SEA-ICE AND SNOW FACIES CLASSIFICATION FROM ENVISAT DATA

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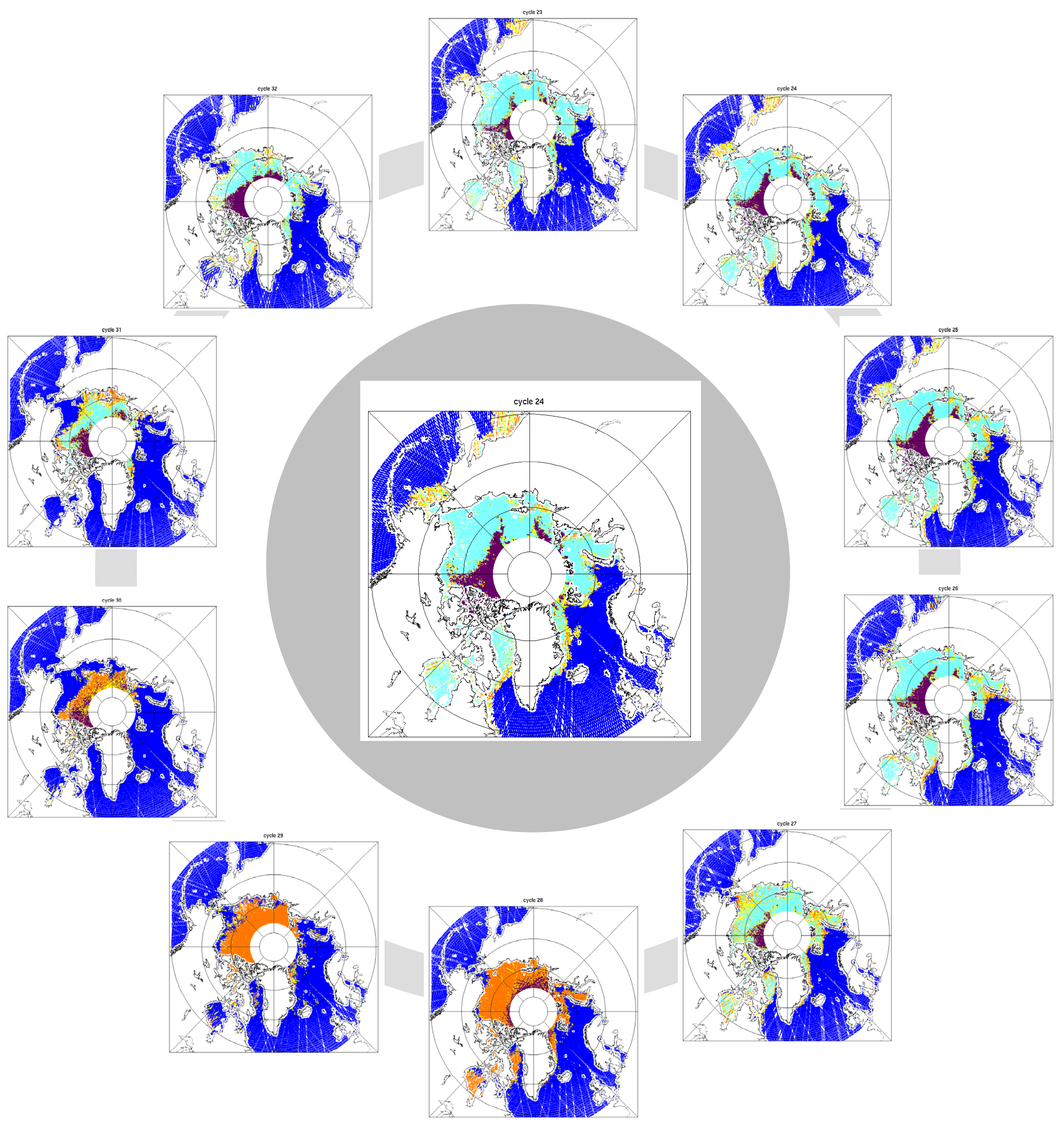
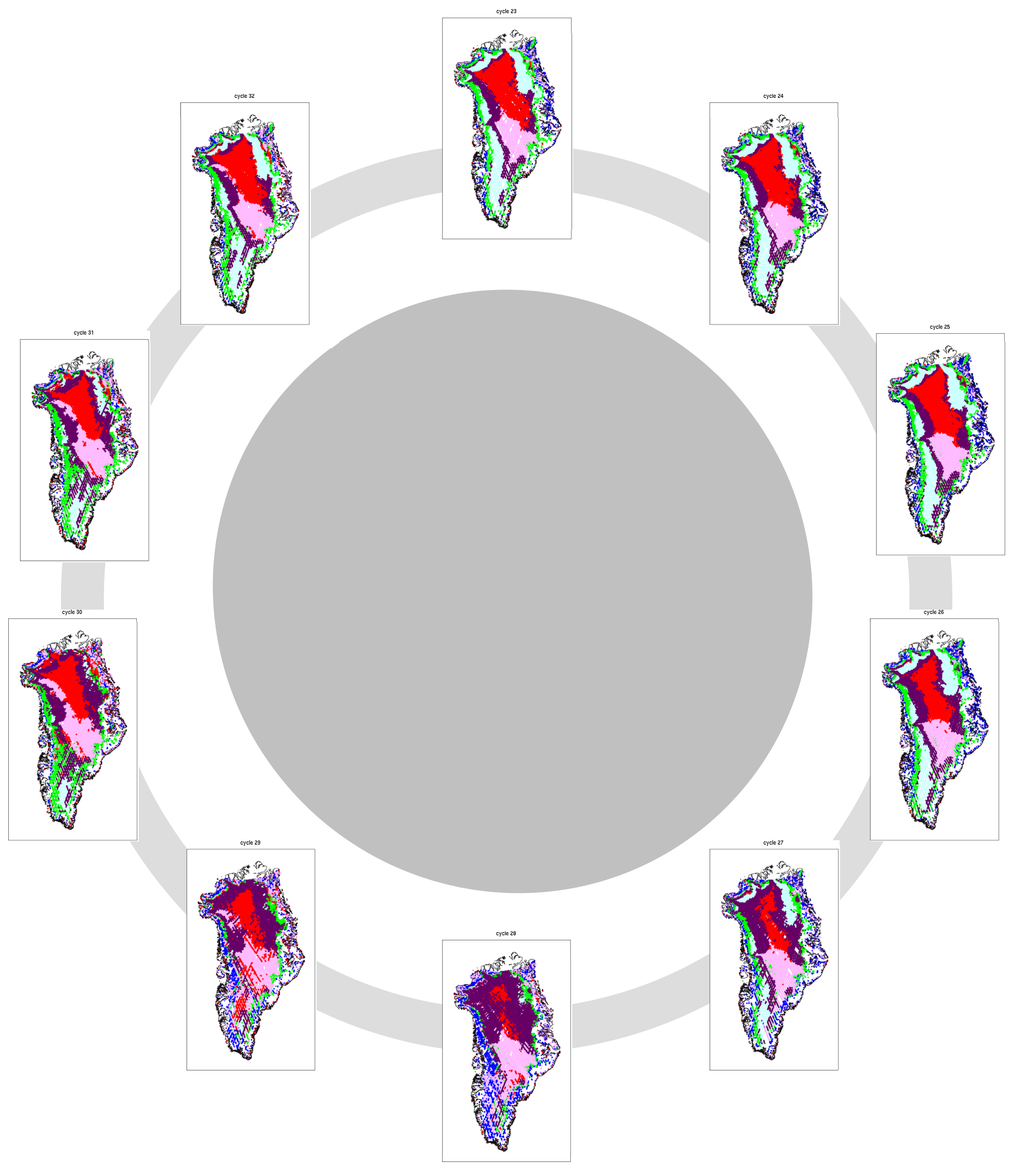
Abstract - Three classification algorithms have been developed for Envisat altimetry mission. They take advantage of having both passive and active microwave sensors on the same platform with co-registered measurements.



Arctic sea ice classification

A sea-ice flag algorithm that detects sea-ice corrupted sea surface height data has been developed. It allows also to separate first-year ice, multi-year ice and wet ice among the global sea-ice group.

Results show good performances of the present approach for recognition of sea-ice corrupted data vs. ice-free ocean data when compared to reference maps built from combination of daily grids of sea ice concentration from SSM/I sensors and backscatter cross-section from SeaWinds scatterometer on QuikSCAT satellite.

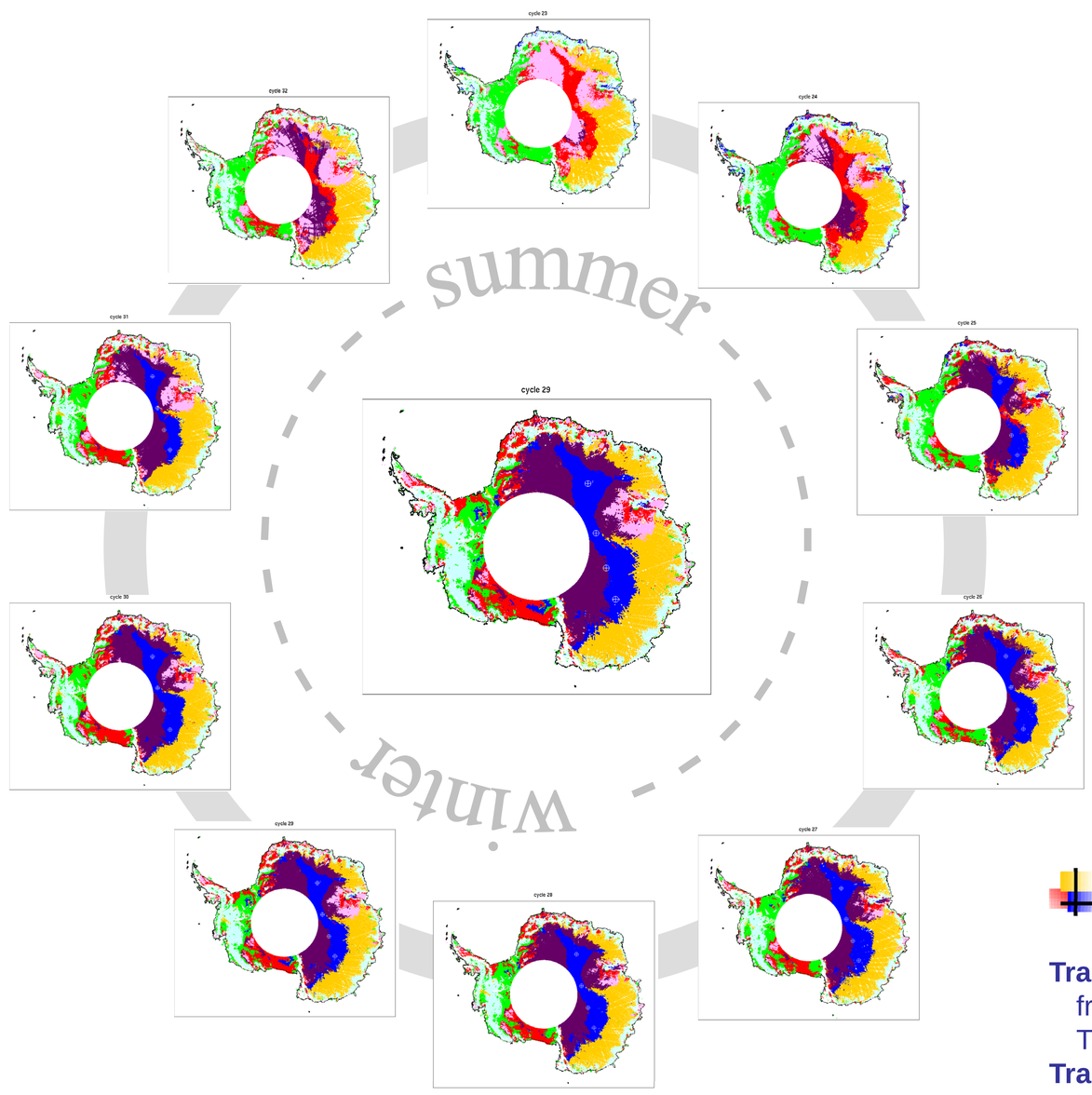


Polar snow facies classification

Two algorithms aim to separate different snow regions within the two polar ice sheets have been developed. Our approach broadens the description of the snow pack by taking into account characteristics such as surface roughness, grain size, stratification, and snow melt effects, whereas this latter has often been solely considered in most previous works.

This difference in snow morphology is due to variable conditions in local climate which is governed by local topography. Such partition of the ice sheet might help to better understand relationships between microwave signatures and snow morphology and might represent a useful and simple tool for tracking the effects of climate change.

Class	Color	Label
1	dark blue	ablation zone
2	light blue	percolation
3	green	wet snow
4	pink	dry snow zone II
5	red	dry snow zone I
6	purple	intermediate dry / percolation



Class	Color	Physical properties	Temporal characteristic
1	dark blue	domes and ridges location / low accumulation / no wind / flat surface	only during winter
2	orange	high accumulation / strong wind / variable slope	rather stable yearlong
3	light blue	high accumulation / steep slope (margins)	rather stable yearlong
4	green	ice shelves / flat surface	yearlong for Filchner Roone / Ross in summer only
5	pink	low accumulation / moderate wind	only during summer / becomes class 7 in winter
6	red	no wind over domes and ridges location / flat surface	change in geographic location between winter and summer
7	purple	low accumulation / moderate wind	only during winter / becomes class 5 in summer

References:

Tran N., **F. Rémy, H. Feng, and P. Femenias**, “Snow facies over ice sheets derived from Envisat active and passive observations”, accepted for publication in IEEE TGRS on 14 May 2008, in press.

Tran N., **F. Girard-Ardhuin, R. Ezraty, H. Feng, and P. Femenias**, “Defining a sea ice flag for Envisat altimetry mission”, accepted for publication in IEEE GRSL on 21 August 2008, in press.