

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

User Consultation Meeting 3

L1P Algorithms

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CoastColour

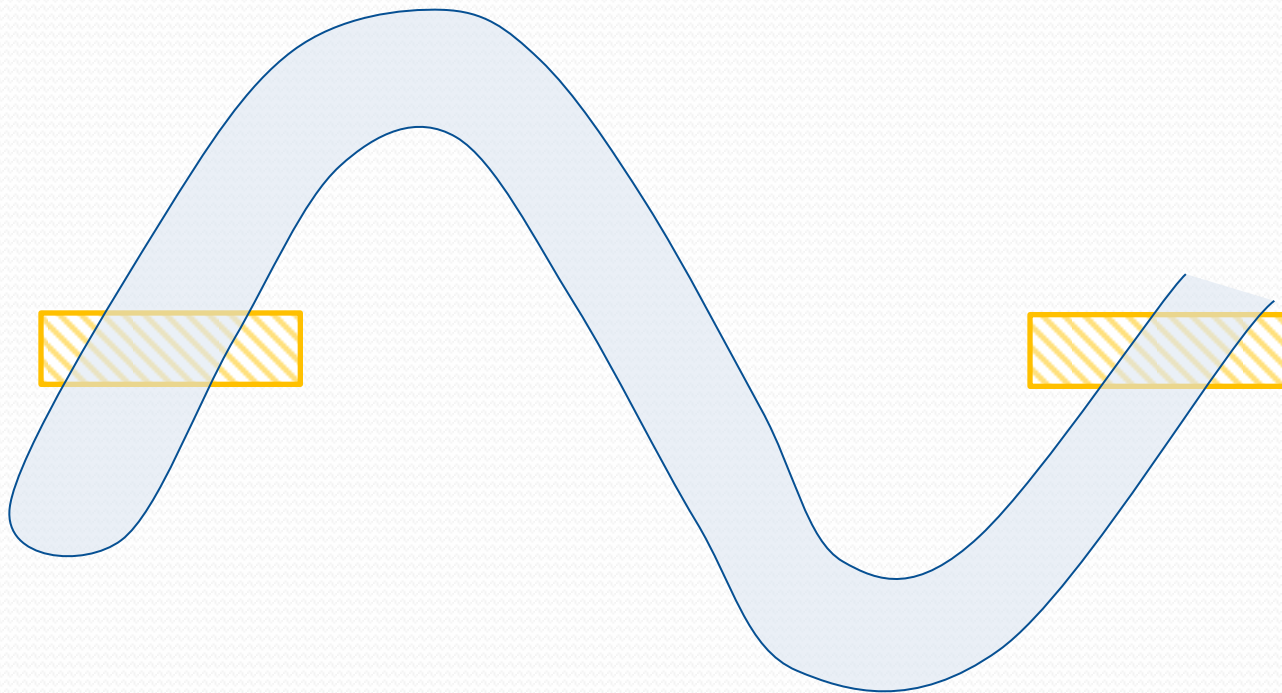
Level 1 processing steps

- Data ingestion & Registration in MERCI
 - 87 TB searchable; offline storage
- Child Product extraction (FRS)
 - 4h / 8TB processing time = 43.5h total
 - Product overlap problem
- Geocorrection Amorgos (FSG)
 - 2-8 min per product processing time = 5000h total
- Radiometric correction BEAM
 - 2nd to 3rd recalibration
 - Smile correction
 - Equalisation
- Pixel Identification
 - Cloud screening
 - SRTM/Globcover land water mask & radiometric land water classification
- Formatting
 - Software update completed
- Product clean up
 - Rule based process
 - Quasi manually done

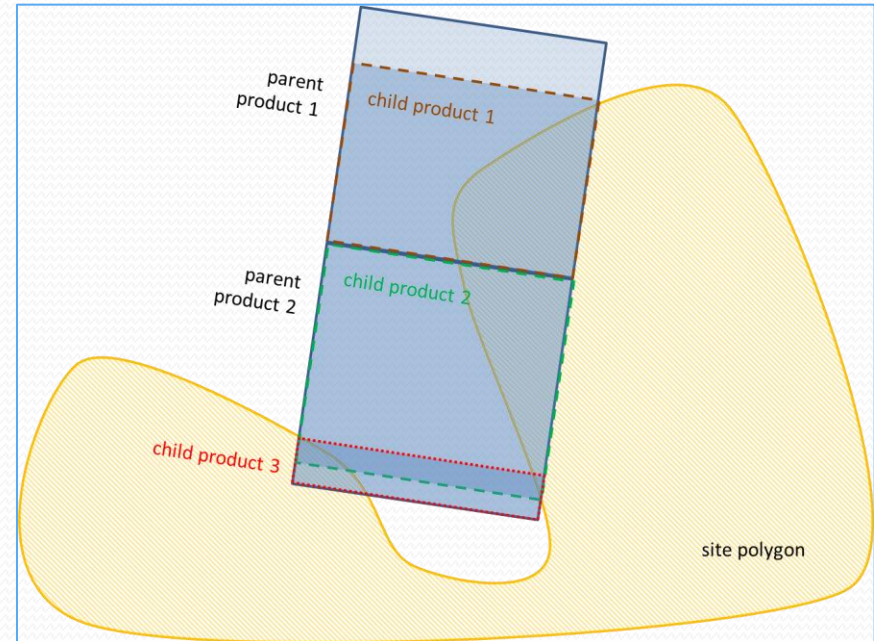
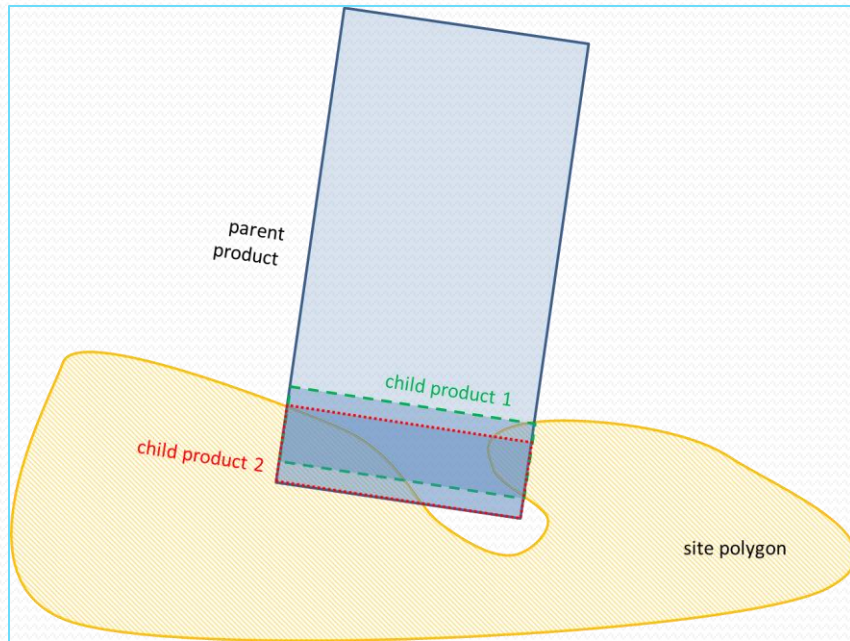
Childproduct generation

- Using geochildgen software
- Part of MERCI software package
 - analysing geoboundary of a product
 - translating geo-coordinates into product limits (first line, last line)
 - cutting MDS
 - updating meta data (SPH, DSDs)
 - writing N1 format
- Update for CoastColour to work with FSG products
- Working on thousands of products without problems

Child product generation



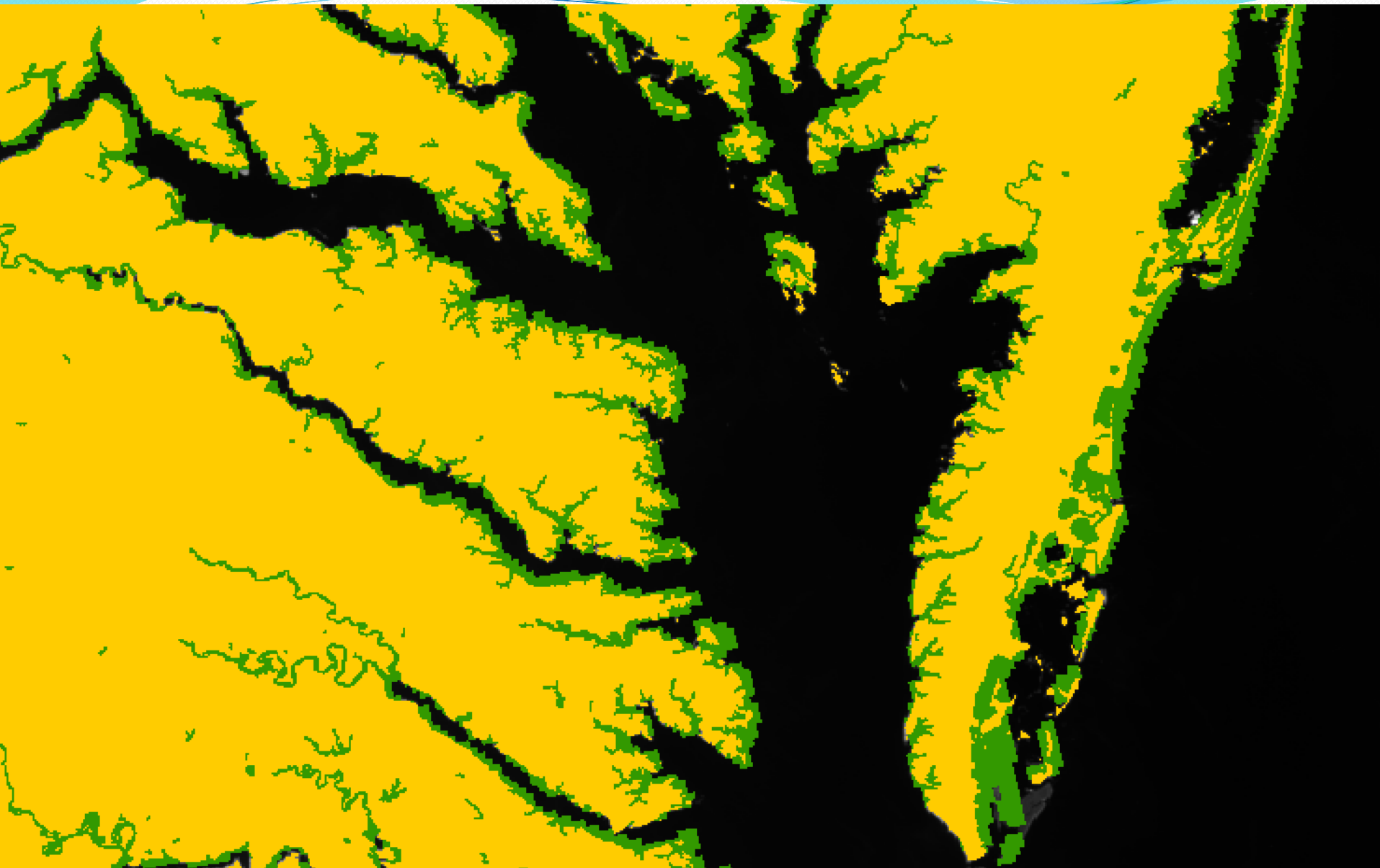
Child Produkt cutting



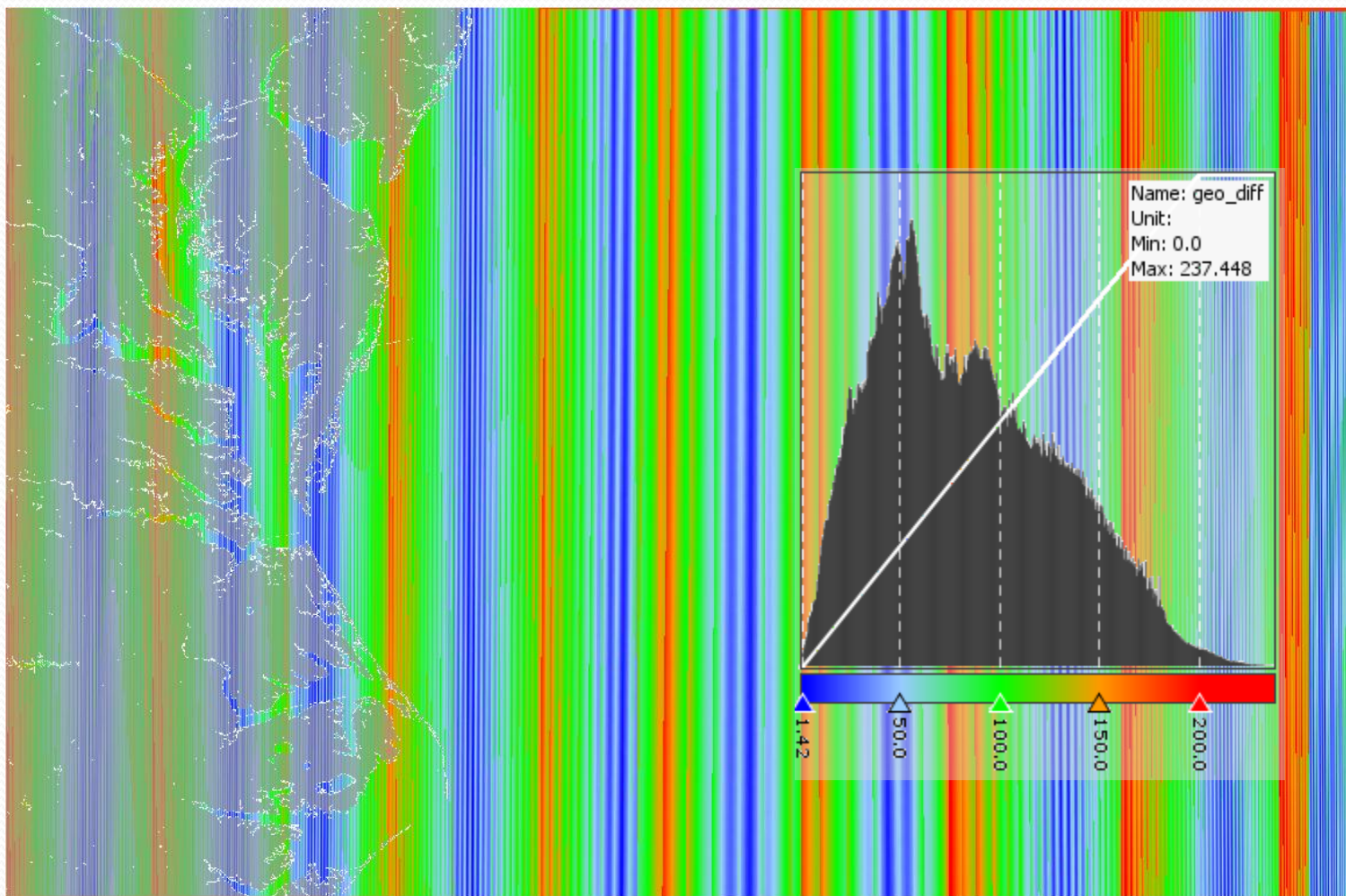
- Unpleasant large number of child products
- Redundant data
- Short solution: cleaning the dataset → done for demonstration dataset
- update of childgen → reprocessing (early next year)

Geometric Processing

- AMORGOS
 - Geolocation accuracy improvement
 - rms from 170m-500m down to 77m absolute / 55m relative
- Land Water Mask
 - Using the improved geolocation to point to a database
 - SRTM data between -50°S and 60°N
 - GlobCover for locations $> 60^{\circ}\text{N}$
 - Antarctica currently missing (no problem for CoastColour)
 - Use of IsciencesCoast line - land/sea mask planned (end of the year)



Effect of Geometric correction (in m)



Radiometric Corrections

- 1) 2nd to 3rd reprocessing gains
- 2) Coherent noise equalisation
- 3) Smile correction

2nd to 3rd reprocessing changes

$$R_{b,k,m,f} = \left(AL_{b,k,m}^{RR} \right)^{-1} \cdot \left\{ \left(X'_{b,k,m,f} - S_{b,k,m,f} \right) \cdot \left[g_0 + g_1(t_f - t_{ref}) + g_2(t_f - t_{ref})^2 \right] - C_{b,k,m,f} \right\}$$

New diffusor ageing model lead to a change in calibration coefficients

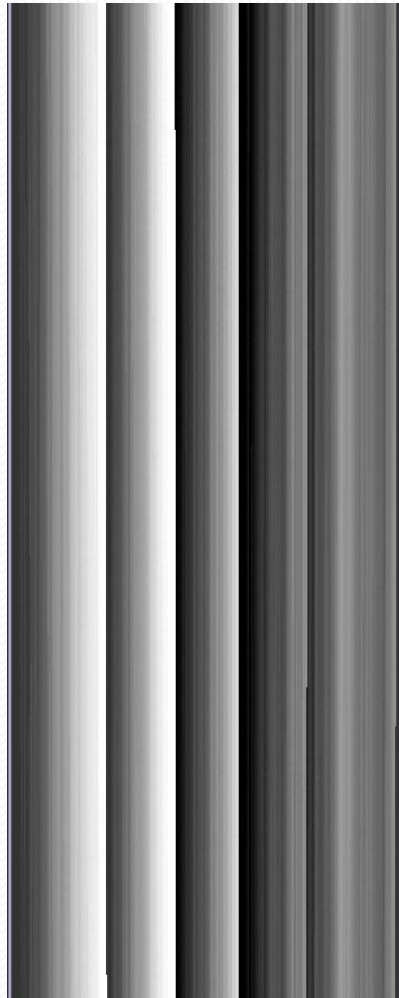
Thanks to ACRI-ST (Ludovic Bourg) for his support!

2nd to 3rd Reprocessing Change

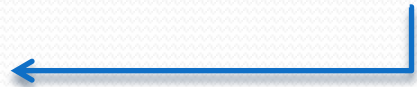
MERIS RR 01.06.2003, 9:26

relative Orbit 480 – RGB

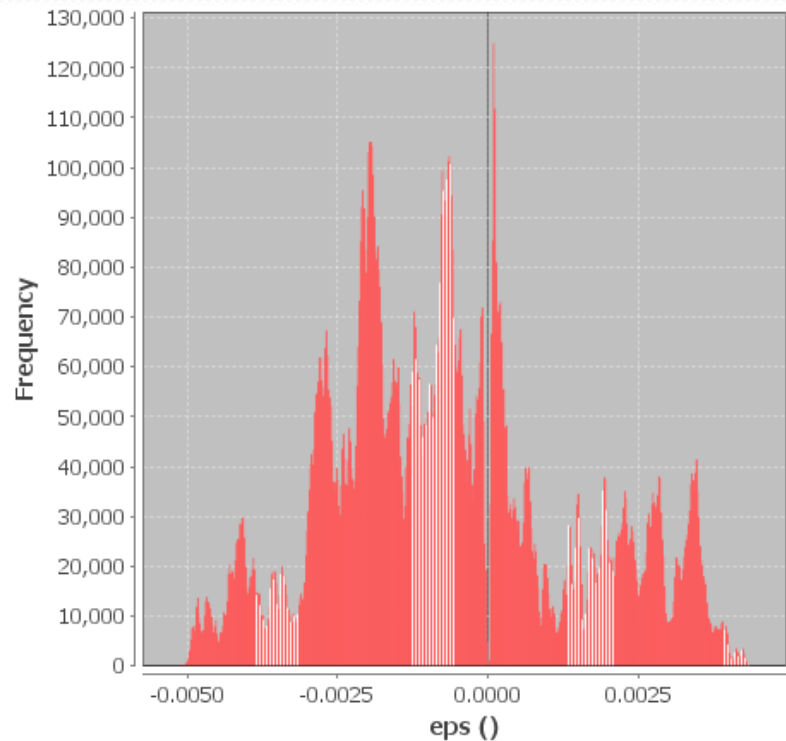
subset of Europe including Baltic Sea and Mediterranean Sea



$$L_{3rd} = L_{2nd} * (1 + \epsilon)$$



Band 1

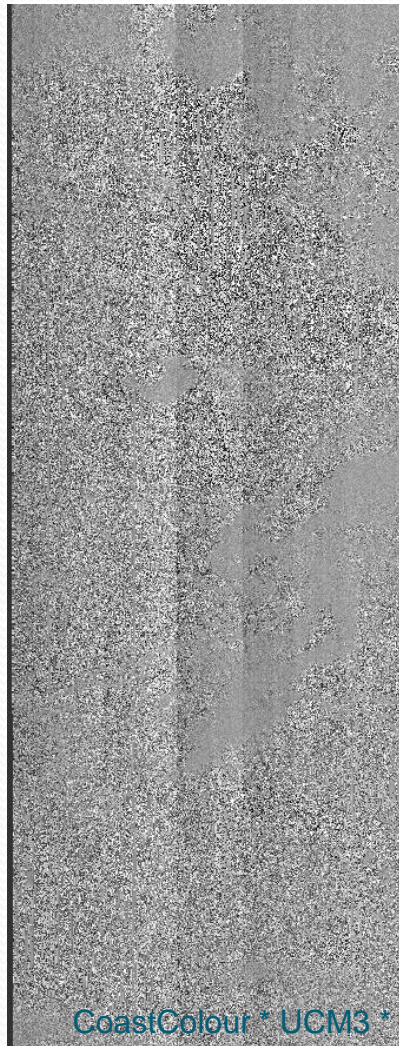


Recalibration Error

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relative Orbit 480 – RGB

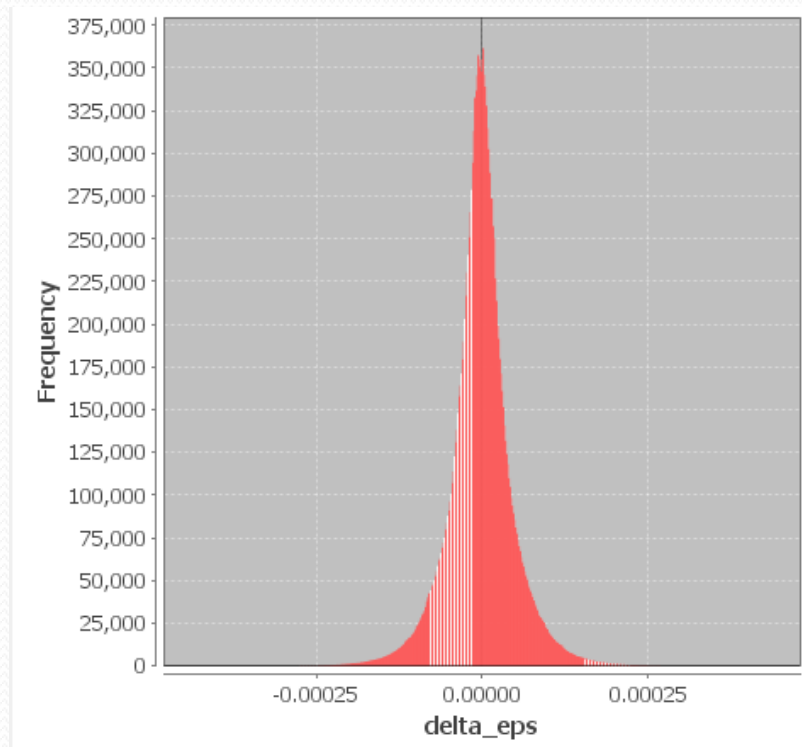
subset of Europe including Baltic Sea and Mediterranean Sea



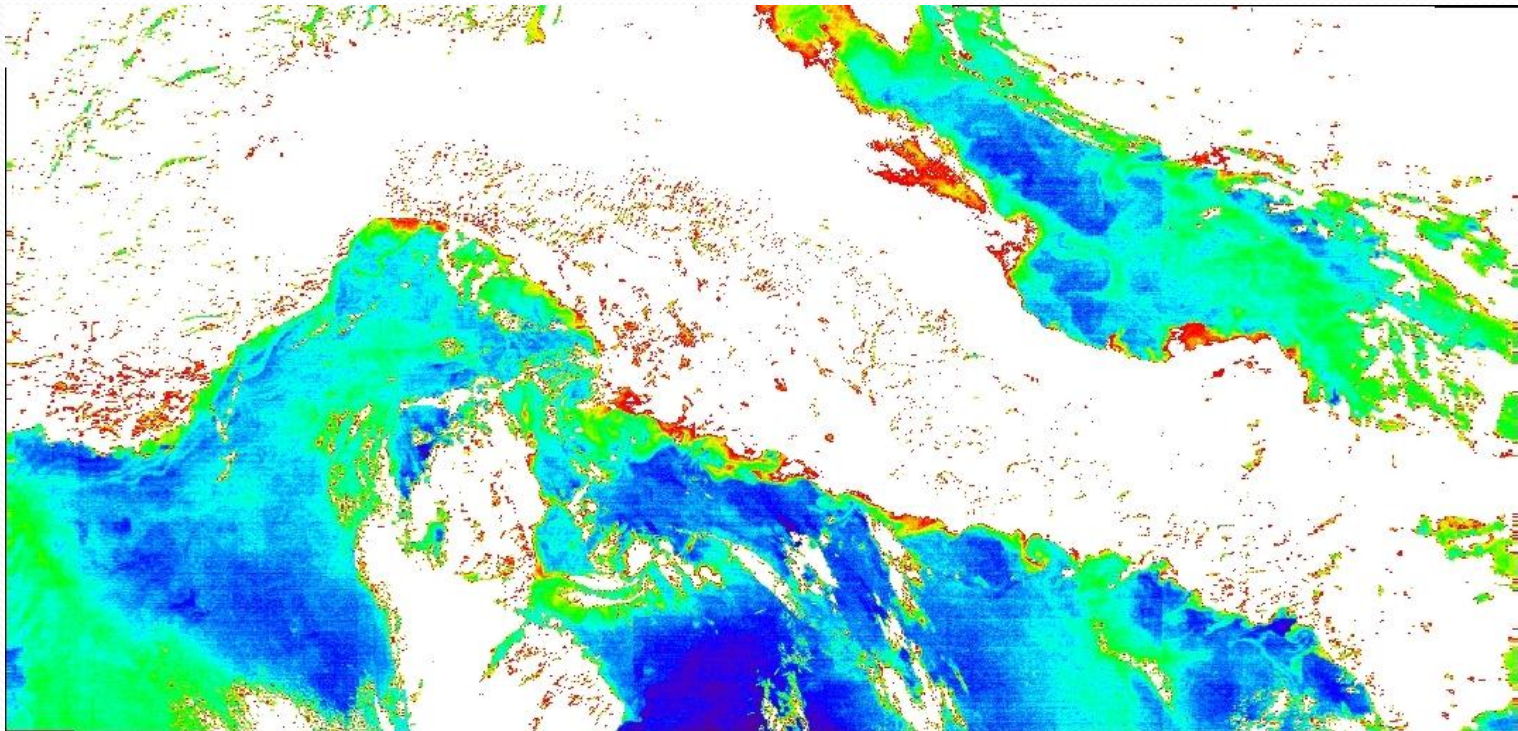
$$\tilde{L}_{3rd} = L_{2nd} * (1 + \epsilon * (1 + \delta)) = L_{2nd} * (1 + \epsilon + \epsilon\delta)$$



Band 1



Coherent noise equalisation



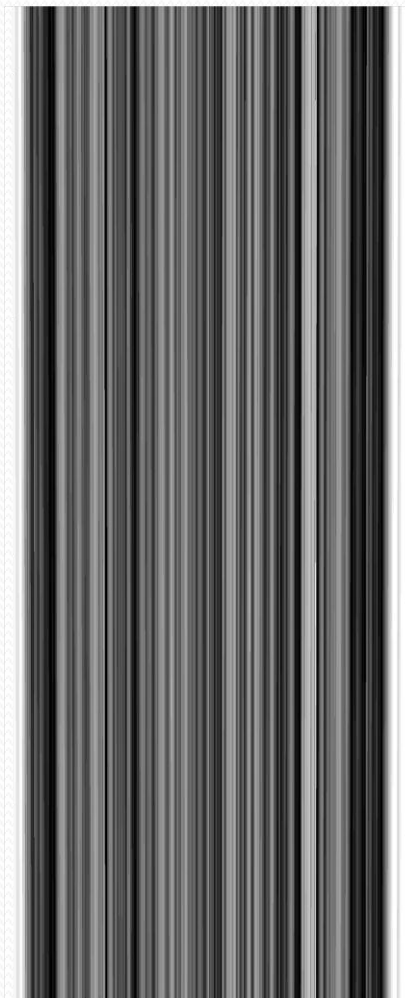
Band ratio between the smile corrected L1 TOA reflectance in band 4 and 3, before equalization (top panel) and after equalization (bottom panel). The color scale ranges from 0.83 to 0.88 (slide from M. Bouvet, ESA, February 2010)

Equalisation 2nd Reprocessing

MERIS RR 01.06.2003, 9:26

relative Orbit 480 – RGB

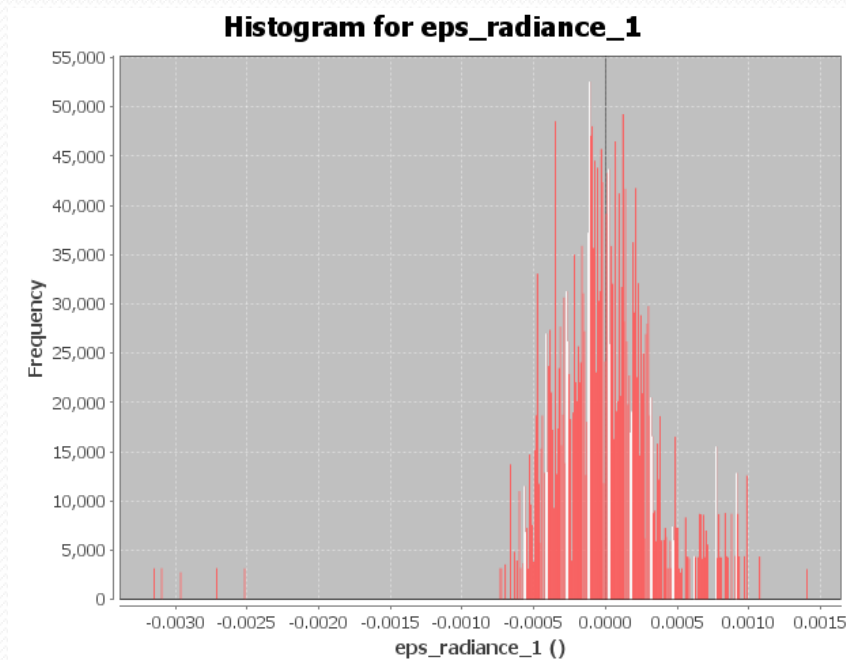
subset of Europe including Baltic Sea and Mediterranean Sea



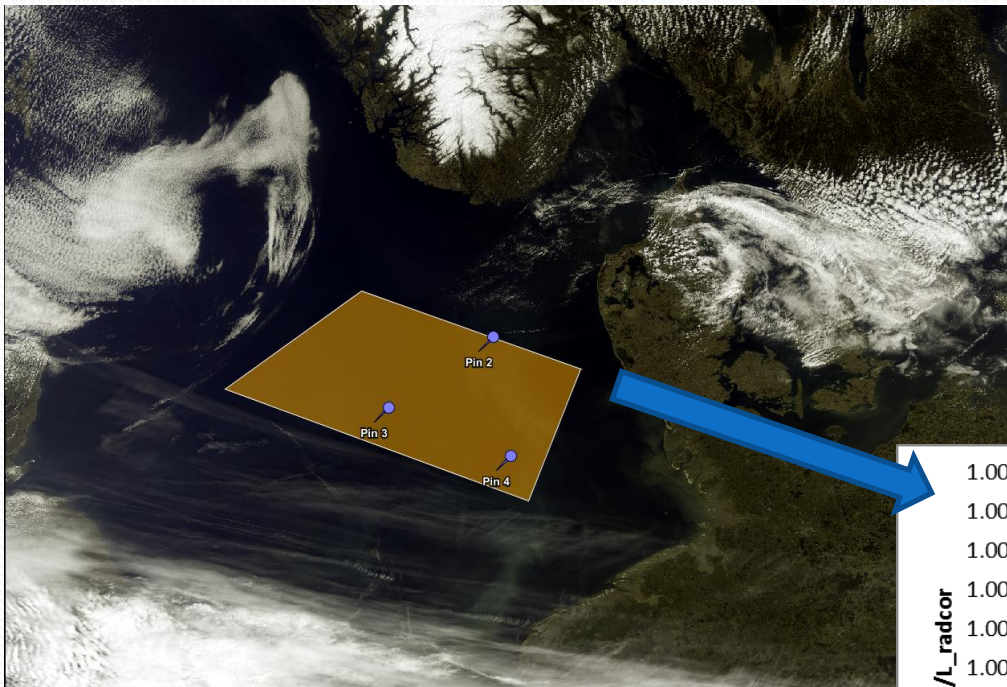
$$\varepsilon = (L_{2nd} - L_{2ndEQ}) / L_{2nd}$$



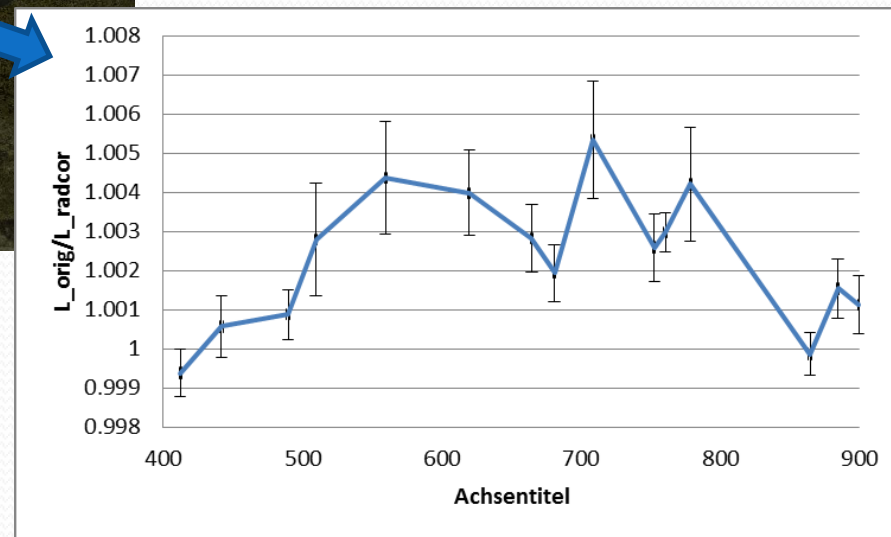
Band 1



Overall Effect of Radiometric Correction

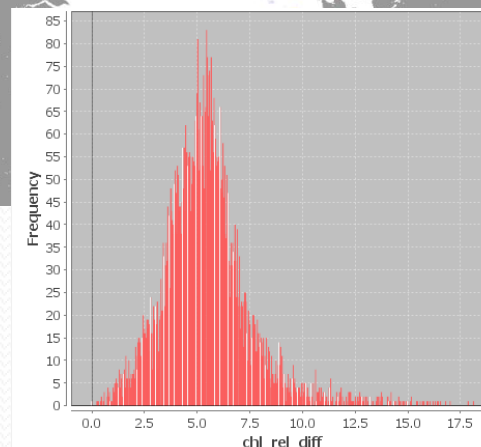
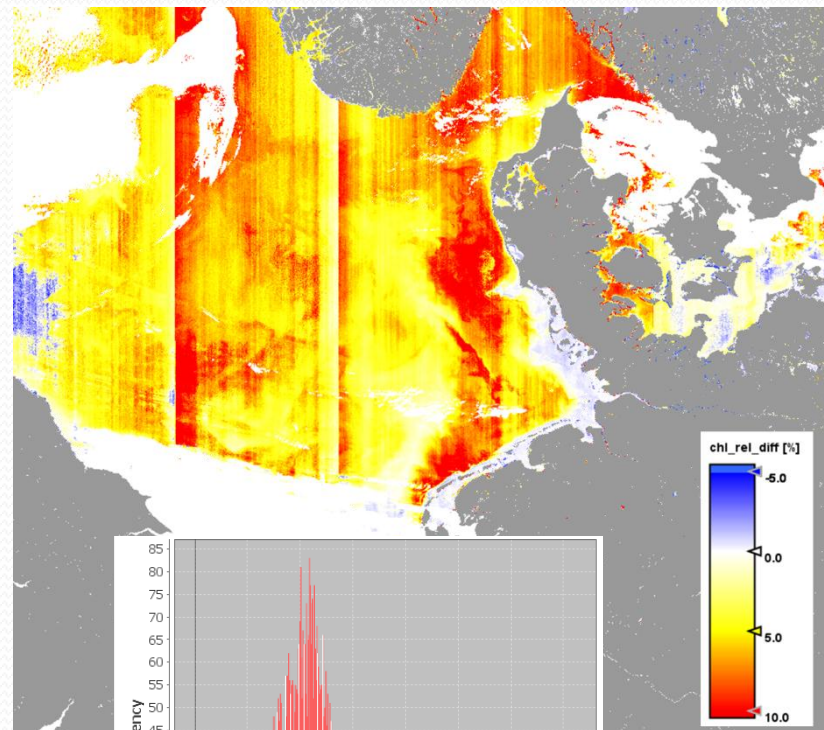
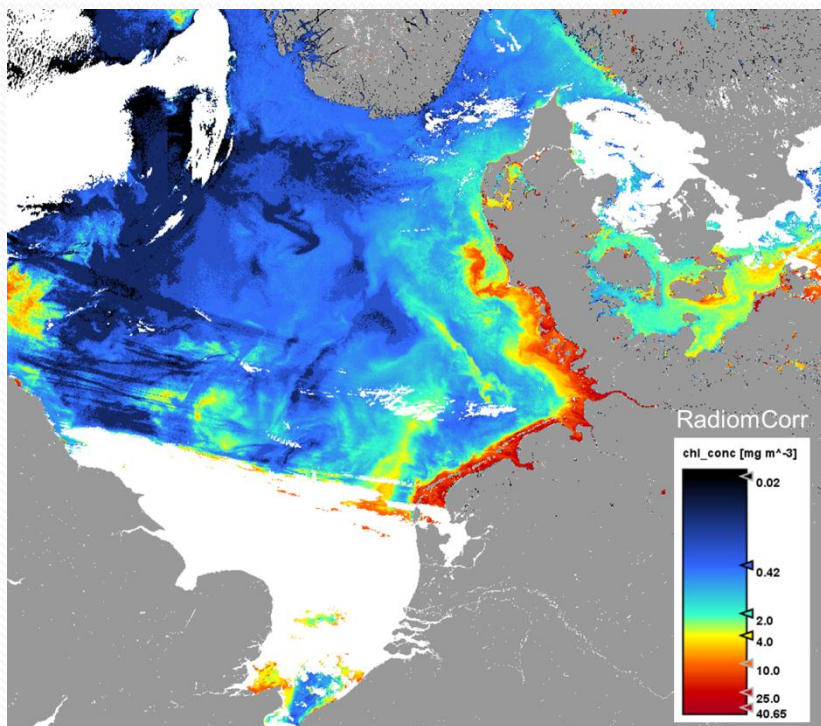


$L_{\text{uncorr}} / L_{\text{corr}}$



Impact on Chlorophyll concentration

$$\frac{(\text{chl_corr} - \text{chl_uncorr})}{\text{chl_uncorr}}$$



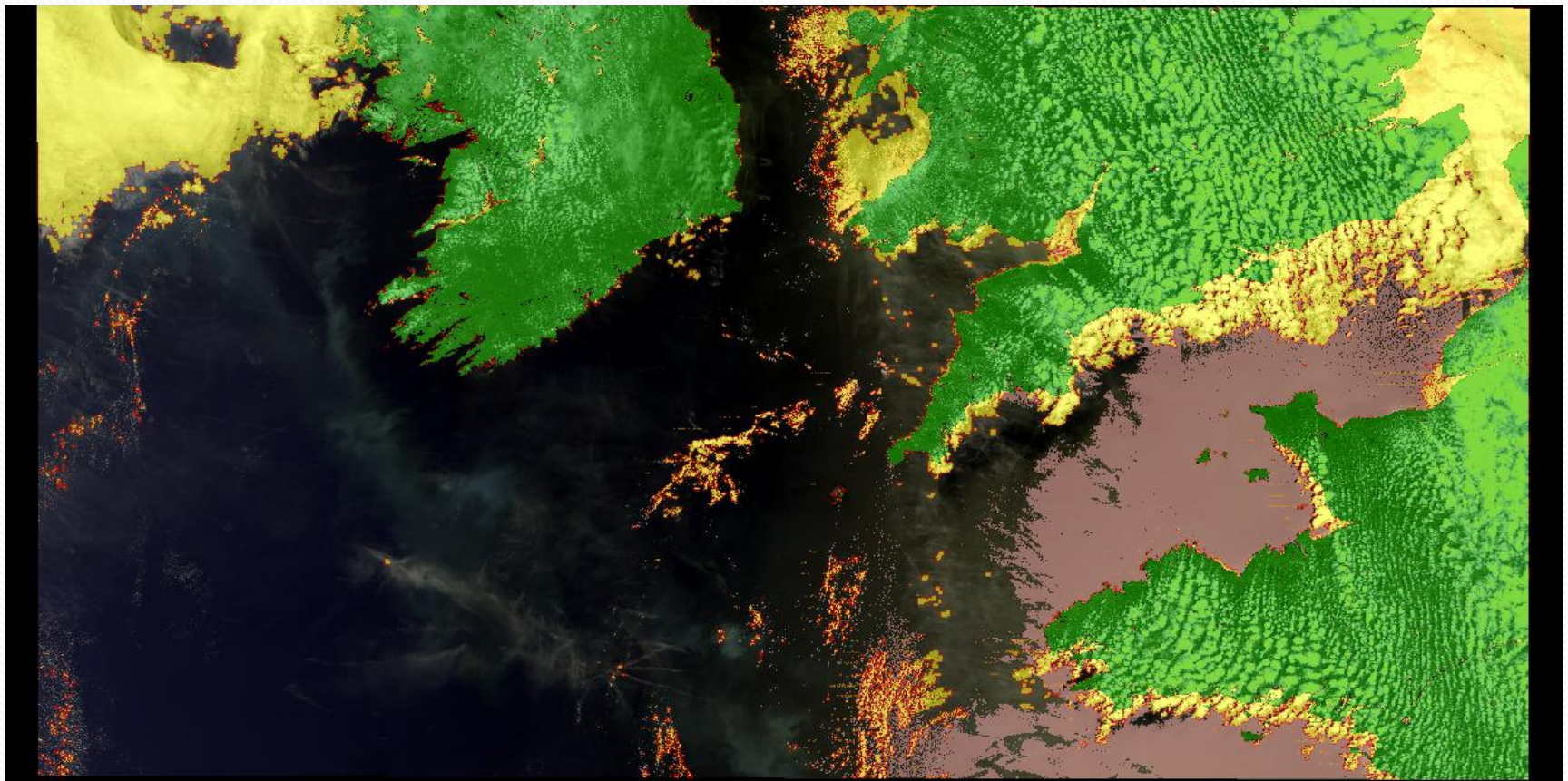
0.0 5.0 10.0 15.0 %

Pixel Classification

- Glint risk
 - Geometric criteria (sun + view + wind speed)
 - Threshold on reflectance
- Cloud
 - Features: brightness, whiteness, height
 - Link to CC-AC
 - Exceptions in glint
- Ice/snow
 - Bright & MDSI
 - Ice climatology

Pixel Classification

- land
- coastline
- cloud
- cloud border
- cloud shadow (not in image)
- snow / ice
- land risk (not set)
- glint risk



Summary

- L1P processing chain completed
- Tools publicly available
 - AMORGOS for geometric correction (ESA Website, dev. by ACRI-ST)
 - BEAM Radiometric processing tool
 - Land/Water mask
- Tools under consolidation
 - IdePix pixel classification
- 1 open issue
 - Land risk flag → currently under development
- 1 issue identified to be addressed in future
 - child product consolidation and concatenation
 - technical solution clear

Level 2 overview

- Adjacency effect correction
 - SW ready
 - Under validation
 - Not applied in demonstration data set
- Atmospheric correction
 - New regional aerosol models (R. Santer)
 - Presentation by R. Doerffer
- Optical water type classification
 - SW ready
 - See presentation Moore/Dowell (given by S. Sathyendranath)
- In-water processing
 - 4 prototype algorithms
 - NOMAD bio-optical model
 - Extended for global neural network
 - Extended for high sediment loaded regional neural network
 - QAA (presentation Lee on Thursday)

L2 Status

- L2 prototypes algorithms ready in April 2011
 - Neural network Atmospheric Correction
 - Different regional in-water neural networks
 - QAA
 - Optical Water Type classification
- L2 production line for demonstration products
 - Neural network Atmospheric Correction
 - Generic neural network, for medium turbid waters
 - High sediment loaded neural network,
 - Applied to specific sites 11 (China) and 27 (Rio de la Plata)
- Final L2 algorithms and production line after UCM₃