IDEAS+

MERIS/AATSR
land-water mask improvement
&
Quality control of the MERIS 4th Reprocessing

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Overview

• Upgrade of MERIS/AATSR land-water masks
  – Upgrade from 300m to 150m based on LC-CCI WB mask
  – Potential future use of the masks

• Quality control of MERIS 4\textsuperscript{th} RP
  – Coarse error screening using MERCI
  – Tool to detect more complex product errors
land-water mask improvements
(300m to 150m)
Recap from last workshop

- QC of old S3 land-water mask for use in MERIS 4th RP
- Location differences between high resolution coastline (red) and mask for land/ocean (in green) of S3
- Creation of a new SEN3 like land-water mask at 300m resolution

Inconsistency between S3 coastline mask and S3 land/ocean mask

- Mask for land/ocean classification (land = black) superimposed by mask for tidal regions (transparent yellow)

Land/Water mask

- New masks based on Land Cover CCI WB product with improvements
- The old Sentinel-3 land/water mask and the SRTM WB product had many land artefacts where water was masked as land

Inland water bodies, especially over northern America were extremely underestimated
Land/Water mask 150m

- The 150m mask for land/water is purely based on the LC-CCI WB product.
Land/Ocean mask 150m

- The mask for land/ocean mask is derived from the mask for land/water mask
- Same methodology as used for 300m version
- Methodology was part of a publication in Remote Sens. 2017, 9(1), 36

Example of vectorised and extracted ocean areas (rivers still present)

Example of GSHHS (red) superimposed to current ocean mask (blue)

0.033 degree buffered GSHHS (green) compared to original GSHHS (red) and current ocean mask (blue)
Land/Ocean mask

Ocean mask with remaining inland water (left); Refined ocean mask without inland water (right)
Intertidal mask 150m
Input data & methodology

1. FES 2004 K1 and M2 tidal amplitude data

2. GEBCO bathymetry data

Methodology

1. Threshold of 0.75 used on K1 and M2 tidal amplitude sum.
2. Threshold of 15m below zero on bathymetry data to generate shallow water mask
3. Intersect mask 1 & 2 to generate shallow water tidal influence mask
4. Intersect with land/ocean mask for further refinements
5. Fill areas between mask and land areas if existing
Coastline mask 150m

- To create a coastline mask which is consistent to the two previous masks, the coastline was derived from the new land/ocean mask.
Mask consistency

• All masks are consistent with each other
  • Masks align on pixel level
  • Masks complement each other without any gaps

Ocean areas from land/ocean mask in dark blue; Coastline mask in red; Tidal regions mask intersecting with water mid blue; Water from land/water mask light blue and land dark green; Land intersecting with tidal region mask light green
Summary & recommendation

• All masks are an improvement compared to the previous 300m version.

• Due to publication dates of LC-CCI and production deadlines of MERIS and AATSR, the 150m version is not included in 4th RP.

• Recommendation:
  • Provide as a separate auxiliary dataset.
  • Include in SNAP as masking operator.
MERIS 4th RP Quality Control
Coarse product screening using MERCI

- MERIS Catalogue and Inventory (MERCI) has a built-in quality checking functionality.
- Tests are normally used for quality statistics of the product.
- Tests have been adopted from 3rd RP product format 4th RP format.
- Tests are pixel-based and only allow band statistics.
- Can be used to detect some basic errors like:
  - shorter than specified in header,
  - missing tie-point lat/lon,
  - processing failed (product empty) ...
Detecting more complex product errors

• There are some more complex errors that can not be detected on a simple pixel/band statistic level:
  • shifted geocoding (hundreds of km, a few pixels),
  • unexpected band data (“discolored” quicklooks),
  • vertical stripes.
• A dedicated processor was developed to identify these issues (only for L1 data).
  • In context of LC-CCI based on 3rd RP archive.
Examples of detectable errors

- Product with a geolocation issue in a L3 global composite
Examples of detectable errors

- Identifying large scale geolocation issues using NDVI based land/water mask and product land/water mask

MER_RRG_1PRACR20090807_125209_000011912081_00253_38884_0000.N1
Examples of detectable errors

- Complete product has a wrong geolocation

MER_FSG_1PNUPA20050208_125332_000004532034_00310_15394_0489.N1
MER_FSG_1PNUPA20050208_130106_000000592034_00310_15394_0489.N1
MER_FSG_1PNUPA20050208_130202_000002022034_00310_15394_0645.N1

wrong geocoding in data of a single product
Example of not detectable errors

- small geolocation shifts can **not** be detected

SRTM SWBD shape file over radiance image
observation **at 2009-01-24** shows what we expect (perfect match)
observation of same area **at 2009-01-27** is shifted by a few pixels, radiance and geocoding do not match
Examples of detectable errors

- Vertical striping effects that are not covered by flags (e.g. invalid)
Examples of detectable errors

- Dropouts in band data which are not flagged.

  RGB image from radiances shows non-realistic values

- Horizontal striping which is not flagged.
Summary, outlook & recommendation

- Systematic screening of all L1 FR and RR products based on methods in place
  - ~150 TB FR
  - ~21 TB RR
- Only selective checking on random L2 FR and RR products
- Result is a list of products that:
  - Need to be removed completely (e.g. empty, too short, wrong geo-location)
  - Need to be kept separate (e.g. stripes, partial bands missing)
- A comprehensive QC of L2 data is recommended
Thank you for your attention!