Manaaki Whenua
Landcare Research

Tracking change in the Motueka using ENVISAT

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Land cover change in the ICM project

- Interaction of ecosystem components
  land change → river → costal environment
- Land cover change will impact on sediment and other contaminants entering river
- Want regular, year round monitoring
- Tie in with terrain, rain fall, soils, state of riparian strip etc to model transport into the river.



ENVISAT

- The worlds largest remote sensing satellite
- Launched in 2002 by European Space Agency
- Carries 8 instruments to look at earth's atmosphere, oceans and land surface
- Studying the big global environmental questions
  - Can we slow down global warming?
  - How badly damaged is the ozone layer?
  - What causes El Niño?
  - What is happening to the world's forests?
  - Why are our sea levels rising?
  - What are the effects of atmospheric pollution?
  - Are natural disasters becoming more frequent?

ENVISAT instruments

Advanced Synthetic Aperture Radar (ASAR)

Medium Resolution Imaging Spectrometer (MERIS)

Advanced Along-Track Scanning Radiometer (AATSR)

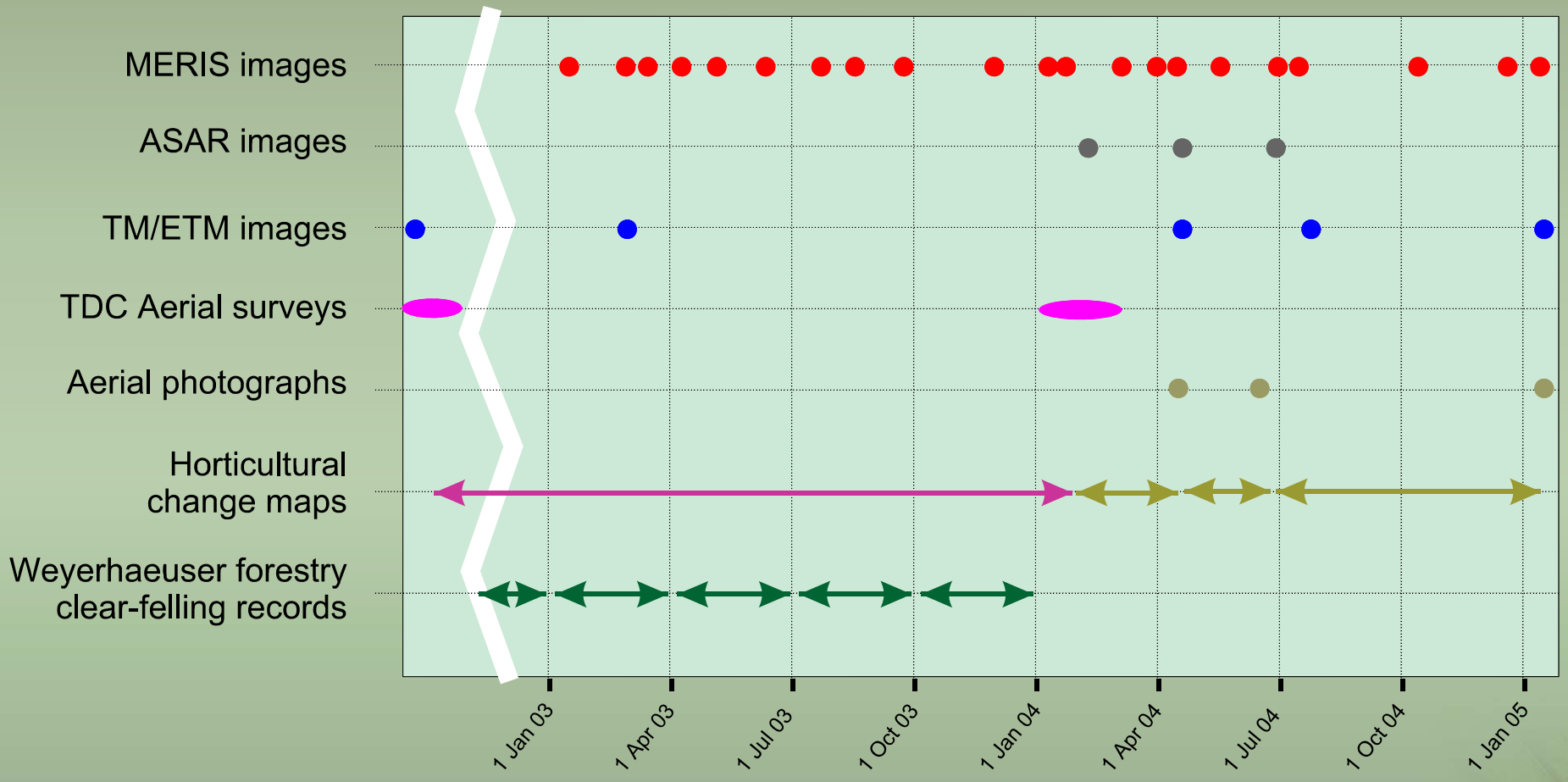
Others

- Radar Altimeter 2 (RA-2)
- Microwave Radiometer (MWR)
- Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS)
- Laser Retro Reflector (LRR)
- Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)
- Global Ozone Monitoring by Occultation of Stars (GOMOS)
- SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY)

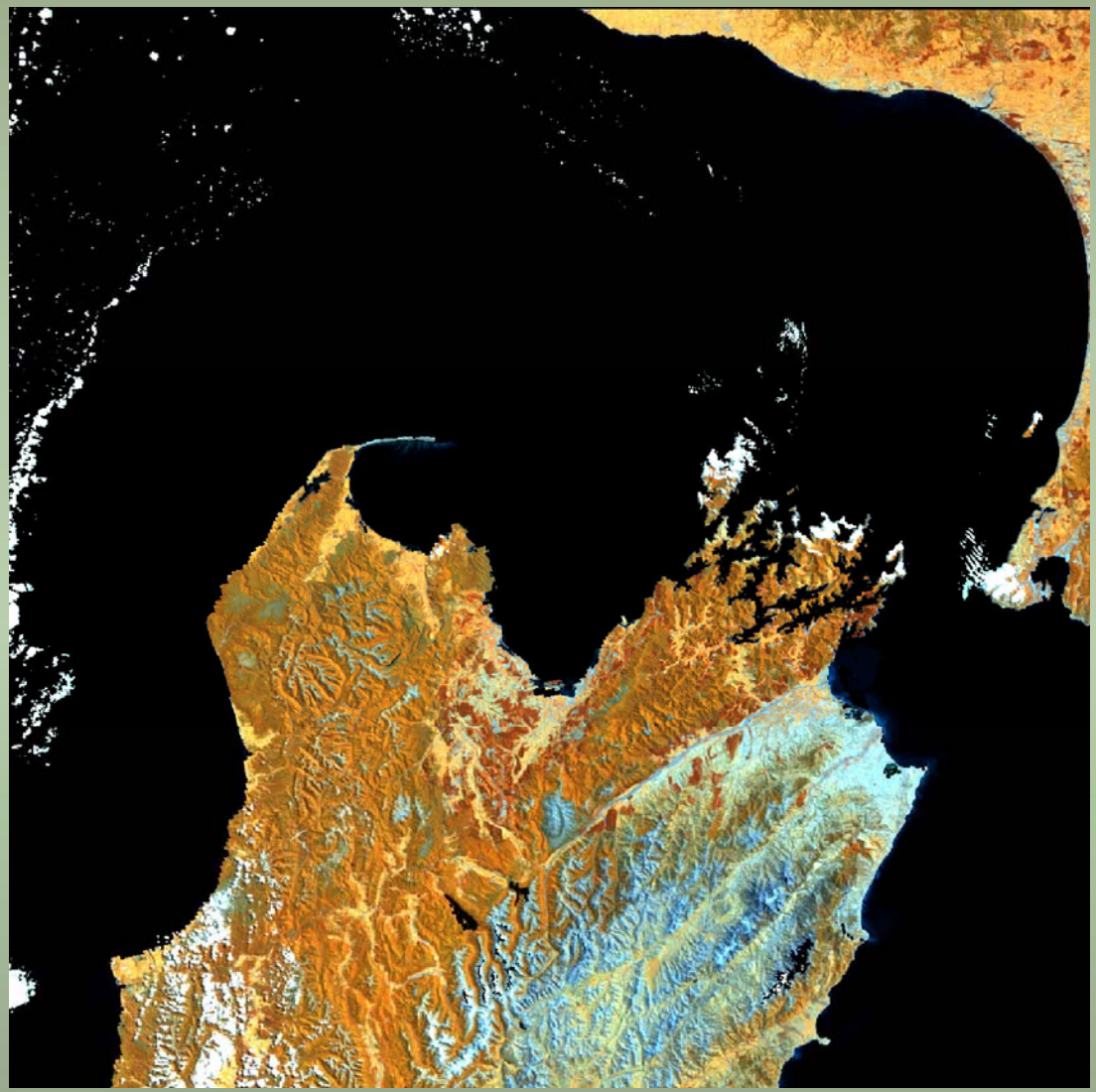
MERIS

- Remote sensing is a trade off
  - Resolution
  - Orbits
  - Spectral capability
  - Cost
- MERIS
  - Low resolution
  - Wide angle – high repeat cycle
  - 15 well calibrated narrow spectral channels
  - Low cost
- Atmospherically corrected reflectance and high level products
  - NDVI
  - fPar
  - Standardised algorithms
  - Sub-pixel approaches

Data used in the study

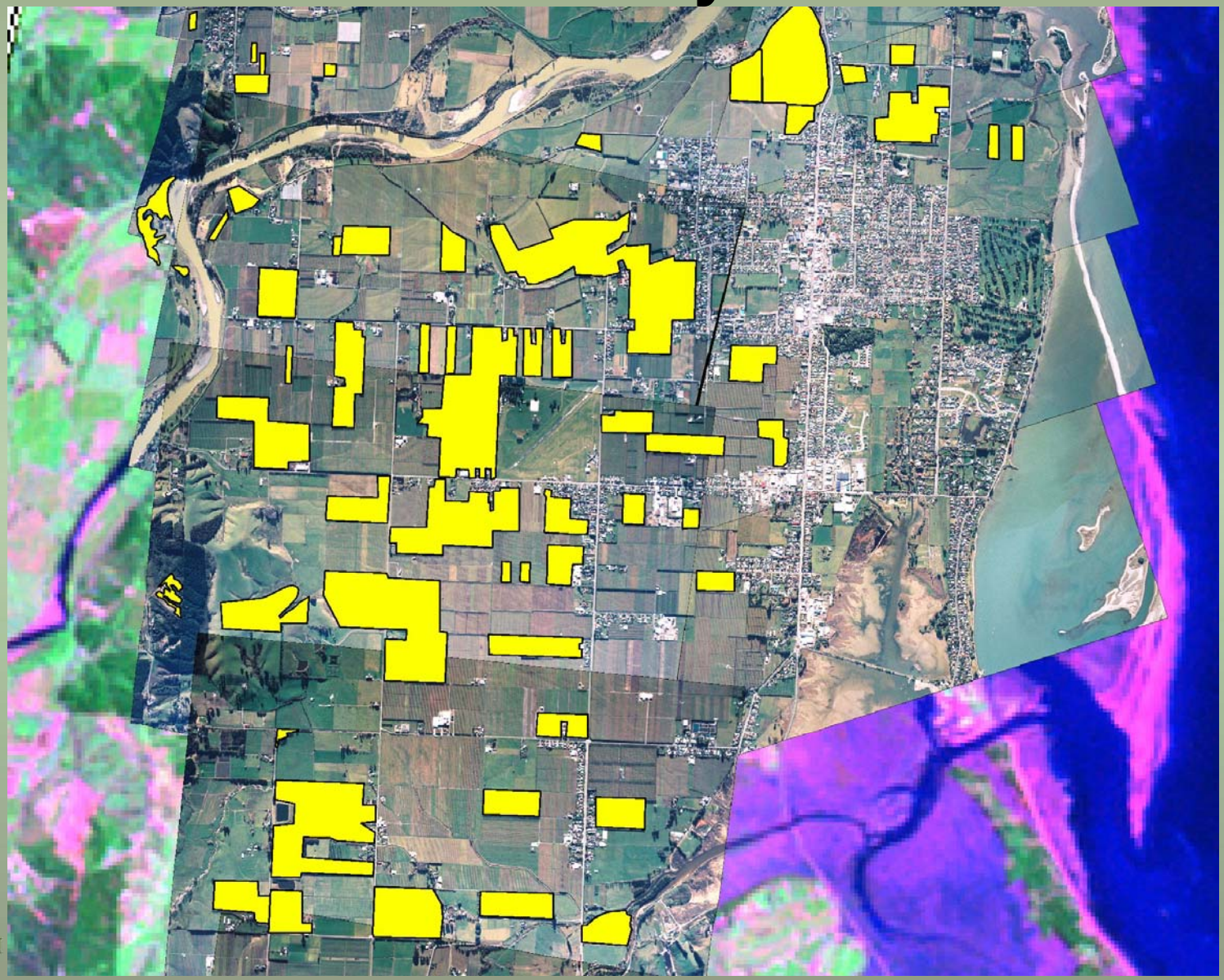


MERIS quarter scene

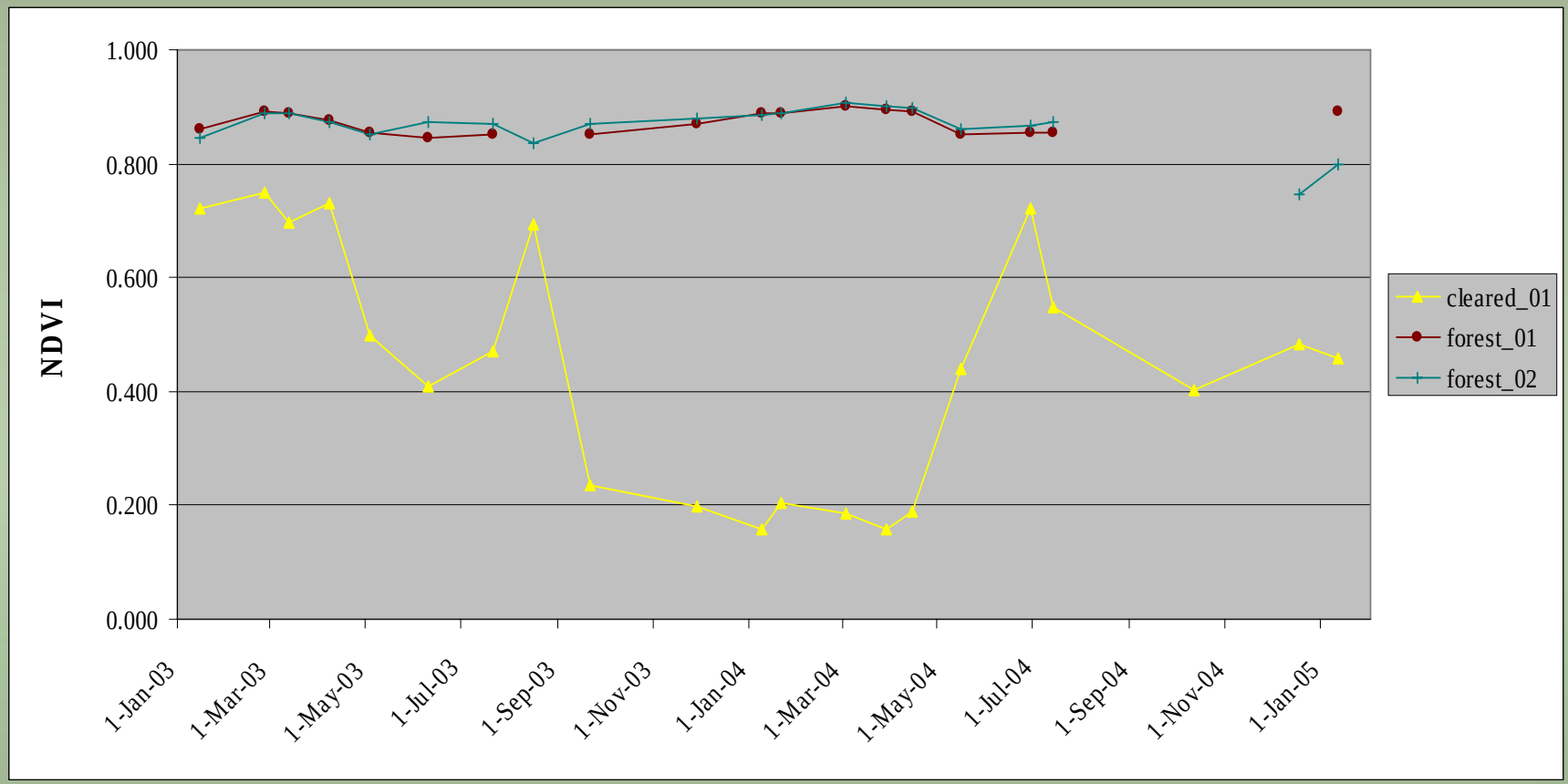


- January 2003
- 14 Spectral bands from 413 to 885 nm (mostly 10nm wide)
- 300 m spatial resolution
- Physical parameters from ESA algorithms
- BOA reflectance
- Algal, yellow substance, sediment, veg index, fpar, surface pressure, aerosols, cloud properties.

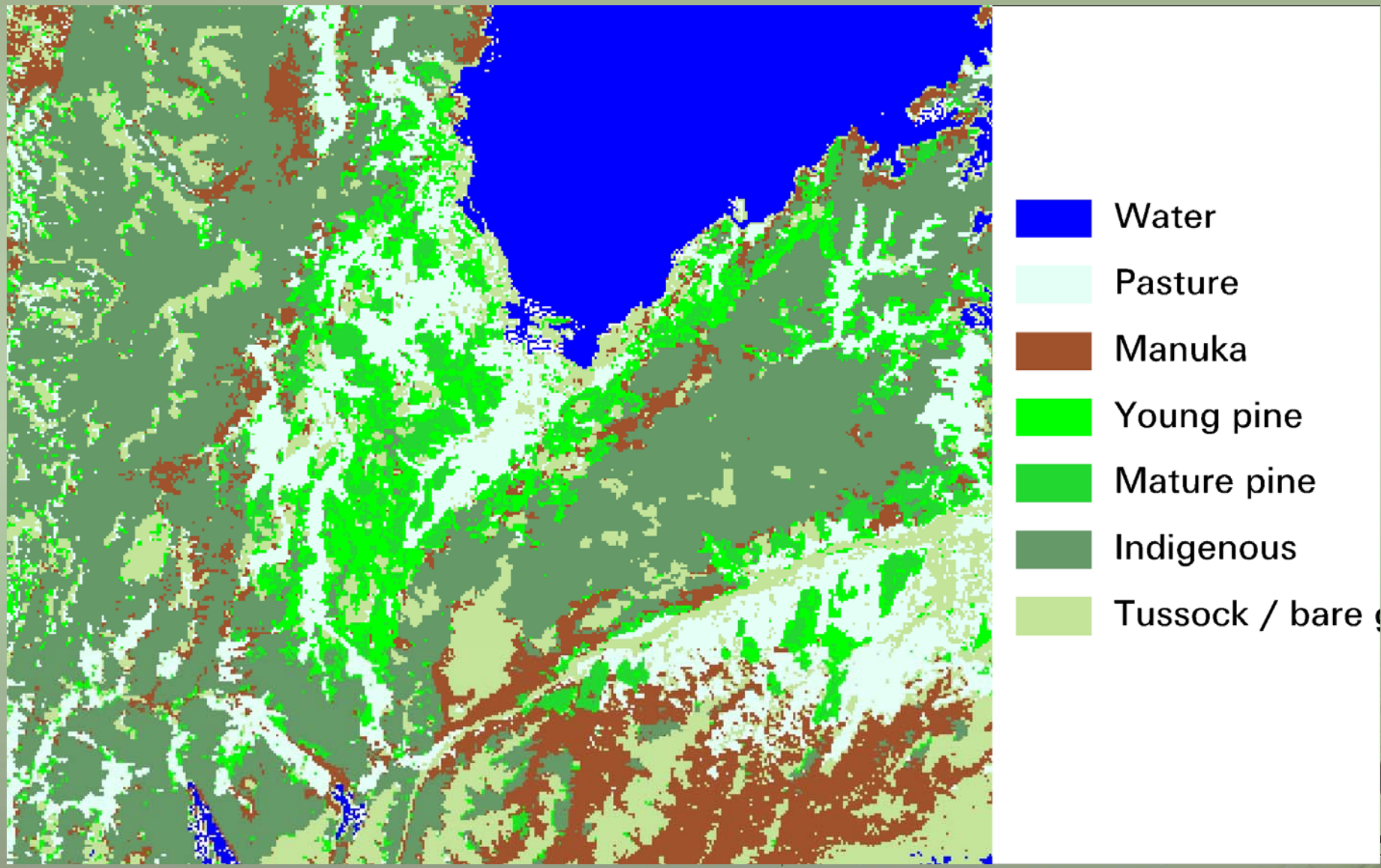
Photo interpretation between aerial surveys



Large plot averages



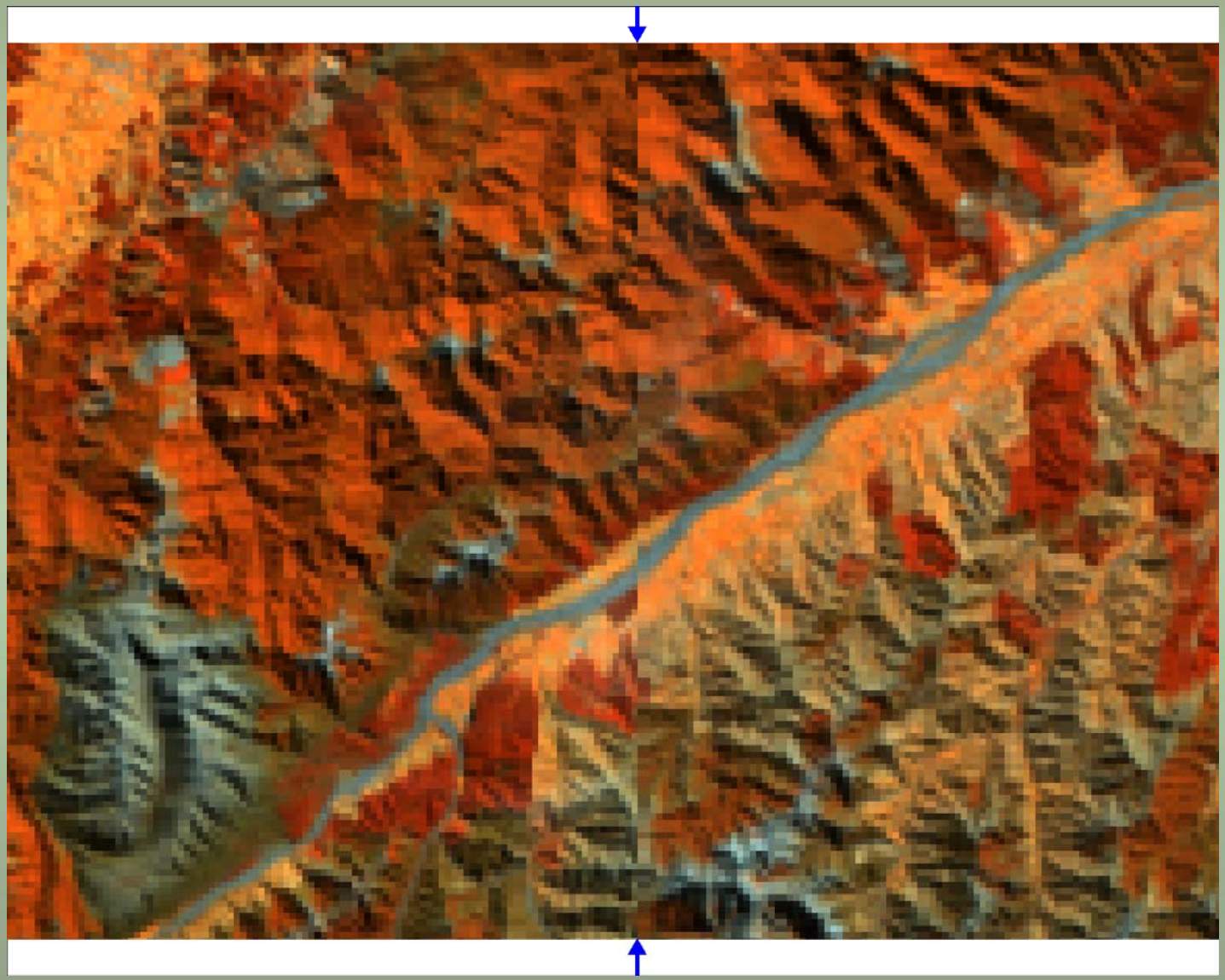
Classification



Jan03

Jan04

Image Discontinuity

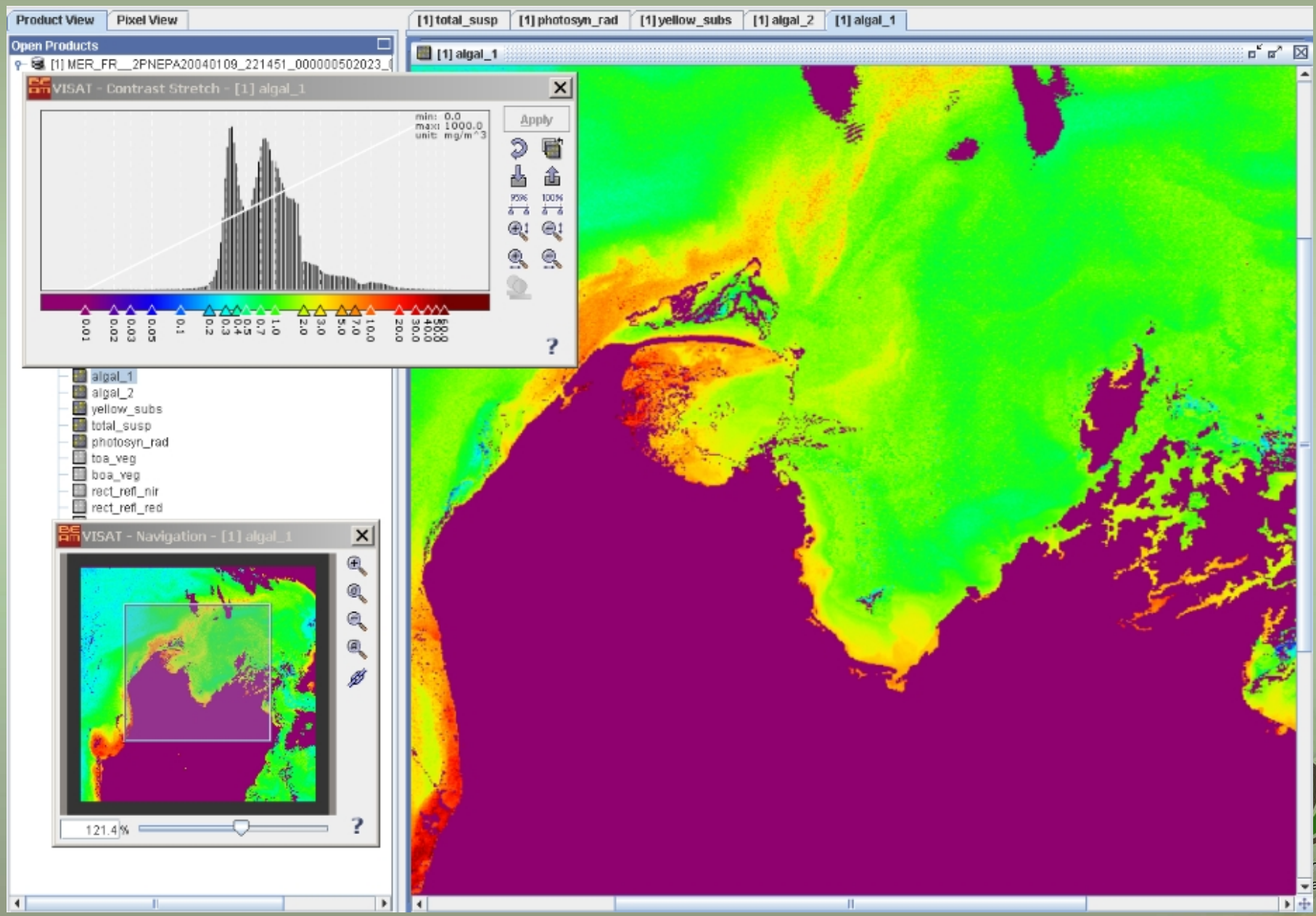


Ocean Products

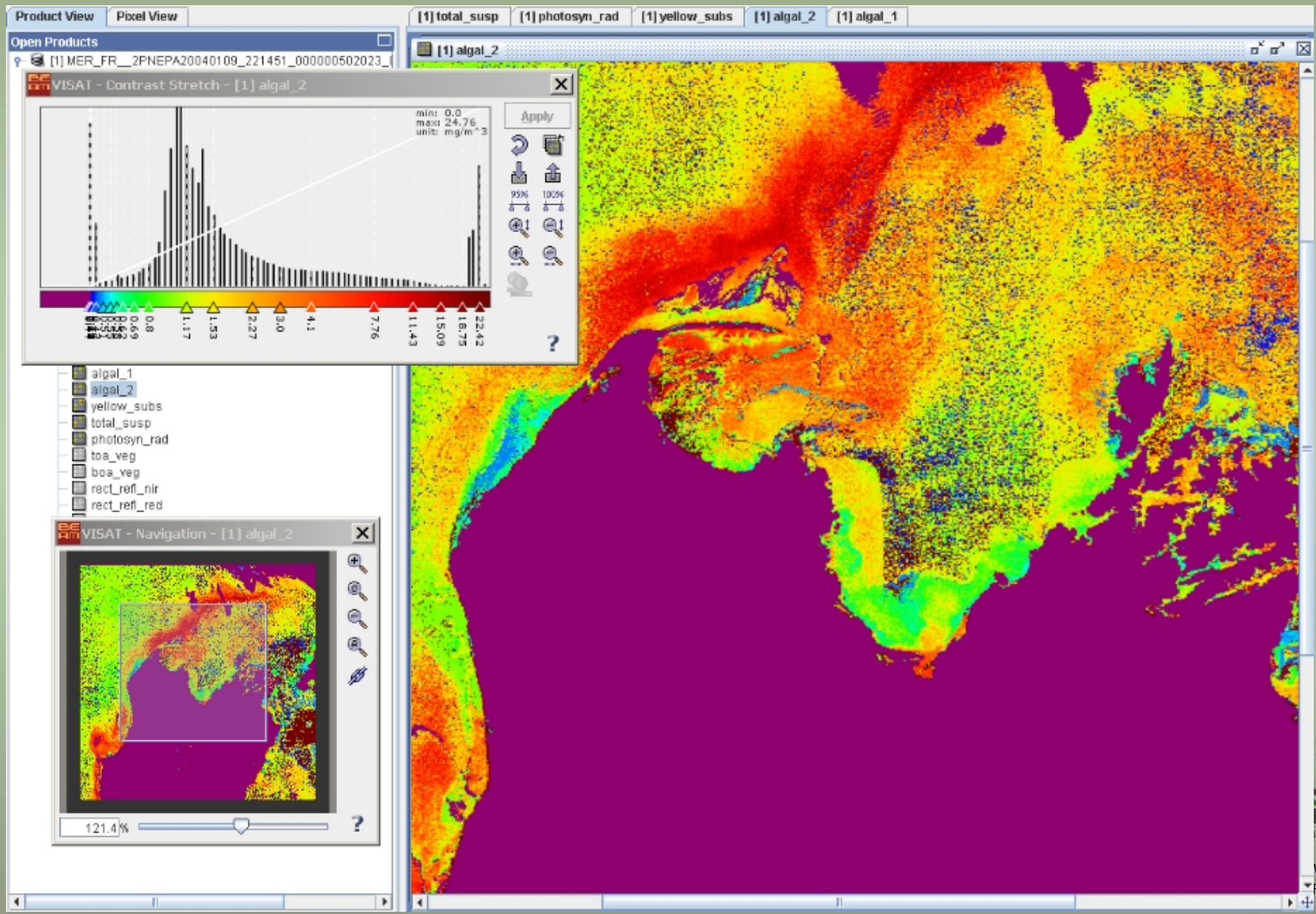
- Generated using standard ESA algorithms developed from experience with SeaWiFS.

- Algal 1
- Algal 2
- Yellow substance
- Total suspended
- Photosynthetic radiation

Algal_1


Product View
Pixel View
Open Products
[1] MER_FR__2PNEPA20040109_221451_000000502023_
VISAT - Contrast Stretch - [1] algal_1
min: 0.0
max: 1000.0
unit: mg/m^3
Apply
0.01
0.02
0.03
0.05
0.1
0.2
0.3
0.4
0.5
0.7
1.0
2.0
3.0
5.0
7.0
10.0
20.0
30.0
algal_1
algal_2
yellow_subs
total_susp
photosyn_rad
toa_veg
boa_veg
rect_refl_nir
rect_refl_red
VISAT - Navigation - [1] algal_1
121.4%
[1] total_susp
[1] photosyn_rad
[1] yellow_subs
[1] algal_2
[1] algal_1
[1] algal_1

Algal_2



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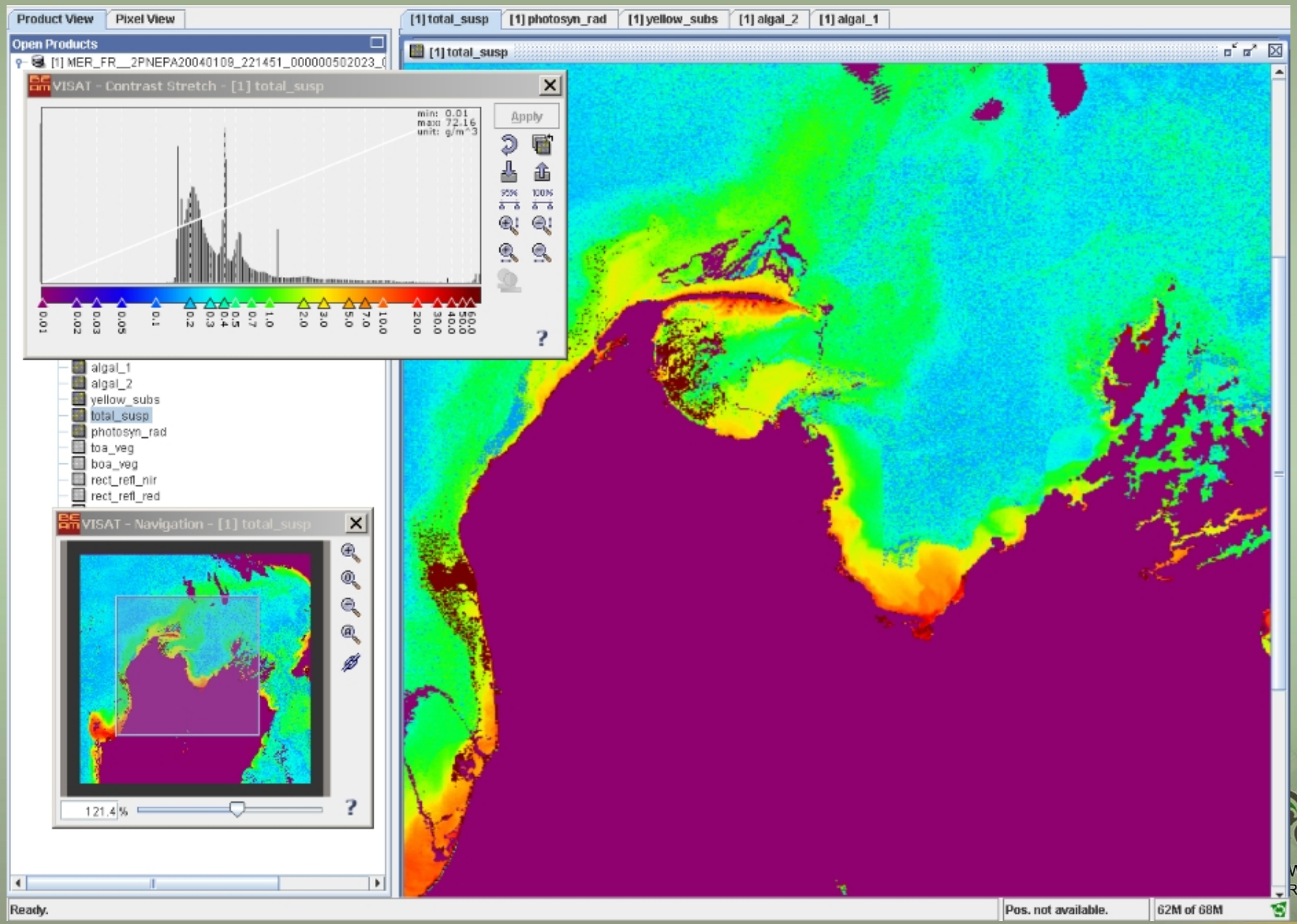
Suspended Sediment



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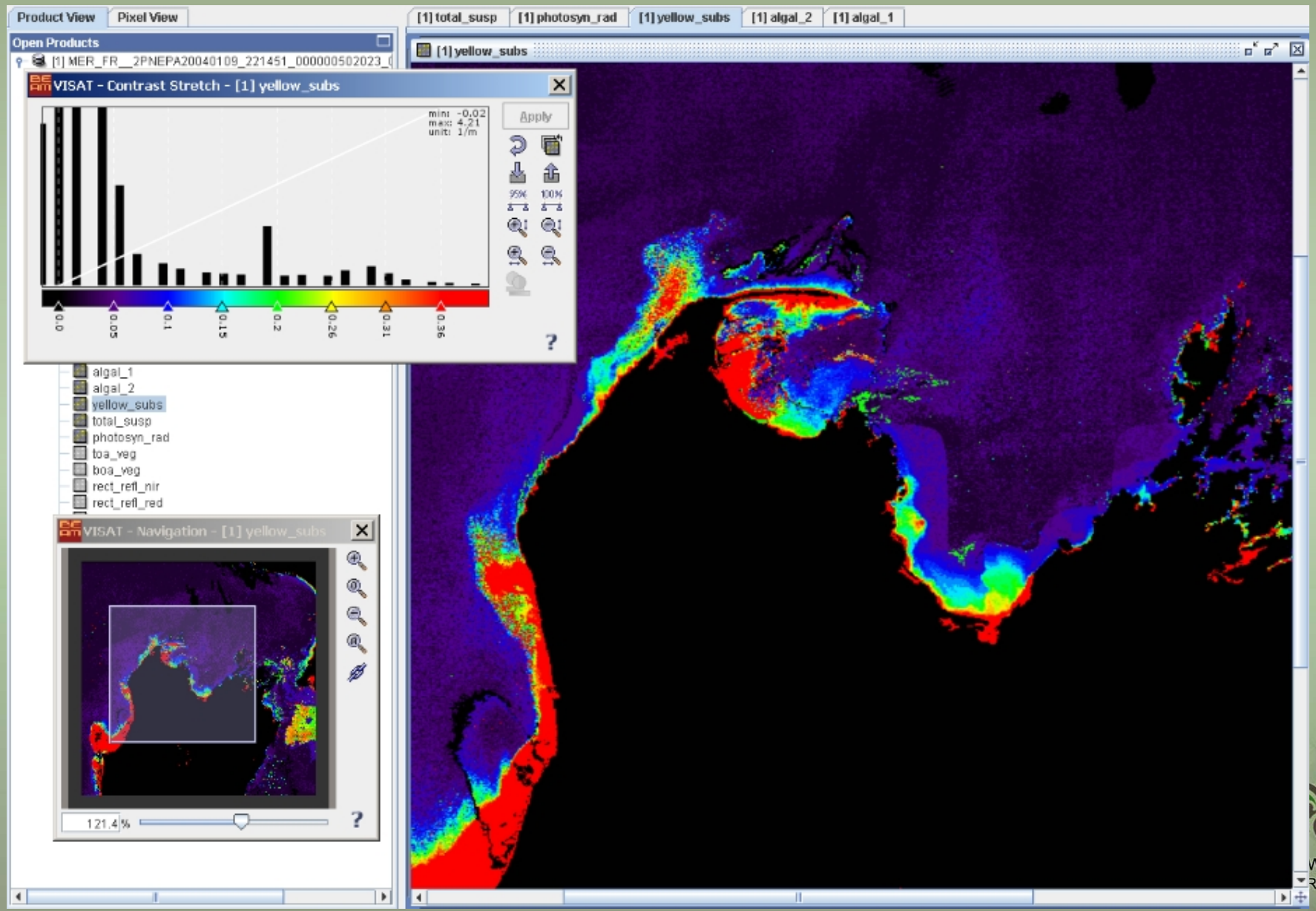
Yellow Substance



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Summary

- 21 MERIS image sequence covering 2 years
- Land cover change has clear spectral differences
- Scale of change is marginal for MERIS scale - need to use sub-pixel techniques
- Rectification needs to be more accurate
- Discussing solutions with ESA
- Ocean products available for comparison with in situ measurements