Cloud screening of desert site data using METRIC (Meris Extraction Tool for Indirect Radiometric Calibration)

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CONTENT

- What is METRIC ?
- Selection of MERIS data over DESERT sites
- Examples of rejection criteria
- Extraction statistics for Libya4

What is METRIC ?

METRIC	MERIS EXTRACTION TOOL FOR INDIRECT RADIOMETRIC CALIBRATION
Objective	Extraction of filtered MERIS measurements acquired over natural sites (Rayleigh, Glitter, Desert, DC Cloud, Antarctic) for radiometric calibration New! New!
Input	MERIS L1b RR (+ optionally L2 breakpoint data obtained with ODESA)
Output	spatially averaged normalised radiance or reflectance (all channels) + statistics and annotations
Operation	embedded in the L1b processing chain or standalone from archived products
History	developed for launch (2002), upgraded in 2011

Selection of the MERIS data over desert sites

Cloud screening

Criteria 1 – Site geographic limits (4 vertices polygon in {lon,lat})

Criteria 2 – Use of L1 Quality Indicator (saturation)

Criteria 3 – Threshold on Reflectance at 443 nm

- » Cloud screening based on high reflectance of cloud at 443 nm
- » Limited efficiency due to fixed threshold (not geometry dependent, not site dependent)

Criteria 4 – Threshold on spectral index between 443 and 865 nm

- » Objective: Cloud screening based on whiteness

Criteria 5 – BRIGHT mask (from MERIS L1b flags) New!

- » RT based geometry dependent threshold at 443
- » Applied only to NON WHITE desert sites – i.e. not applied to Lybia4

Criteria 6 – Threshold on local variance at 490 nm New!

- » identification of high short-scale variability (cloud/soil, cloud shadow, cloud contours)
- » Applied only to HOMOGENEOUS desert sites (→ applied to Libya4)

Selection of the MERIS data over desert sites

Final selection:

- Pixels must satisfy all criteria
- More than 90% of the site's area is selected

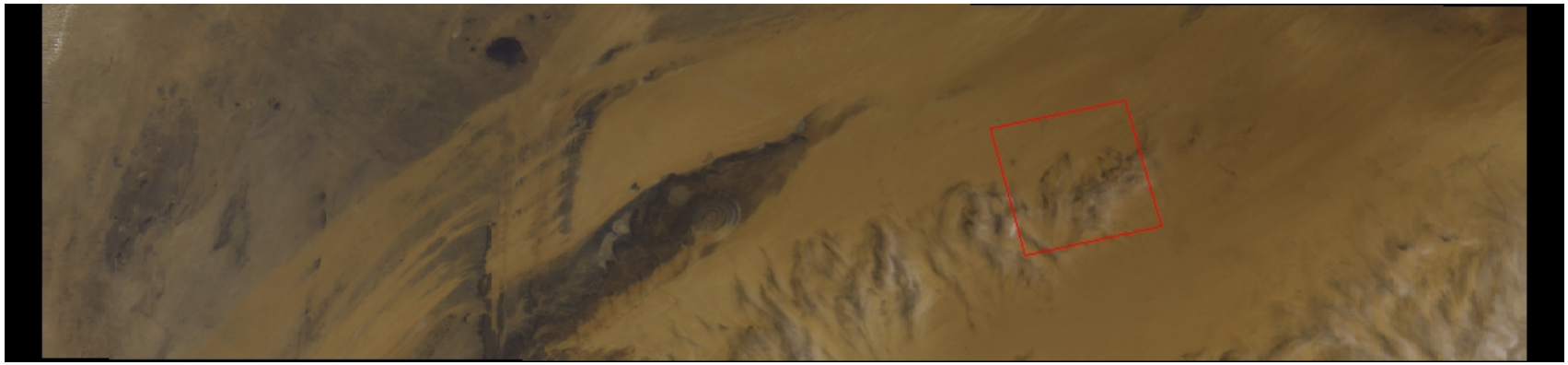
Output

- Reflectance: average and standard deviation (all bands)
- Annotations (at site centre):
  - Geographic co-ordinates
  - Product co-ordinates (and source product references)
  - Sun and View angles
  - Sensor cell reference (camera and spatial detector indices)
  - Meteo: horizontal wind vector, sea level pressure, total column ozone, relative humidity

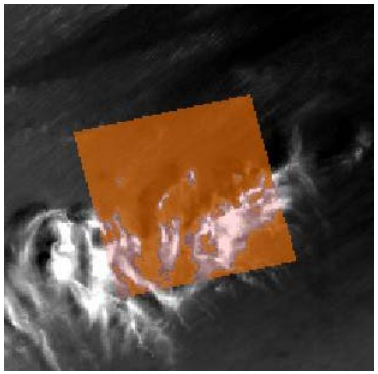
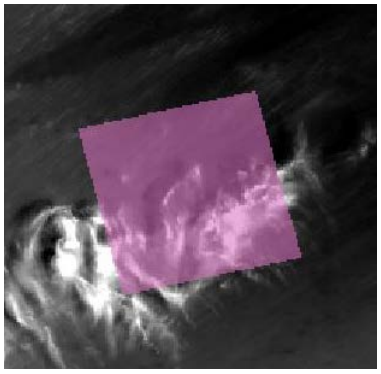
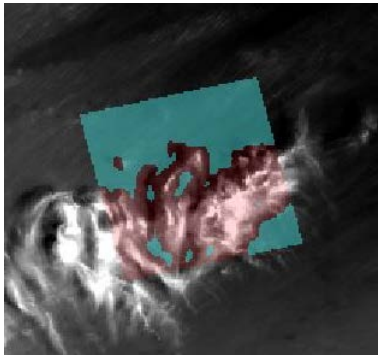
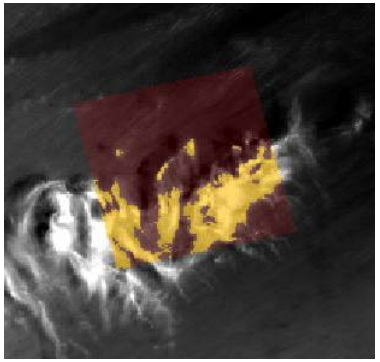
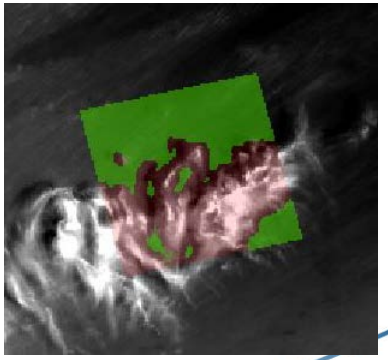
Example of criteria

Mauritania2 (as no images available for Libya4)

RGB



ρ443 | spectral index | variability | bright mask | Final

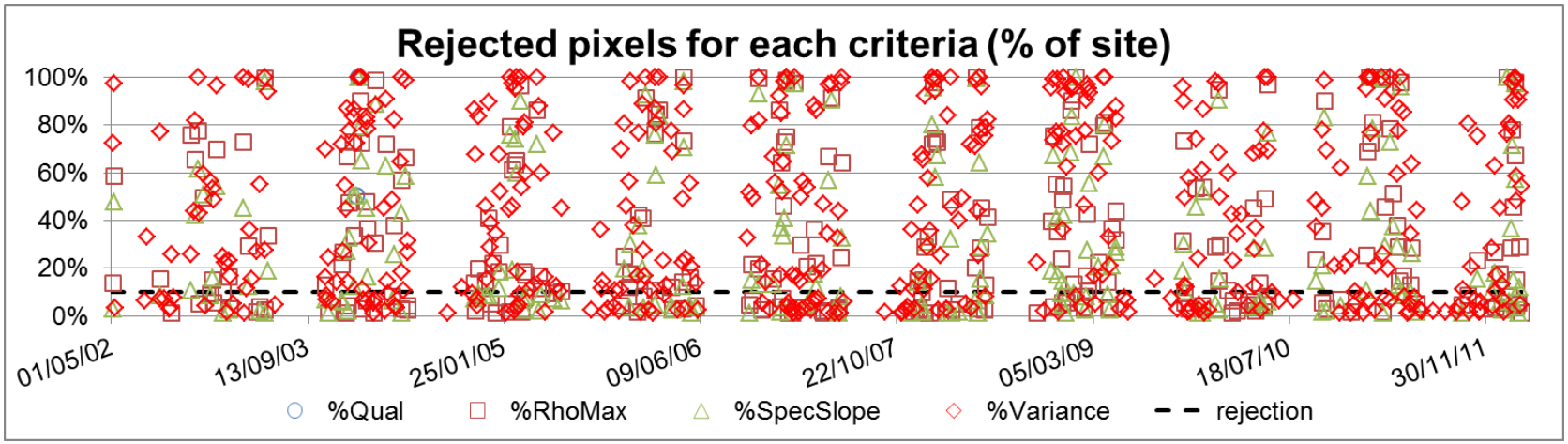






Extraction statistics for Libya4

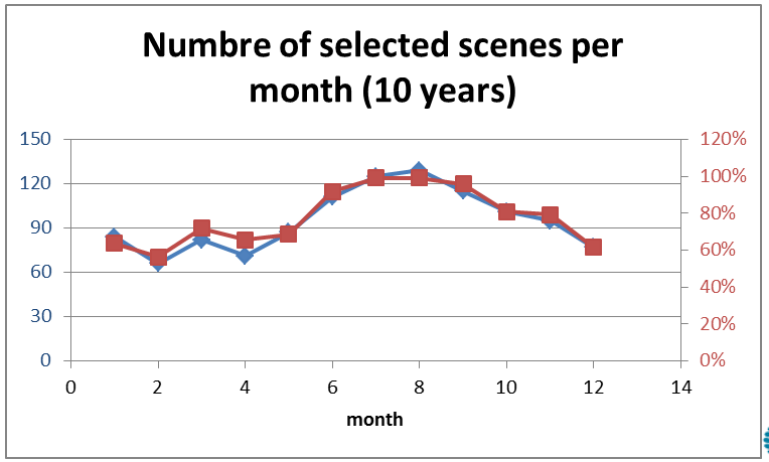
10 years mission coverage (05/02, 03/12):

1650 overflights → 1465 full coverage → 1143 results (322 rejected, 22%)

- Rejection time series:

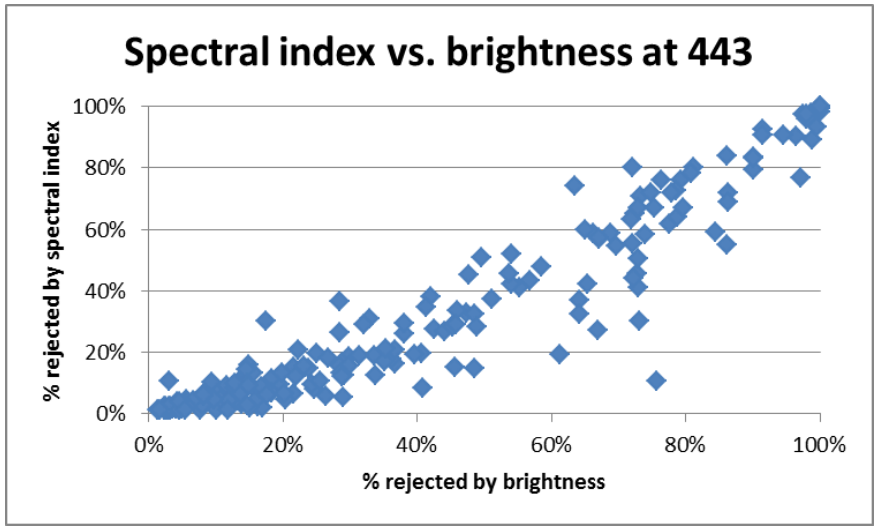


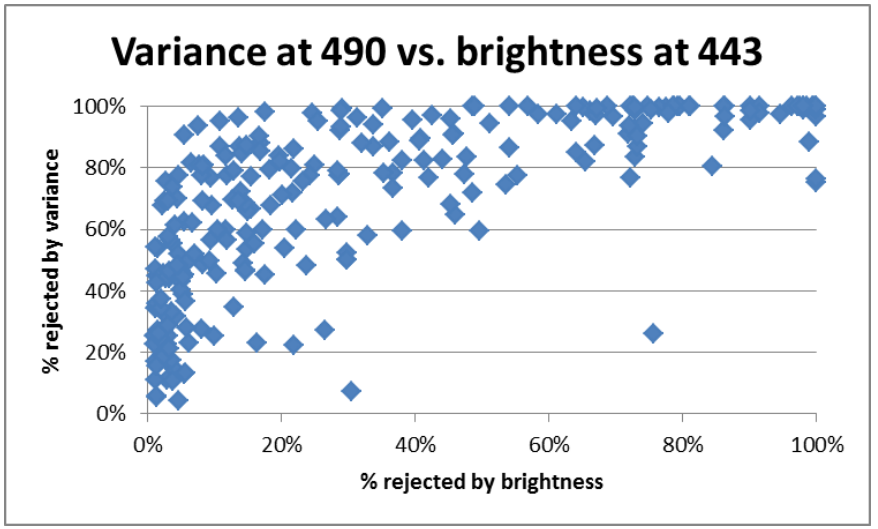
- Overall scene selection statistics:



Extraction statistics for Libya4

Rejection time series suggest strong correlations between the 3 used criteria.





If spectral index and brightness are indeed correlated, local variability is largely independent bringing in new information.