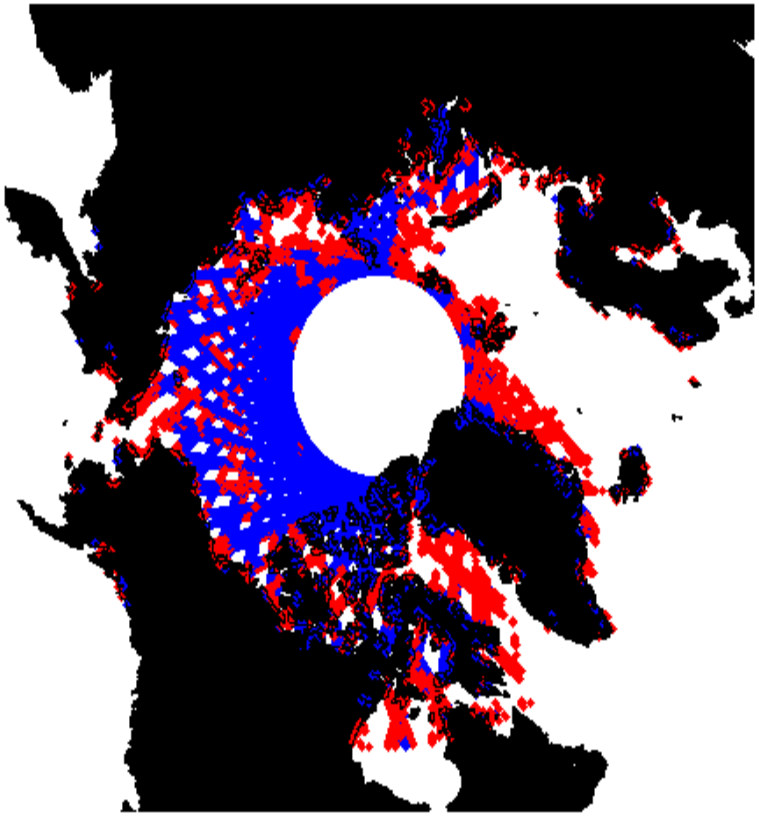
cycle 3 & subcycle 5 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 3 & subcycle 5 with Brightness temp<230K

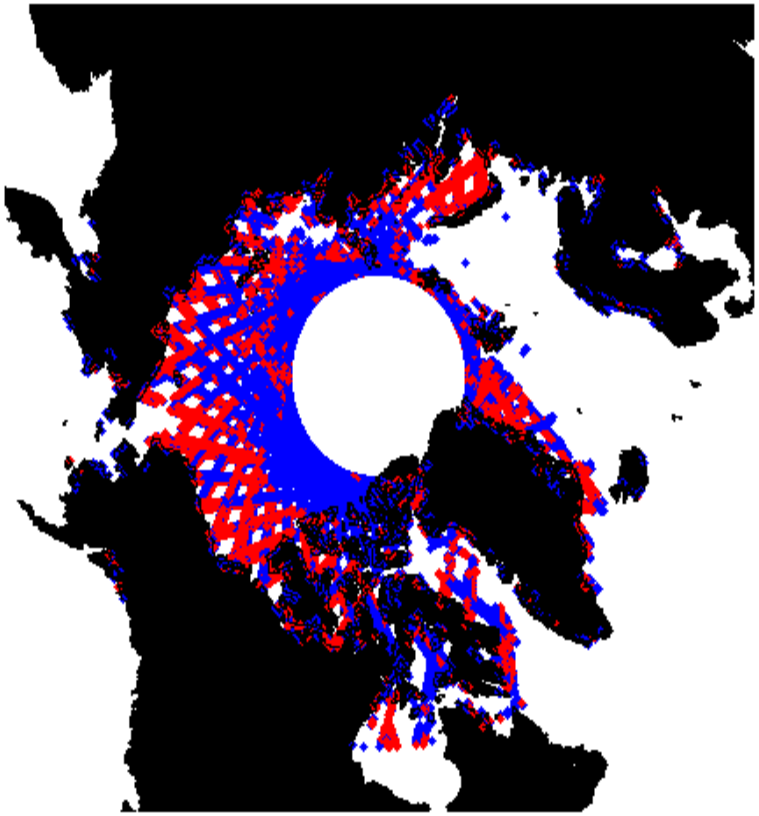


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

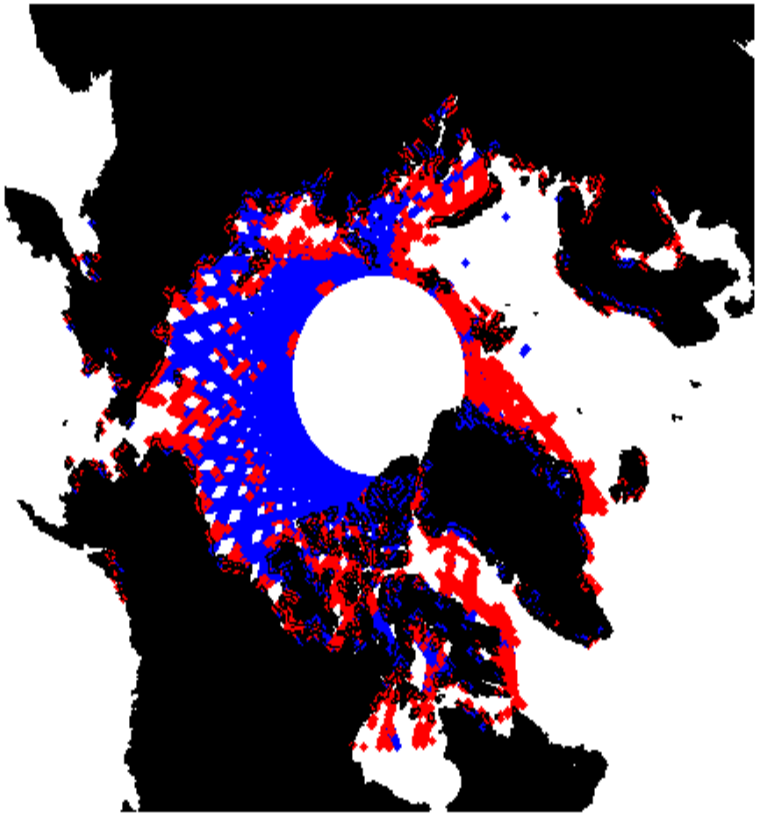
cycle 4 & subcycle 1 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 4 & subcycle 1 with Brightness temp<230K



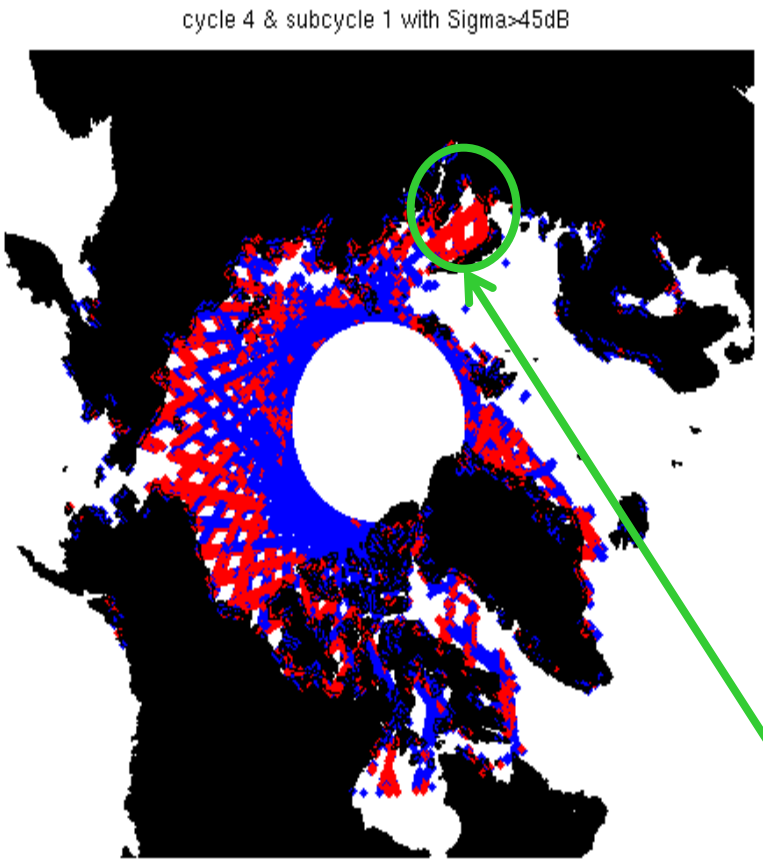
ALTIKA - ENVISAT over sea ice

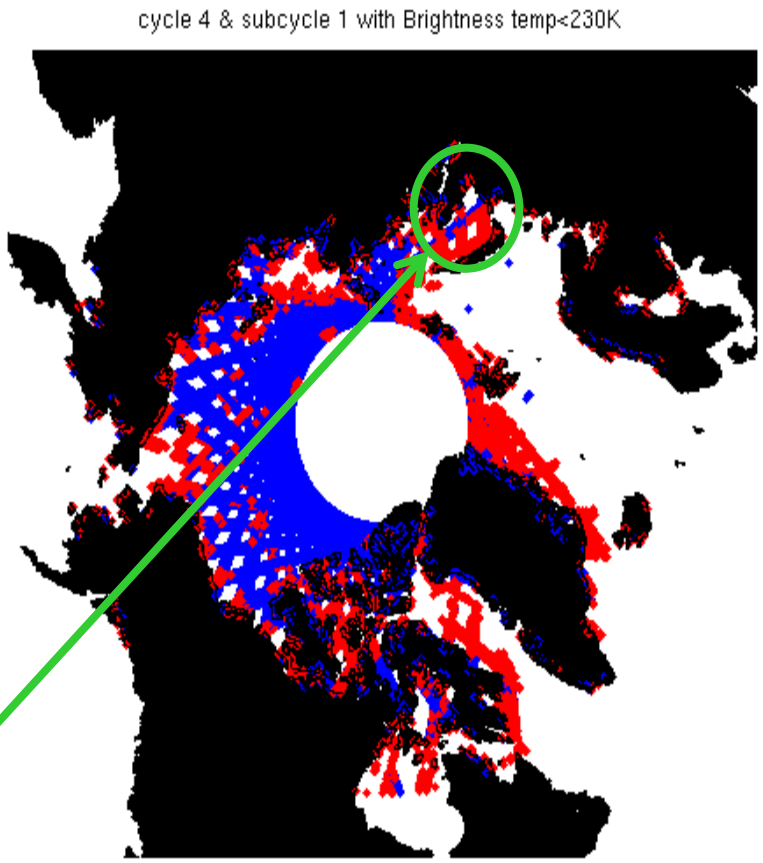
Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

Ice with TB>230 K

Ice with TB<230 K





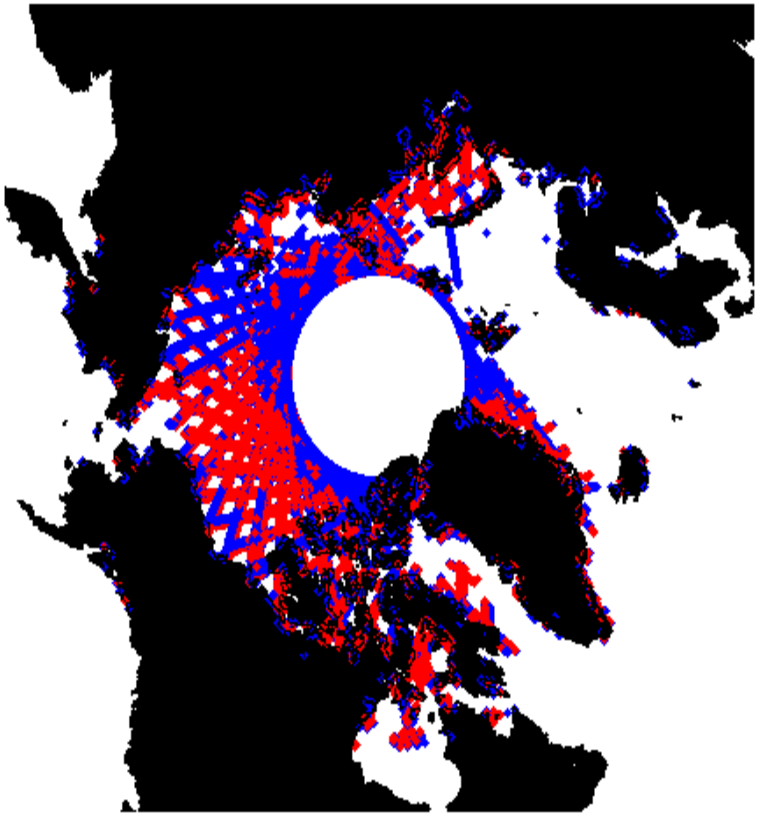
Sea ice melting seen by both the radiometer and the radar

ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

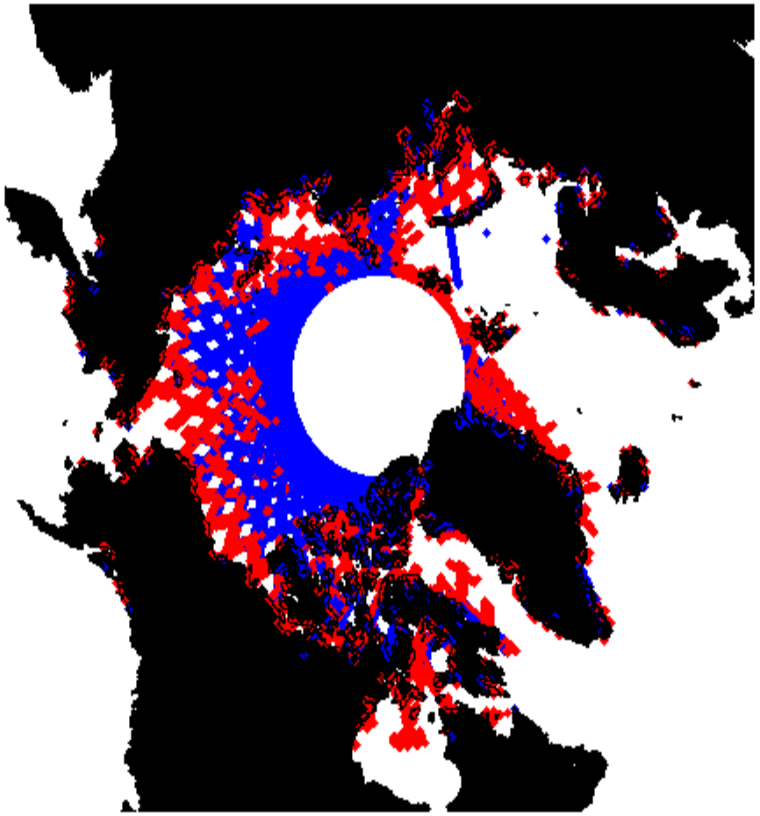
cycle 4 & subcycle 2 with Sigma>45dB



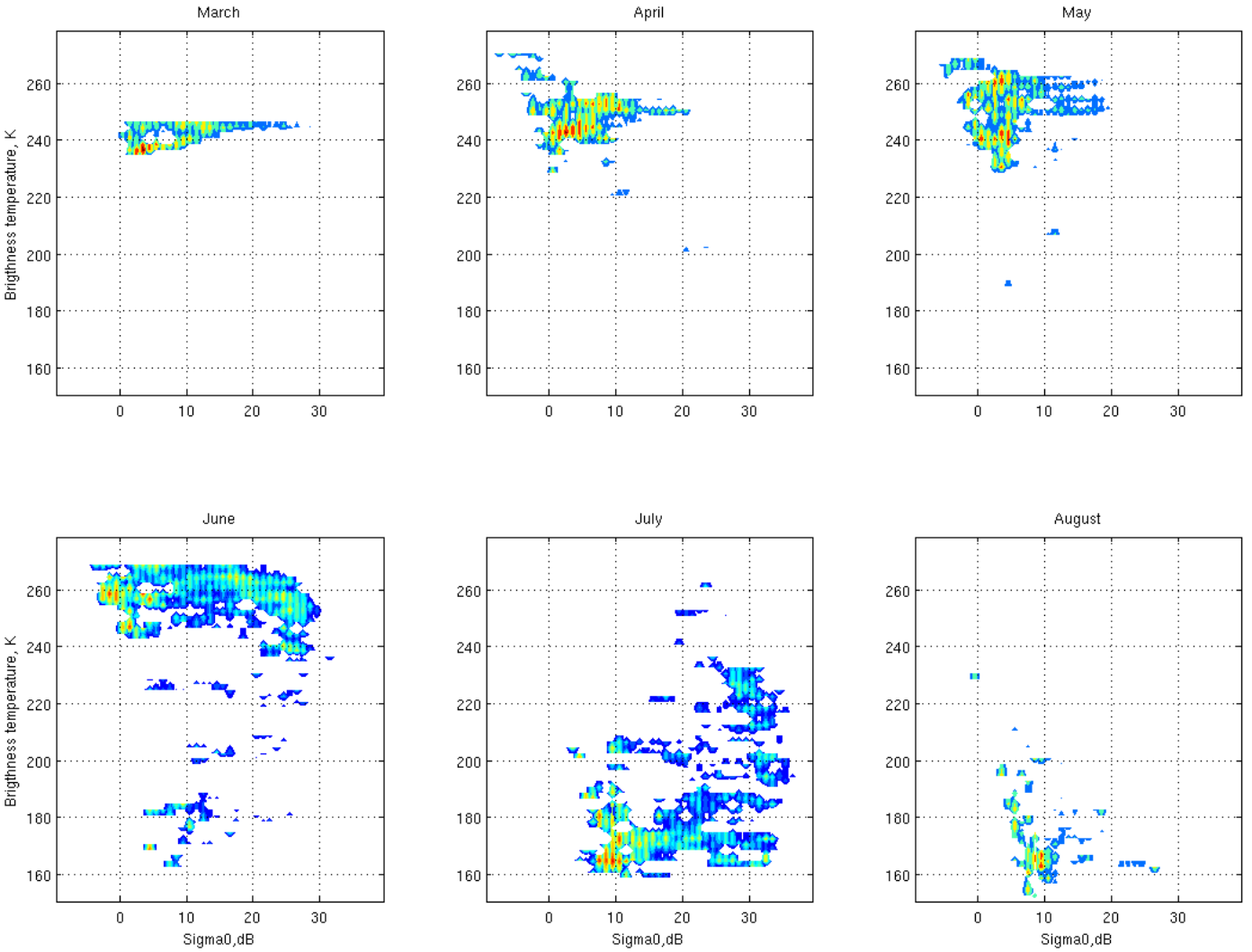
Ice with TB>230 K

Ice with TB<230 K

cycle 4 & subcycle 2 with Brightness temp<230K



ALTIKA - ENVISAT over sea ice



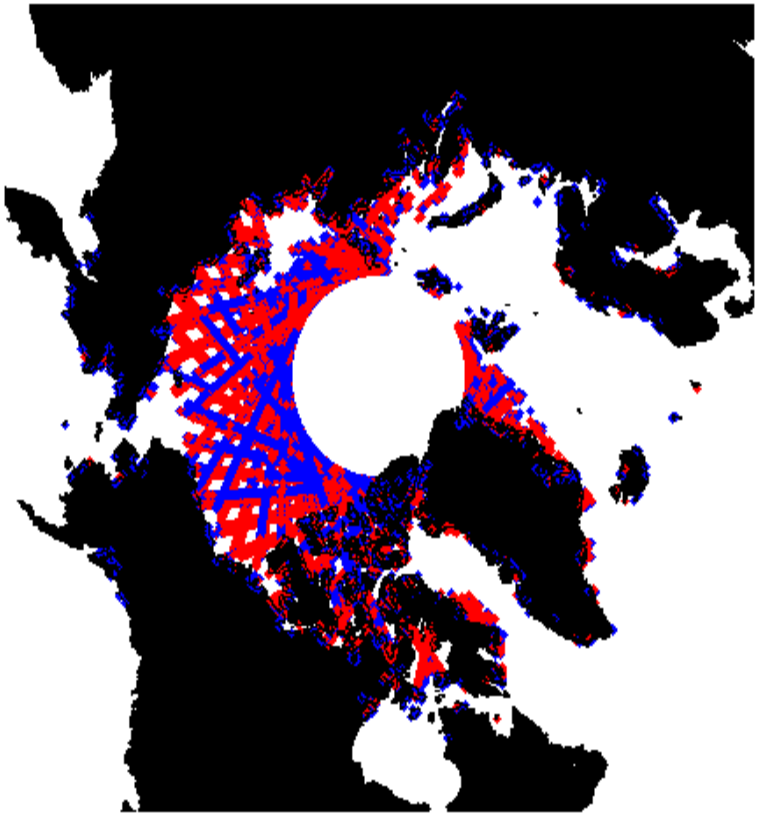
Evidence in snow/ice melting with AltiKa !

ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

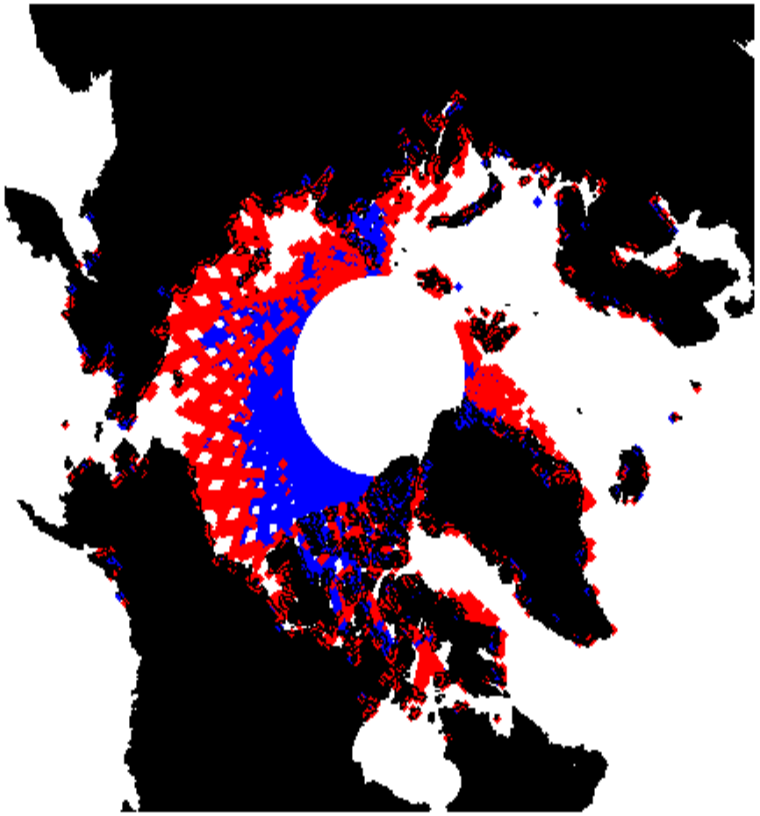
cycle 4 & subcycle 4 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 4 & subcycle 4 with Brightness temp<230K

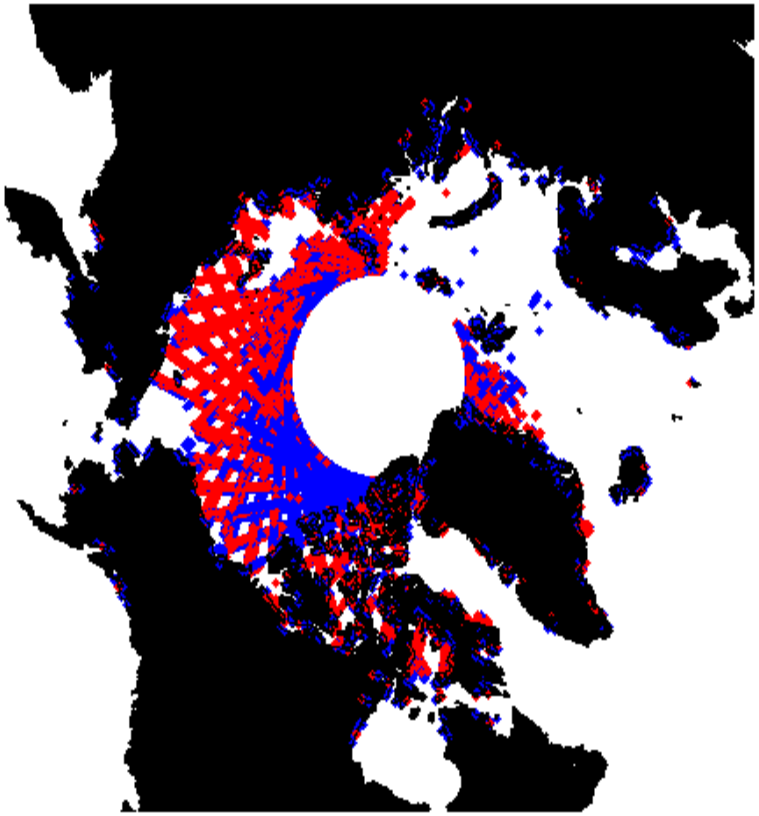


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

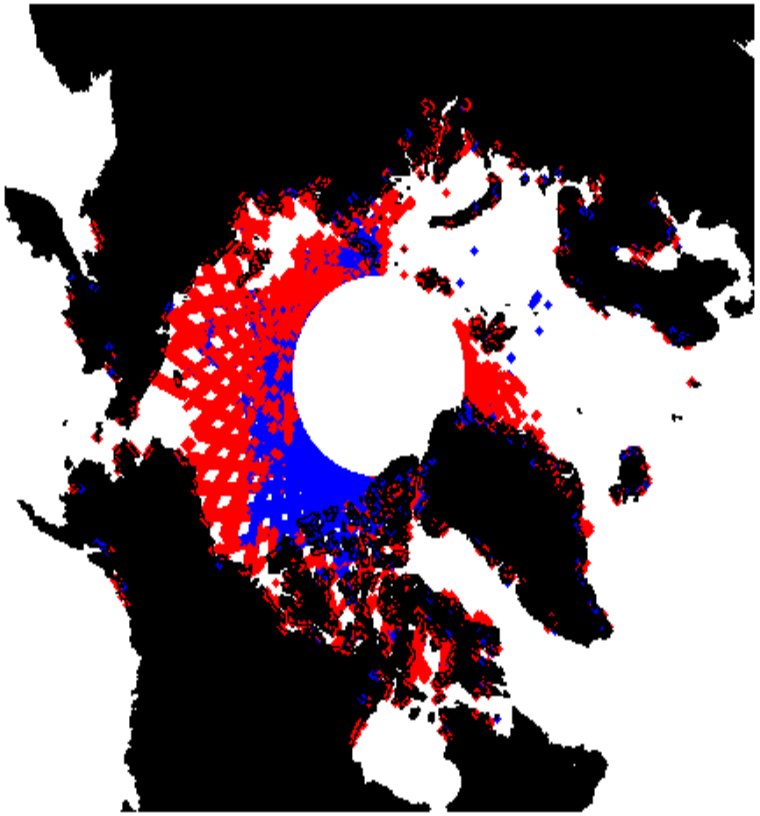
cycle 4 & subcycle 5 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 4 & subcycle 5 with Brightness temp<230K

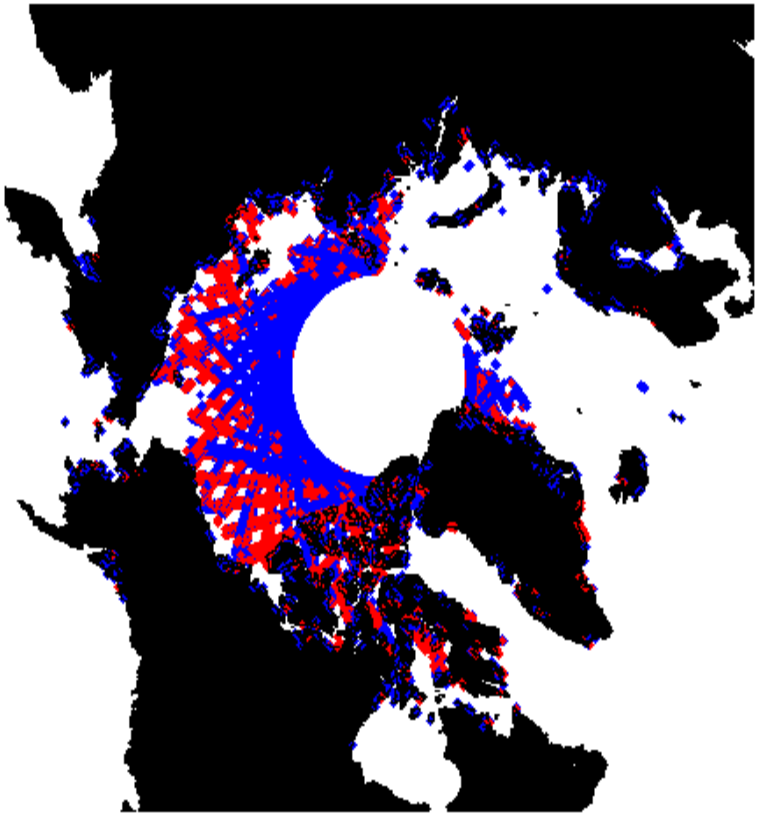


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

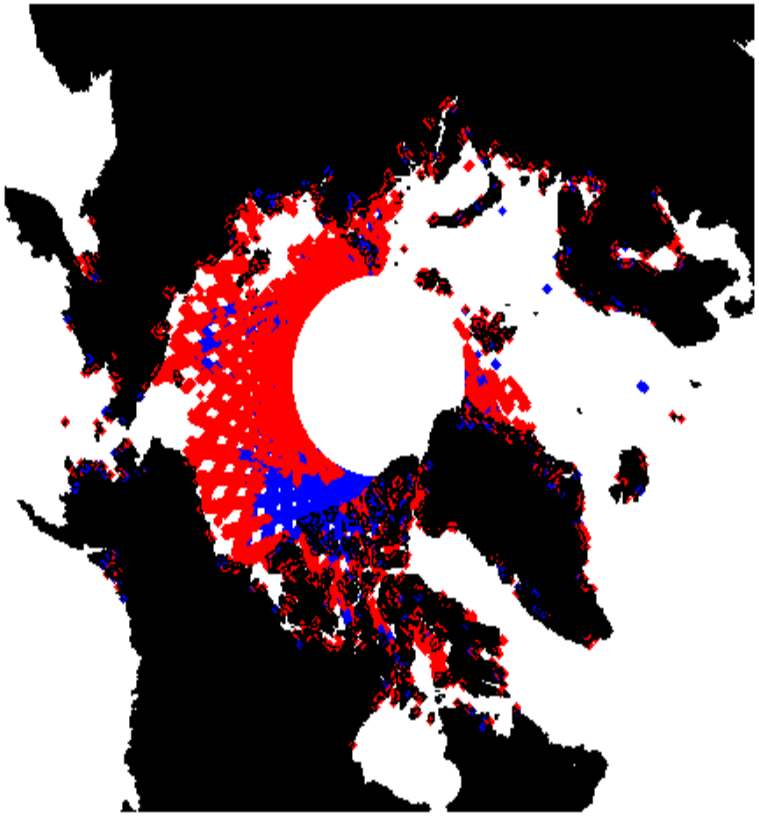
cycle 5 & subcycle 1 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 5 & subcycle 1 with Brightness temp<230K

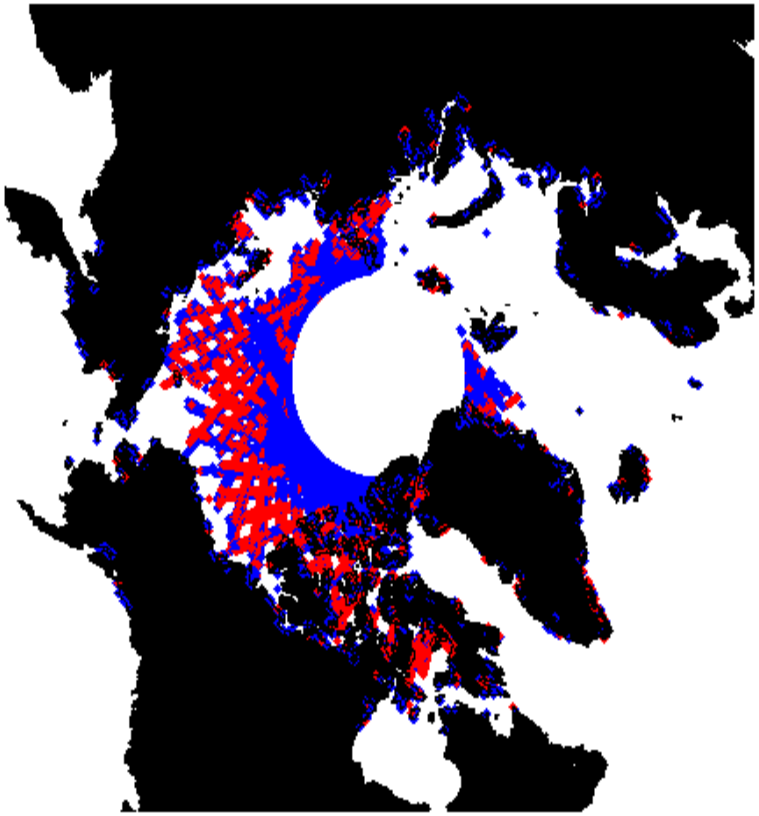


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

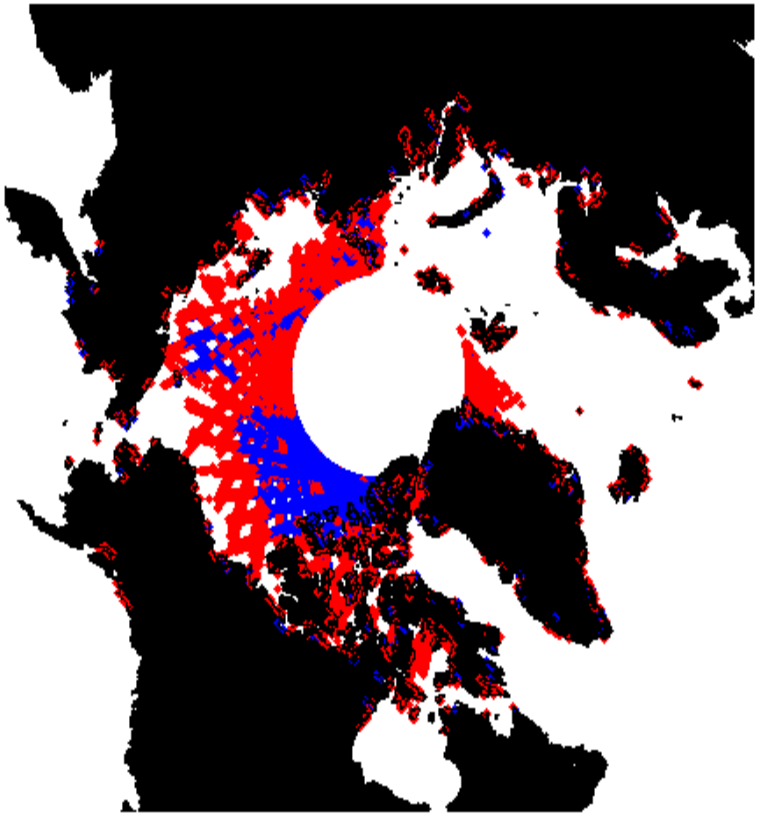
cycle 5 & subcycle 2 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 5 & subcycle 2 with Brightness temp<230K

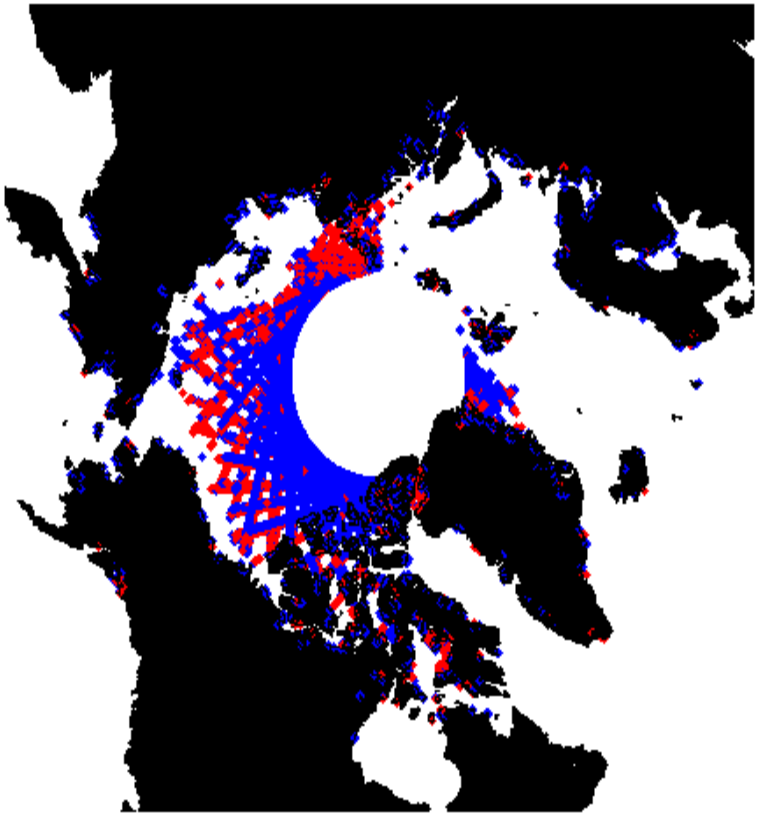


ALTIKA - ENVISAT over sea ice

Ice with Sigma0<45 dB

Ice with Sigma0>45 dB

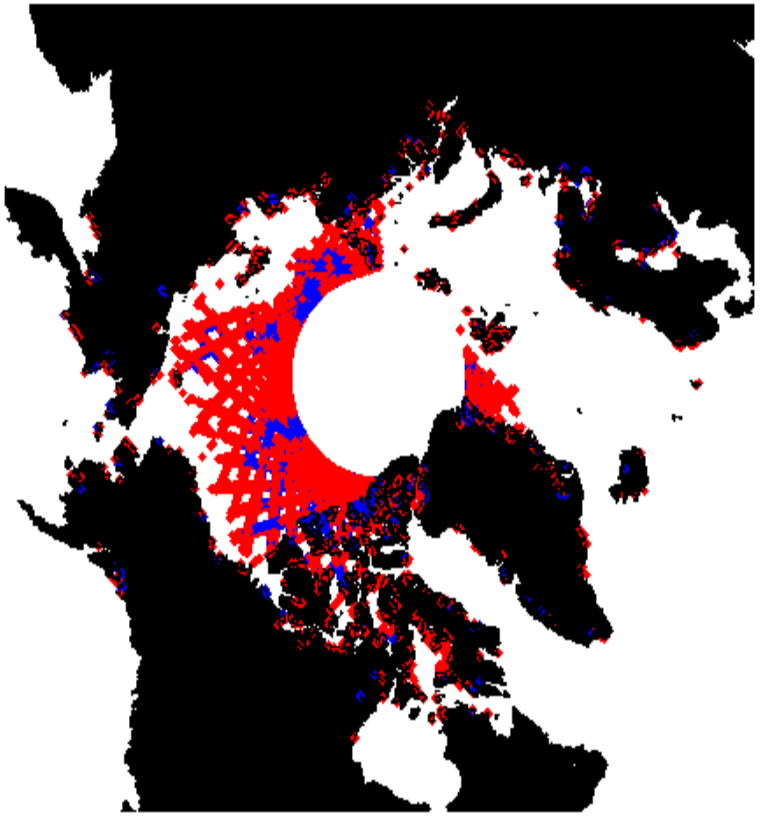
cycle 5 & subcycle 3 with Sigma>45dB



Ice with TB>230 K

Ice with TB<230 K

cycle 5 & subcycle 3 with Brightness temp<230K



ALTIKA - ENVISAT Conclusions

- **AltiKa is a good continuation for wetland studies especially with its better resolution.**

- **Signal characteristics represent some very good tools for ice detection/extension.**

- **Introduction of radar use to observe melting sea ice provides us with new information**

Thank you for your attention!