Global Processing and Products
from MERIS Full Resolution Data
for the Coastal Zone

User Consultation Meeting 3

Optical Water Type Classification

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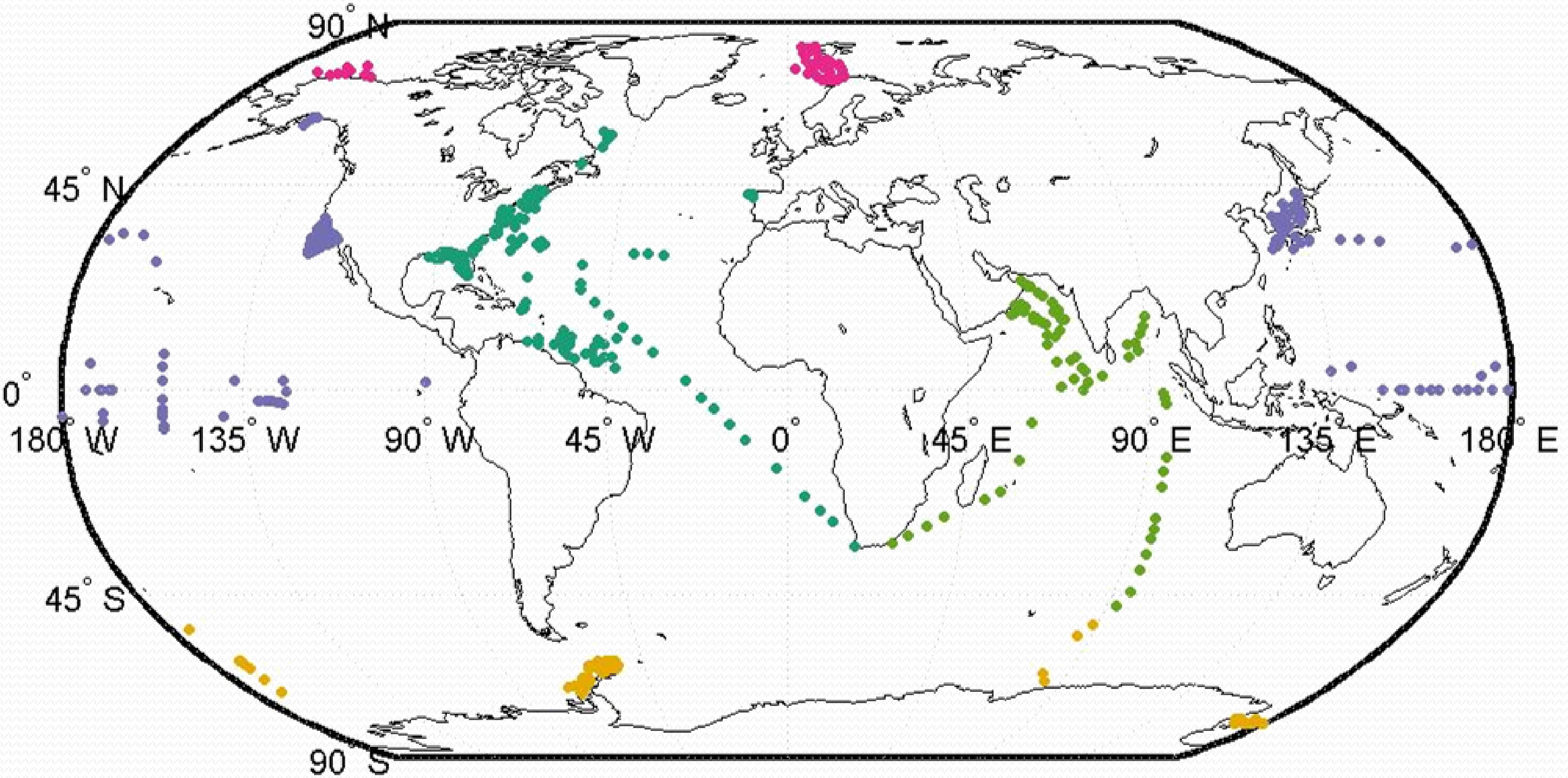
19.-21.10.2011

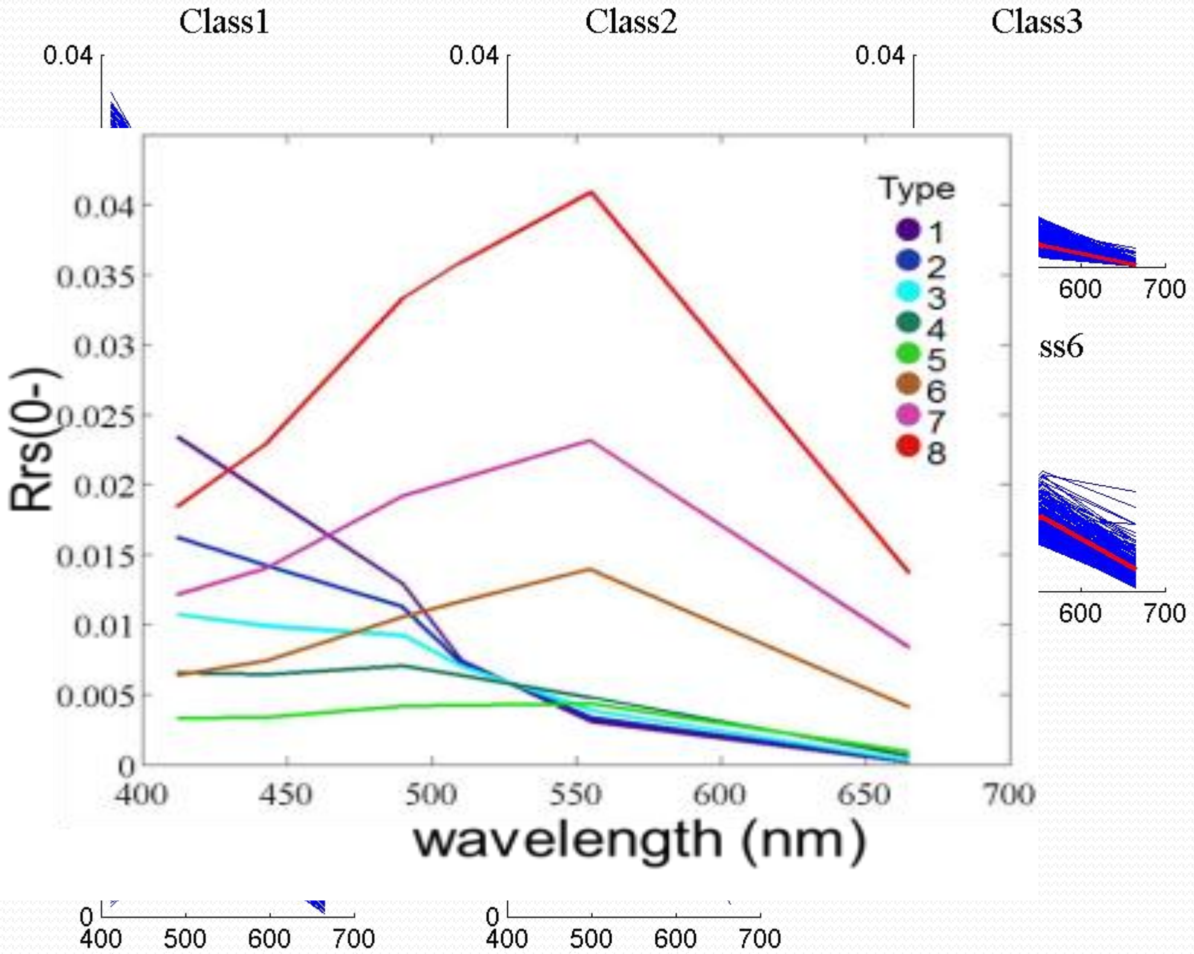
Lisbon, Portugal

NOMAD data set – V2



- Southern Ocean
- Atlantic Ocean
- Pacific Ocean
- Indian Ocean
- Arctic Ocean

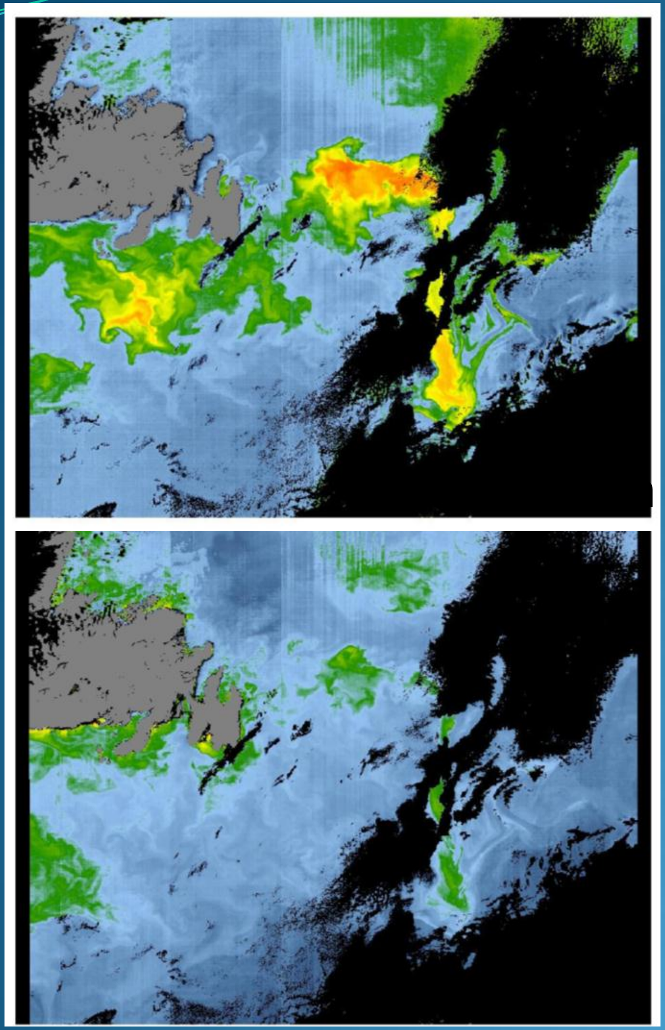
Clustering Result

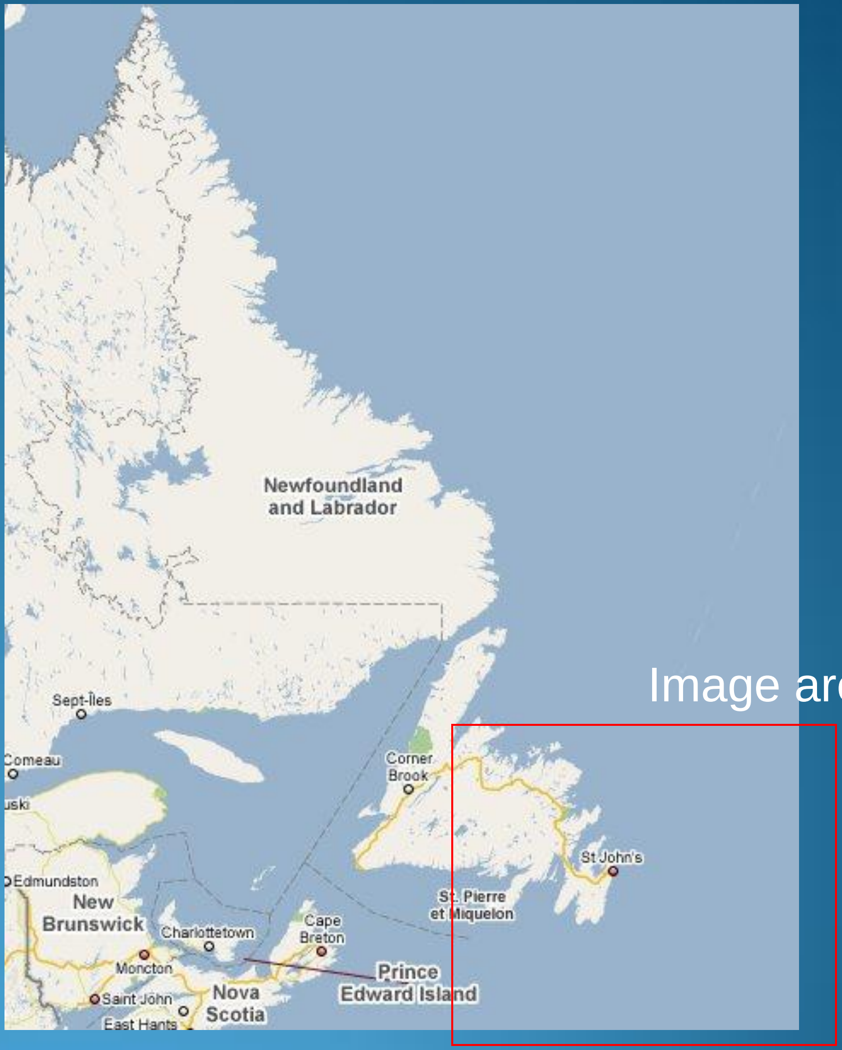


8 objectively identified classes in radiance space

Image date: 2009 09 03 (RR)

Location: South of Newfoundland

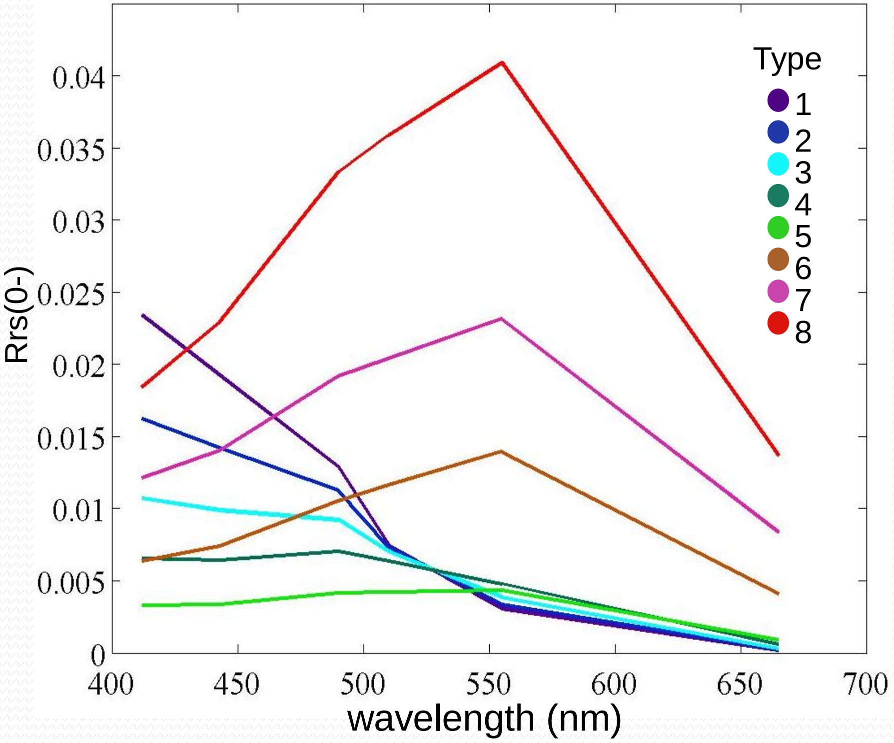




Notes:

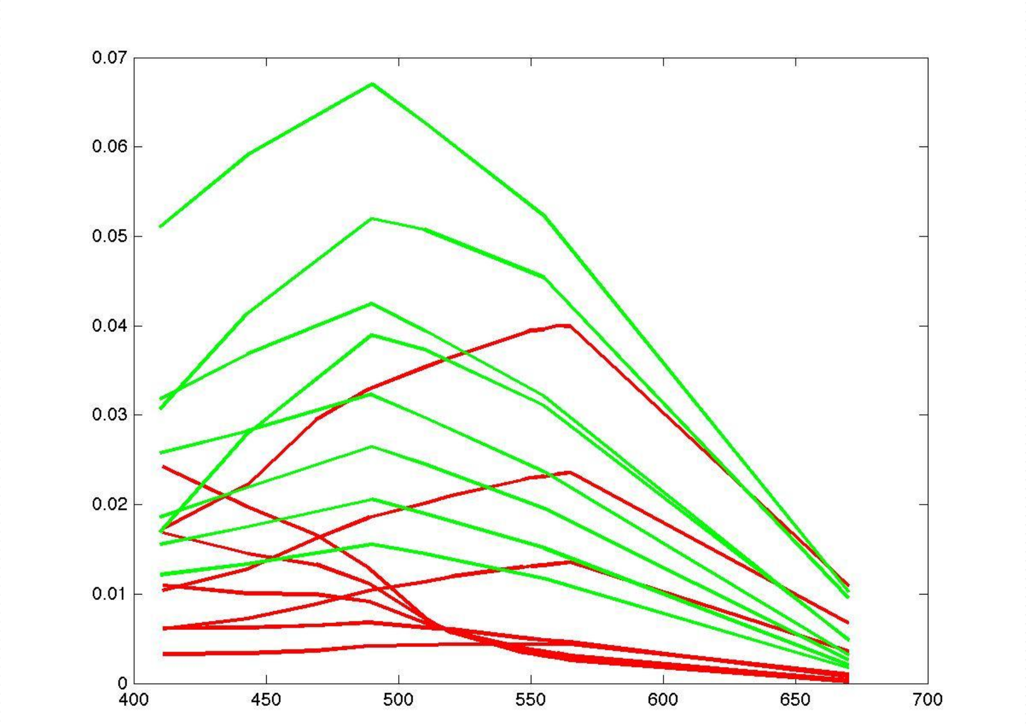
- image contains a coccolithophore bloom (usual at this time of year at this location) seen as the bright pixels in the Rrs 560 image.

Optical Water Types 1-8



- Rrs mean spectra behave as endmembers.
- Rrs class statistics form the *fuzzy membership function*.
- Fuzzy membership allows for intermediate values between 0 and 1.

OWT 9 - coccolithophore class



- A collection of 8 classes (green) the collectively form the 9th OWT (red are the NOMAD 8). These were derived from satellite data (SeaWiFS) using the coccolithophore mask.
- Coccolithophore Rrs peaks at 490nm, compared to 555nm for sediment classes.

CoastColour Implementation of OWT

- On November 19, 2010, the fuzzy logic code (originally in c) developed at the University of New Hampshire was successfully ported into the java-based Beam software at Brockmann Consult in Germany.

- The fuzzy code classifies ocean color radiometric level 2 (based on remote sensing reflectance) into 9 different optical water types (OWTs).

- Based on initial tests done by M. Peters and T. Moore, the java code and the c code were computing the same results for 1 test pixel.

- Based on image testing completed on Nov. 23, 2010, the java-based code in Beam is producing identical results for the same image processed at UNH.

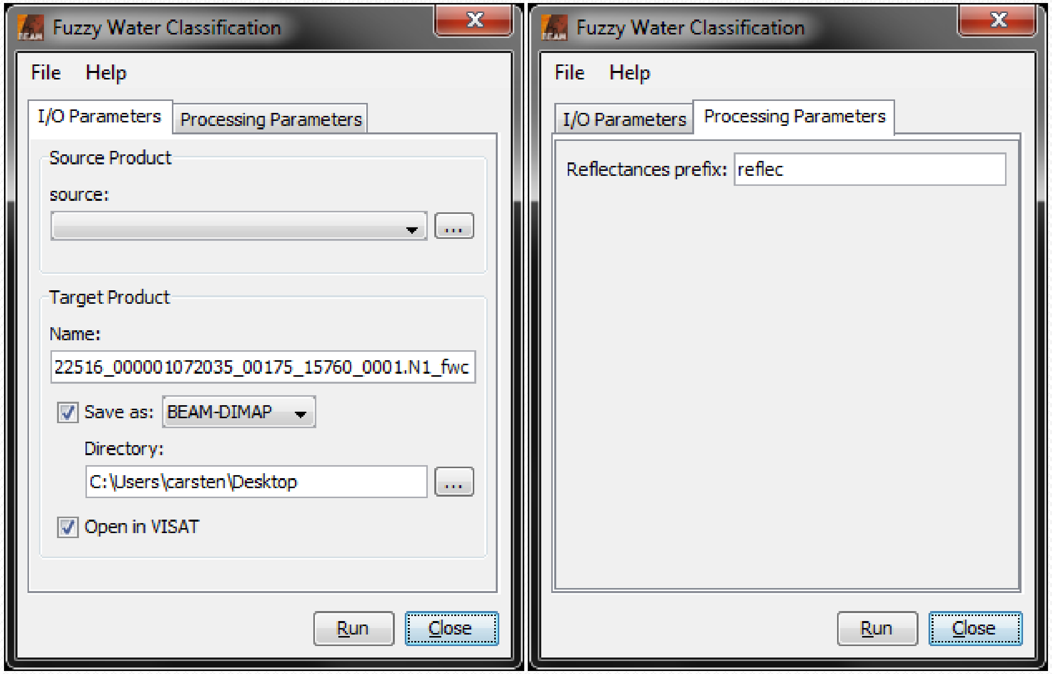
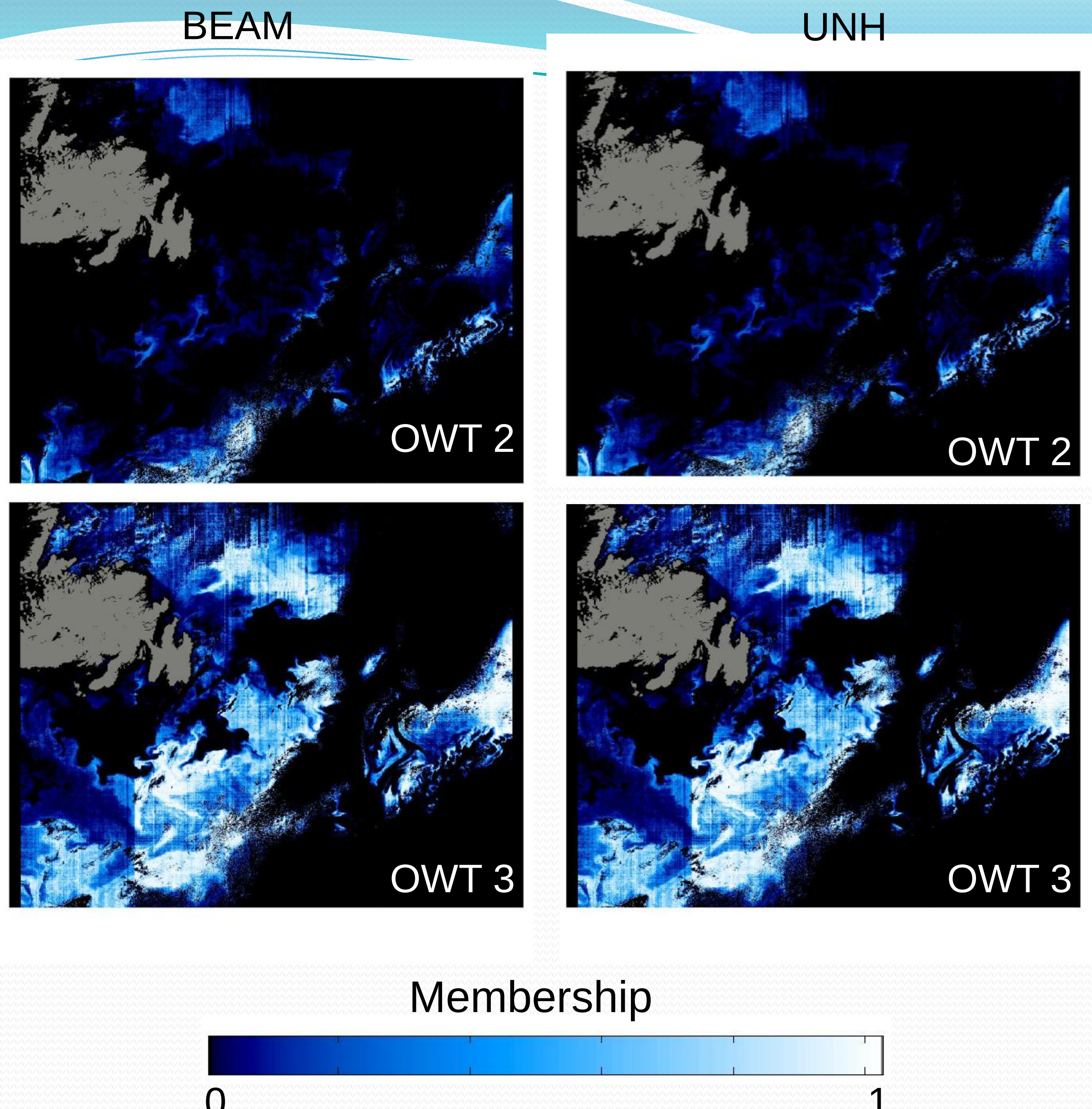
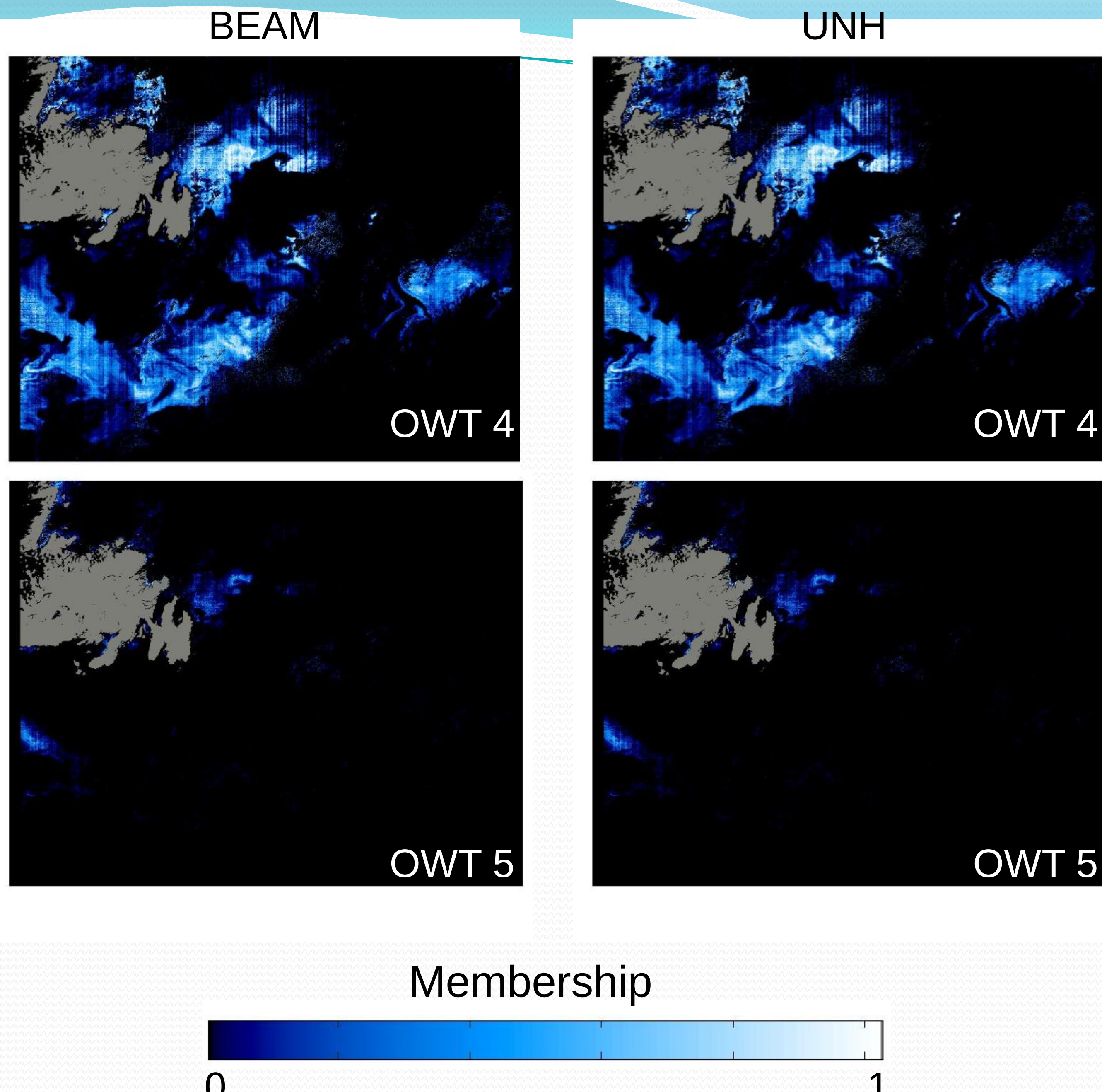


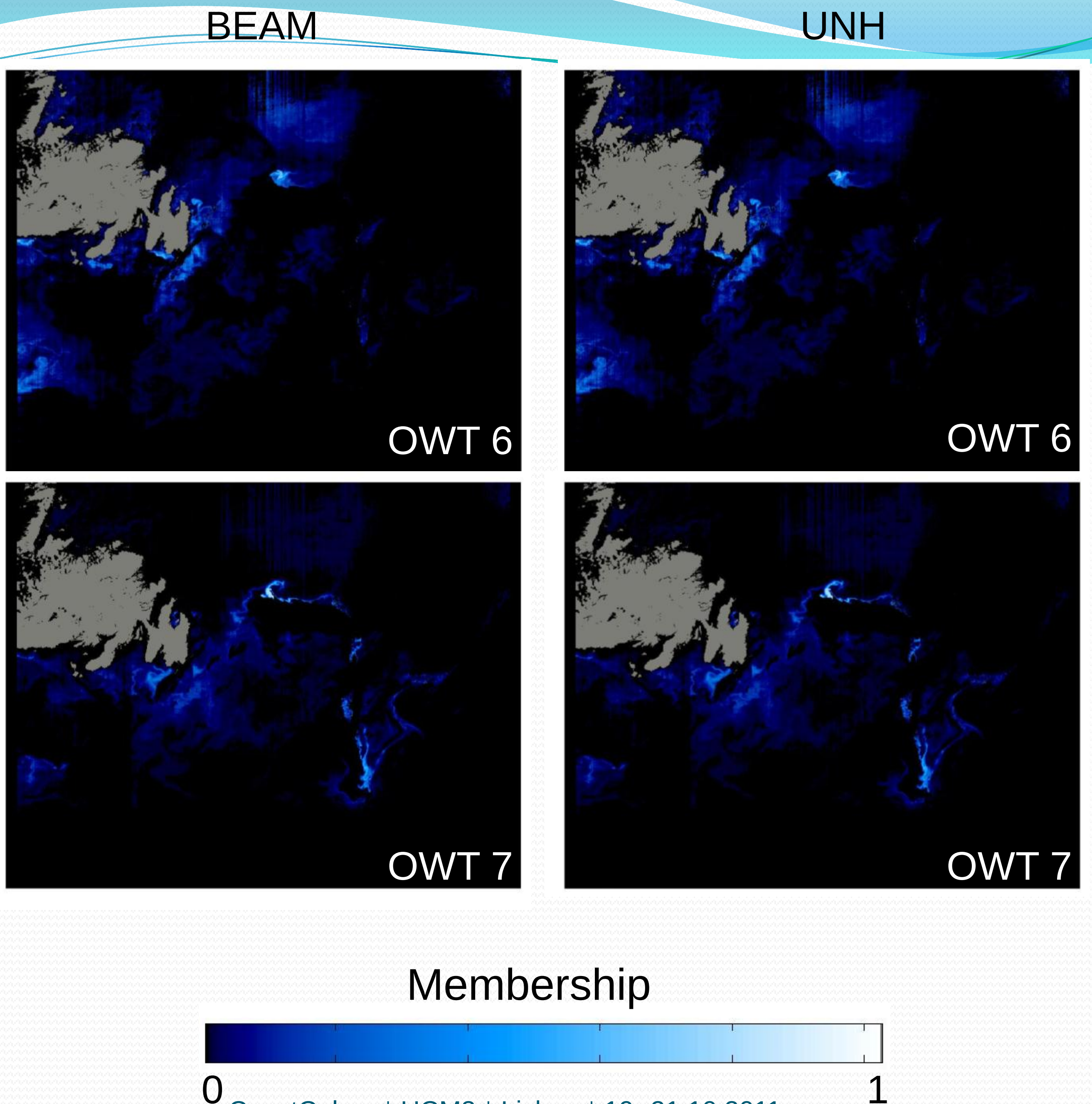
Image comparisons

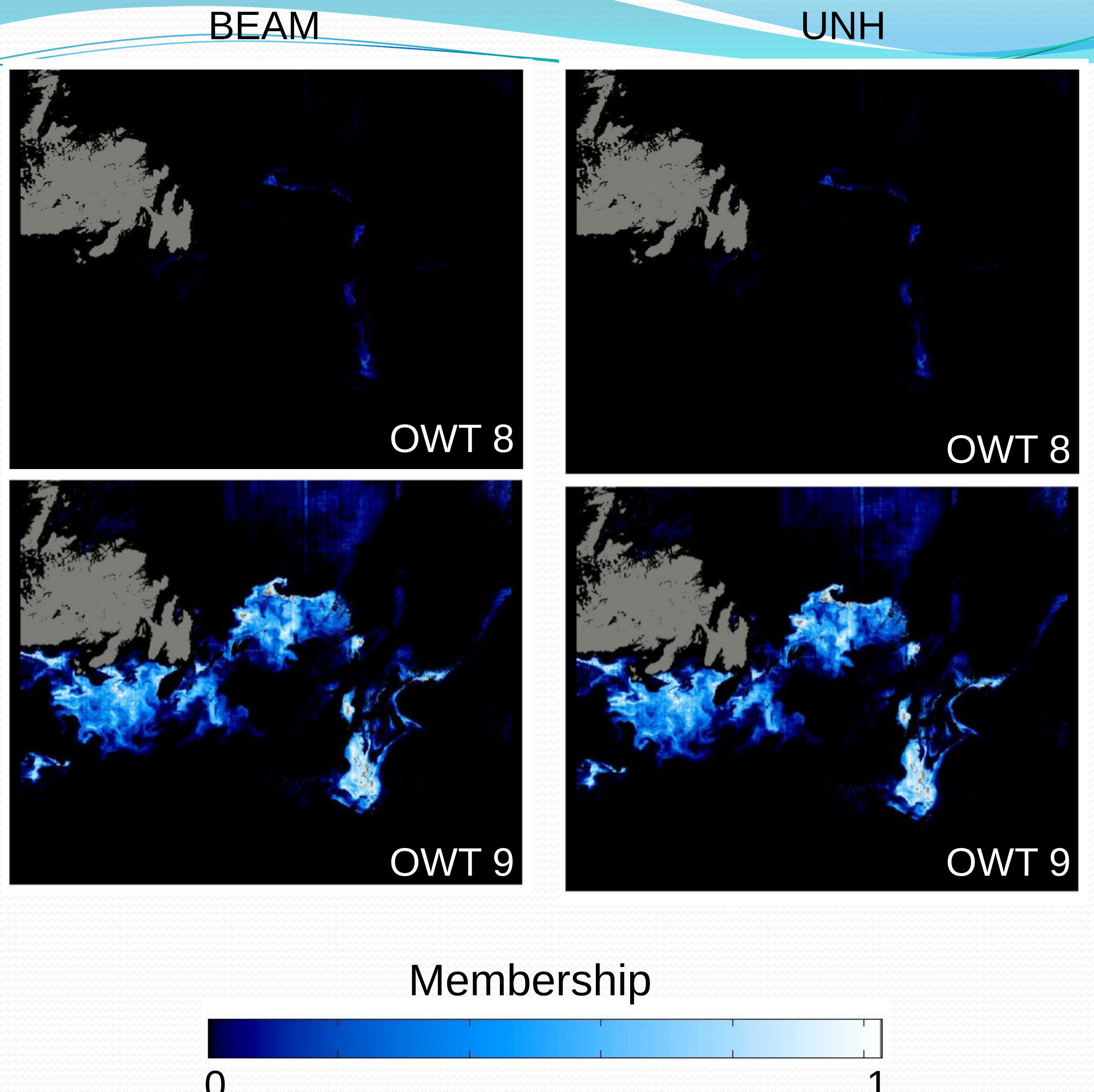
- Fuzzy membership maps for OWTs 2-9 are compared (there were few OWT 1 memberships in this scene).
- The dominant OWT (the OWT with the maximum membership) and the fuzzy sum (sum of all memberships) are also compared.
- These form the standard output products from the fuzzy code.

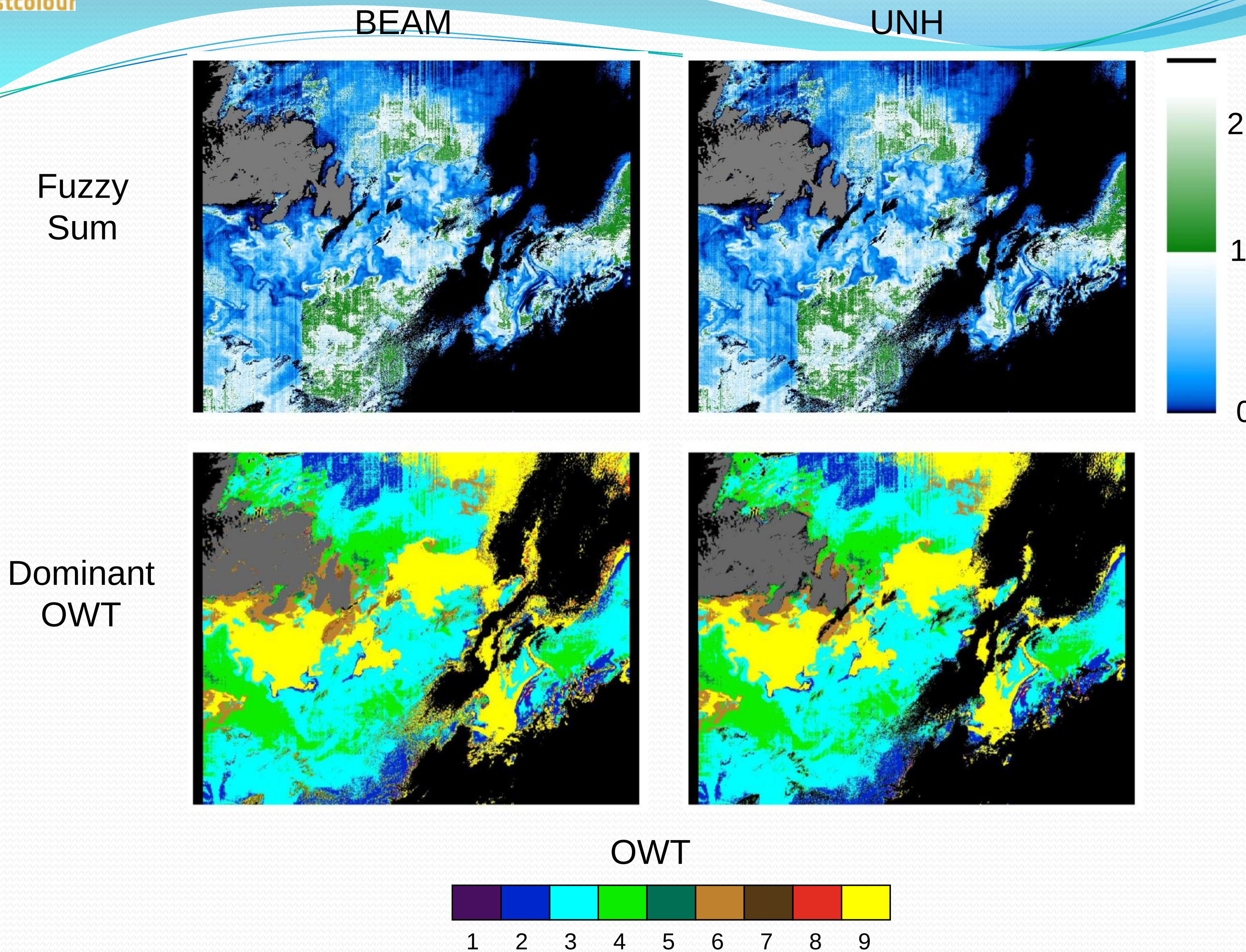

BEAM
UNH
OWT 2
OWT 2
OWT 3
OWT 3
Membership
0
1



BEAM
UNH
OWT 4
OWT 4
OWT 5
OWT 5
Membership
0
1


BEAM
UNH
OWT 6
OWT 6
OWT 7
OWT 7
Membership
0
1


BEAM
UNH
OWT 8
OWT 8
OWT 9
OWT 9
Membership
0
1

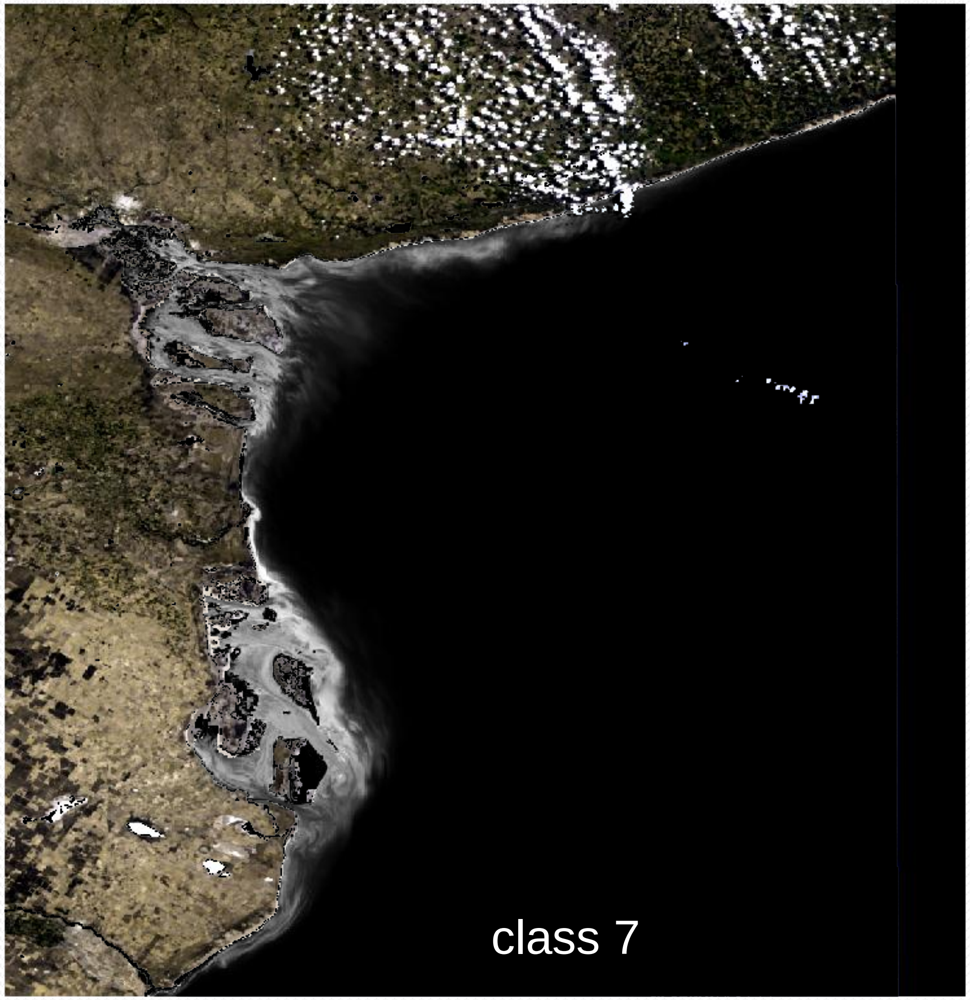


BEAM
UNH
Fuzzy Sum
Dominant OWT
2
1
0
OWT
1 2 3 4 5 6 7 8 9

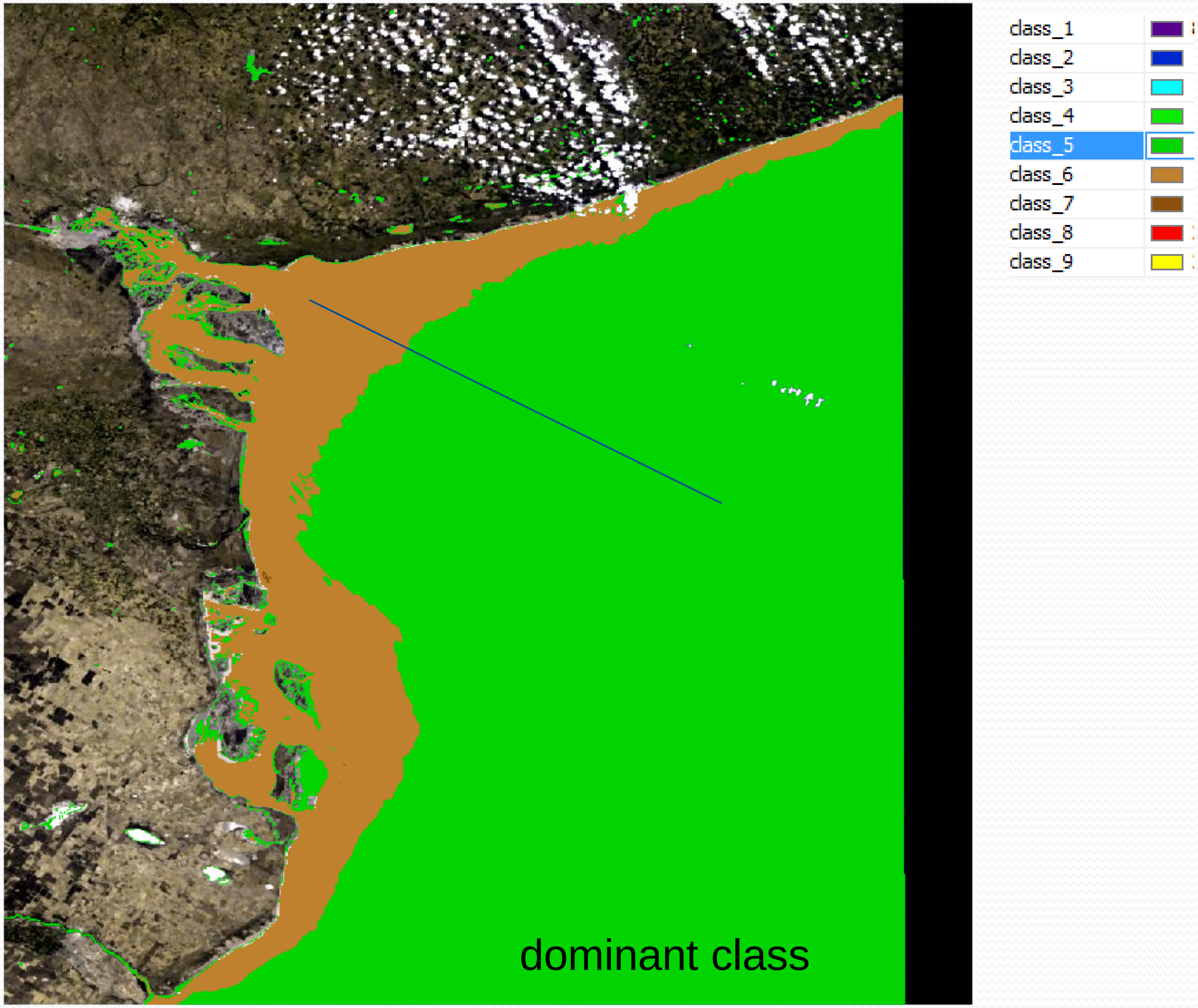
Analysis (T. Moore)

- BEAM and the UNH fuzzy classification codes are producing identical results for the fuzzy membership maps.
- The UNH code screens out pixels in the 'dominant' OWT map based on a membership sum threshold - currently set to a value of 0.01, so there are a few pixels that have been screened from the UNH image. Not implemented in CoastColour BEAM Processor.
- Otherwise, everything looks perfect.

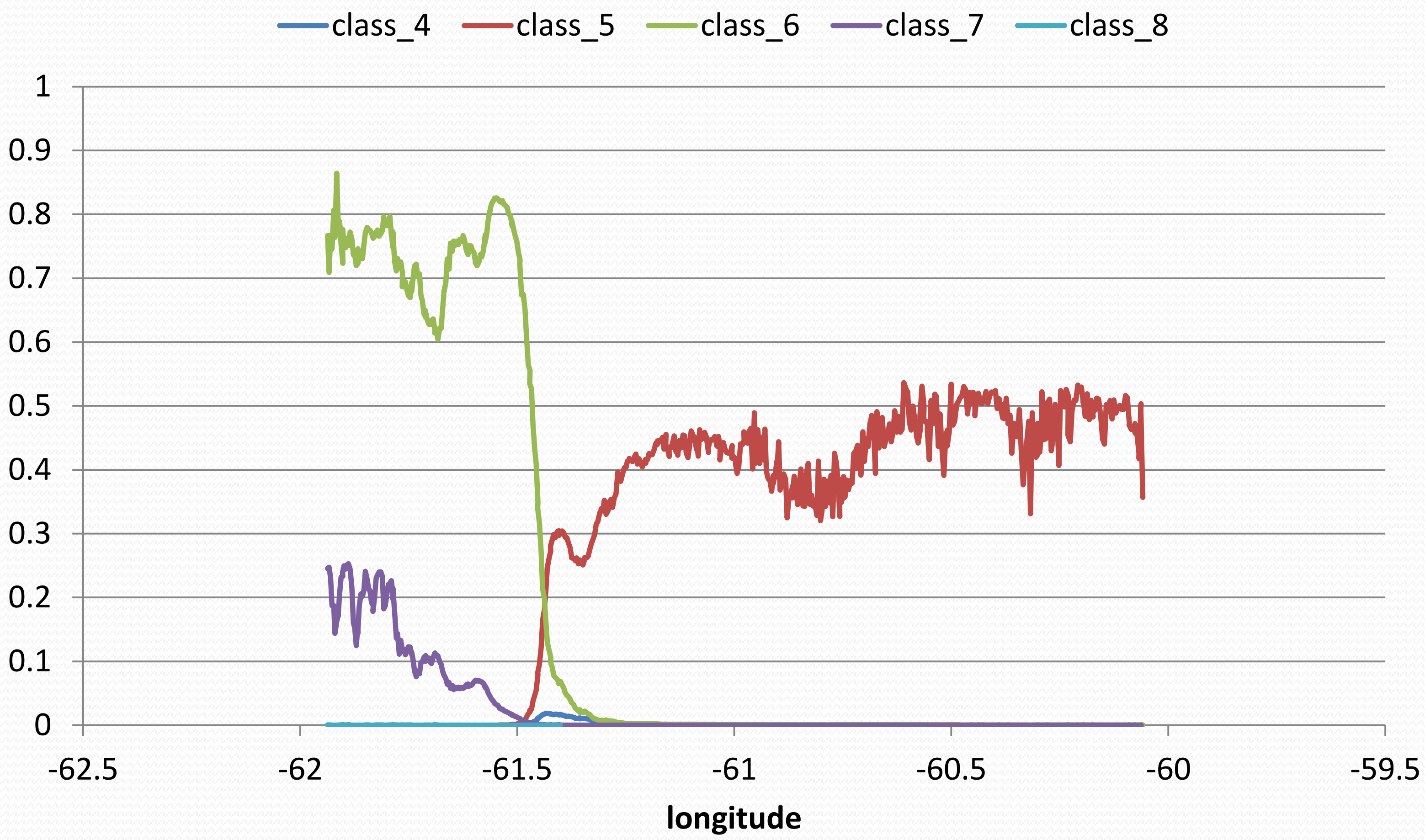
Example



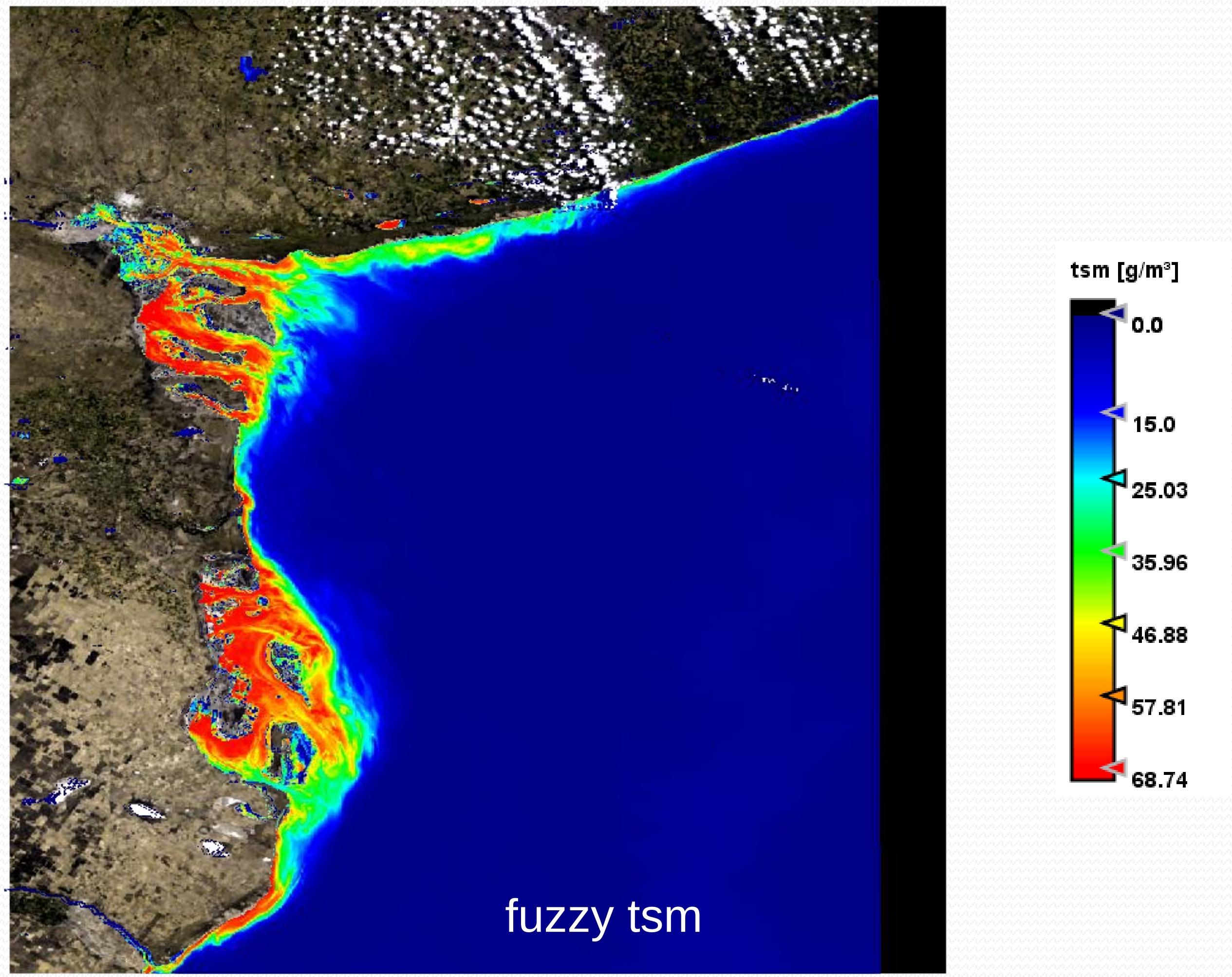
Example


dominant class
class_1
class_2
class_3
class_4
class_5
class_6
class_7
class_8
class_9

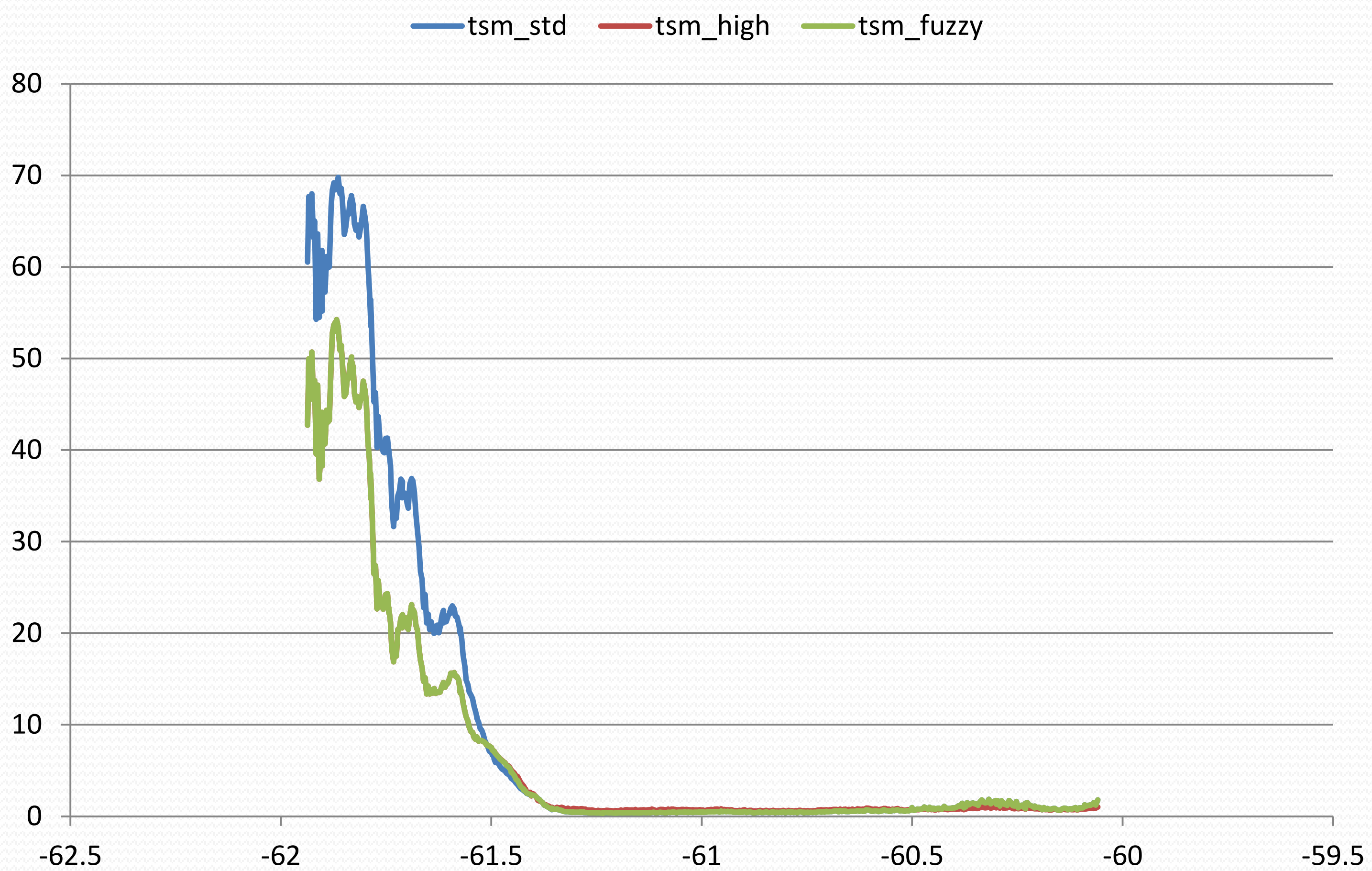
Class membership along transect



((class_5)* tsm_std+ (class_6+class_7)* tsm_high)/(class_5+ class_6 + class_7)



TSM transect



Summary

- OWT offers the possibility to select per pixel suitable algorithms and merge them according to the class membership
- OWT has been integrated into the CoastColour L2W Prototype processor
- More testing and validation will be done for definition of final L2W algorithm
- Algorithm for propagating the errors is under discussion, in close cooperation with OC-CCI