

# Cross-calibration using Libya-4 and other desert sites

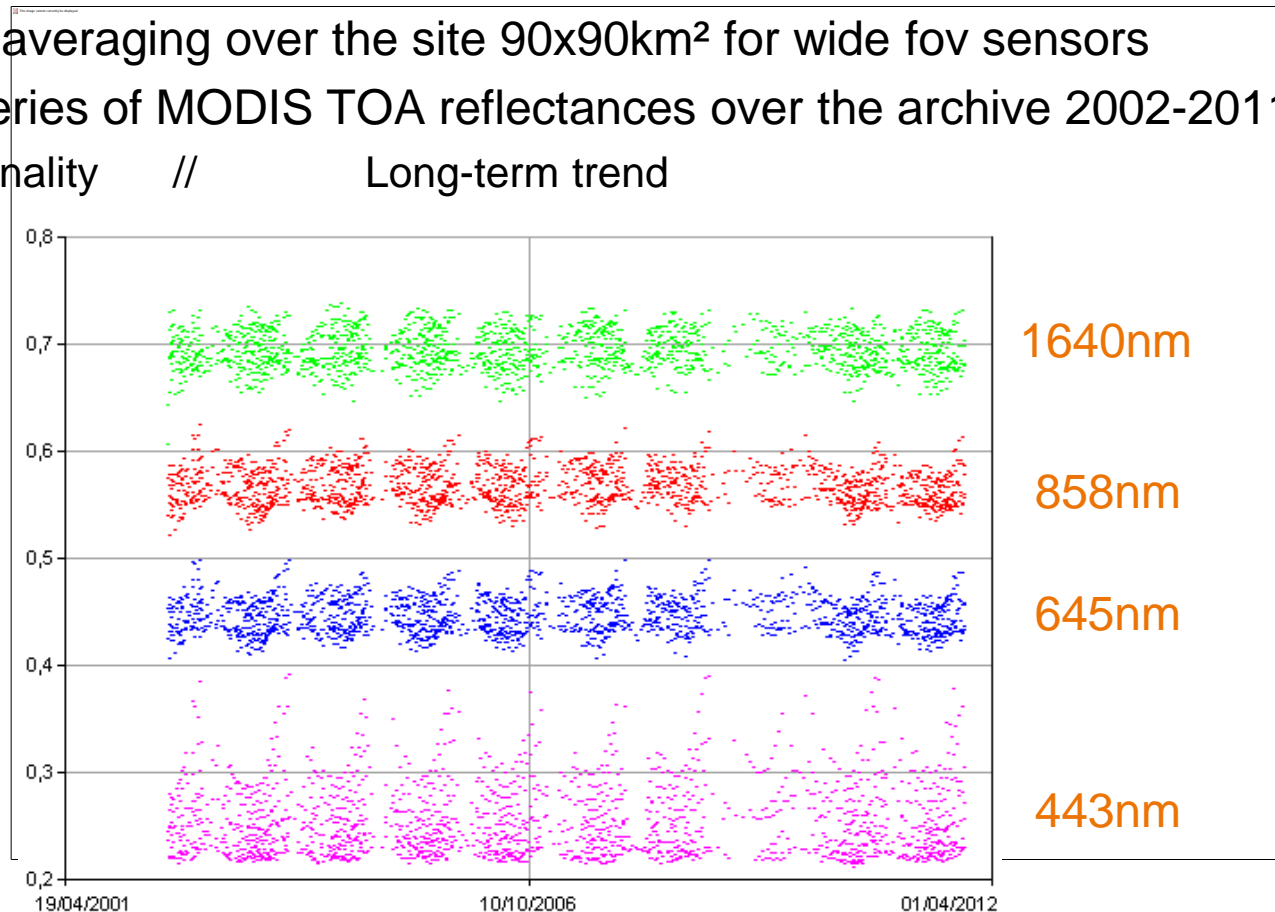
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# CONTENT

- **From a TOA collection to a cross-calibration**
- **Consistency between Libya-4 and other sites**
- **Cross-calibration results**
- **Impact of reciprocity on matchups**

# Starting from a TOA collection

- Dedicated cloud screening (spectral, brightness, local variation...)
- Spatial averaging over the site 90x90km<sup>2</sup> for wide fov sensors
- Time series of MODIS TOA reflectances over the archive 2002-2011
  - ◆ Seasonality // Long-term trend



- Geometrical matching and cross-calibration according Lach erde et al. (2012)
  - » no temporal simultaneity required

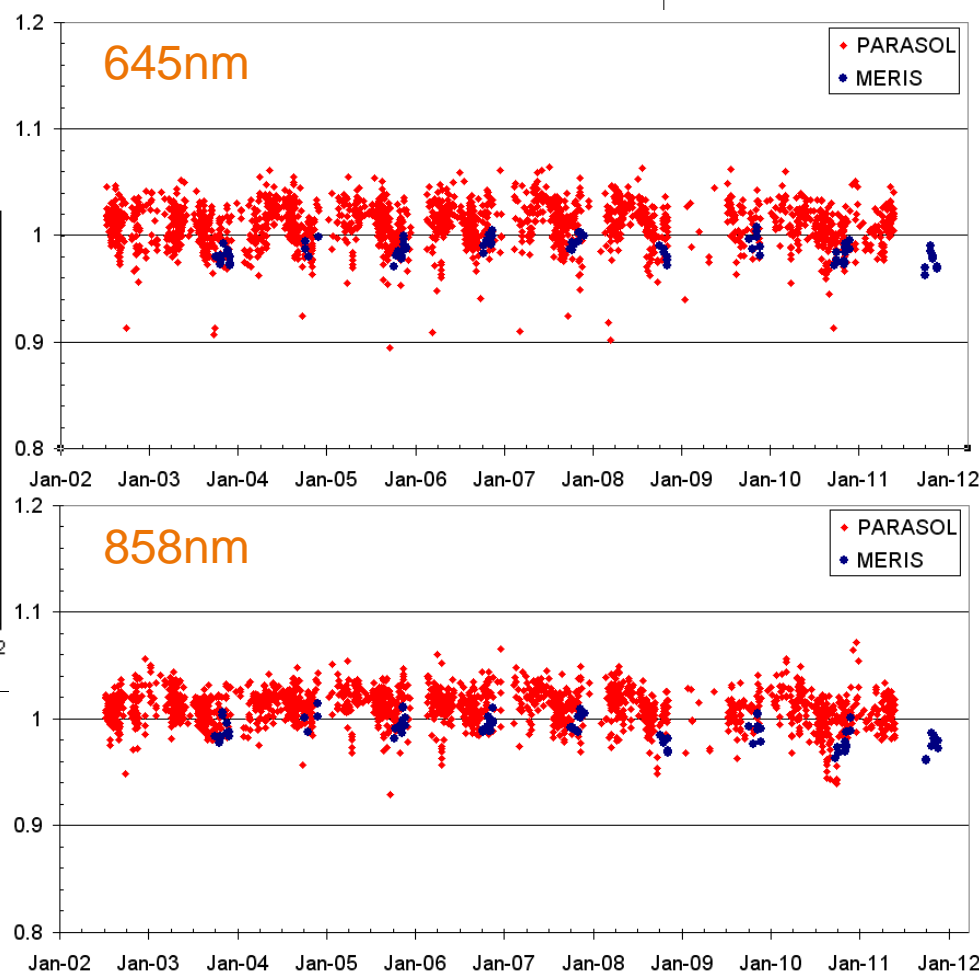
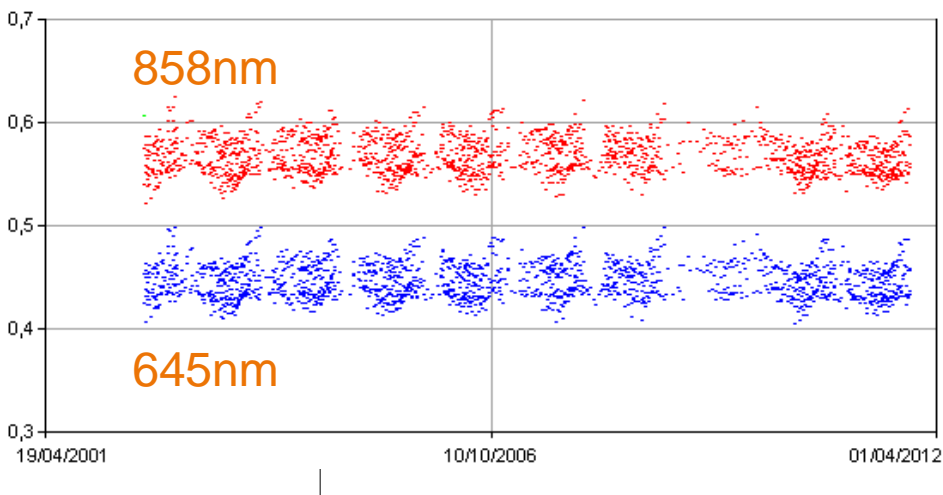
# Cross-calibration over Libya-4

- Statistics for MODIS cross-calibration over Libya-4

- ◆ TOA archive = 1 806 meas.
- ◆ cross-calibration with PARASOL = 3 445 matchups
- ◆ cross-calibration with MERIS = 87 matchups

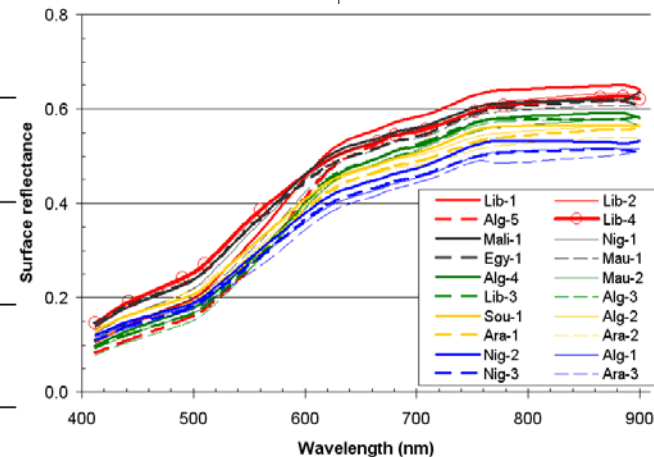
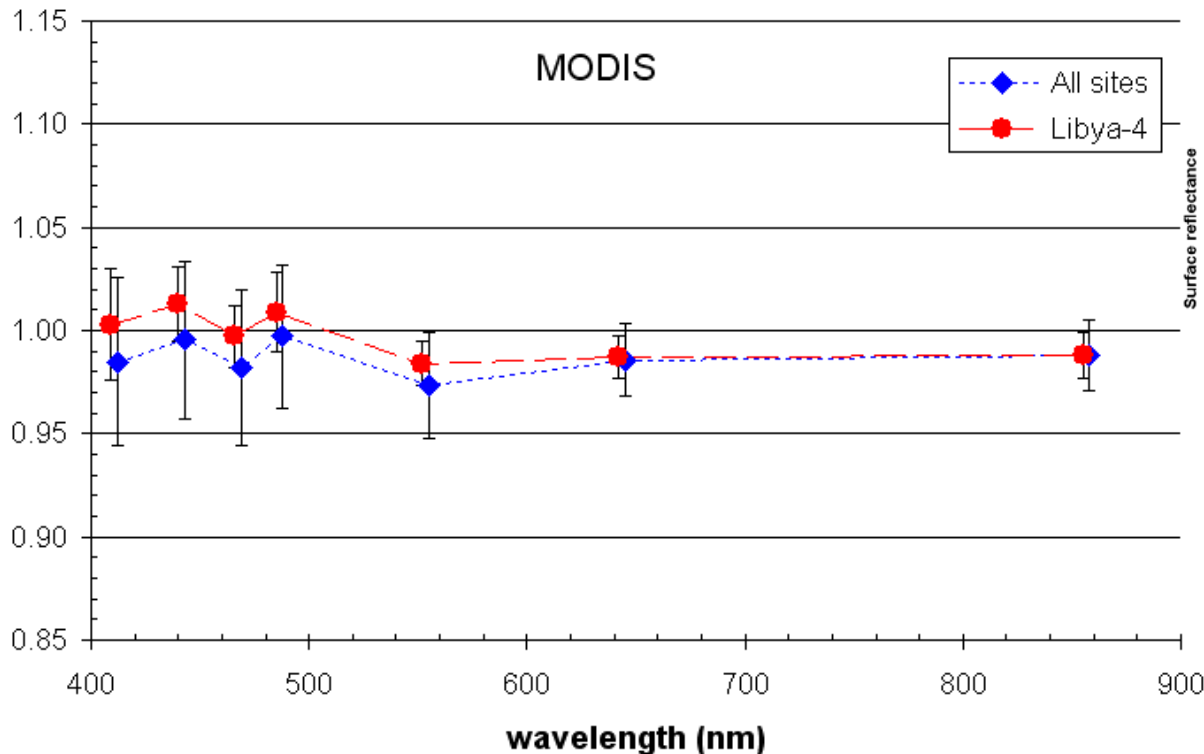
## Cross-calibration time series

## TOA time series



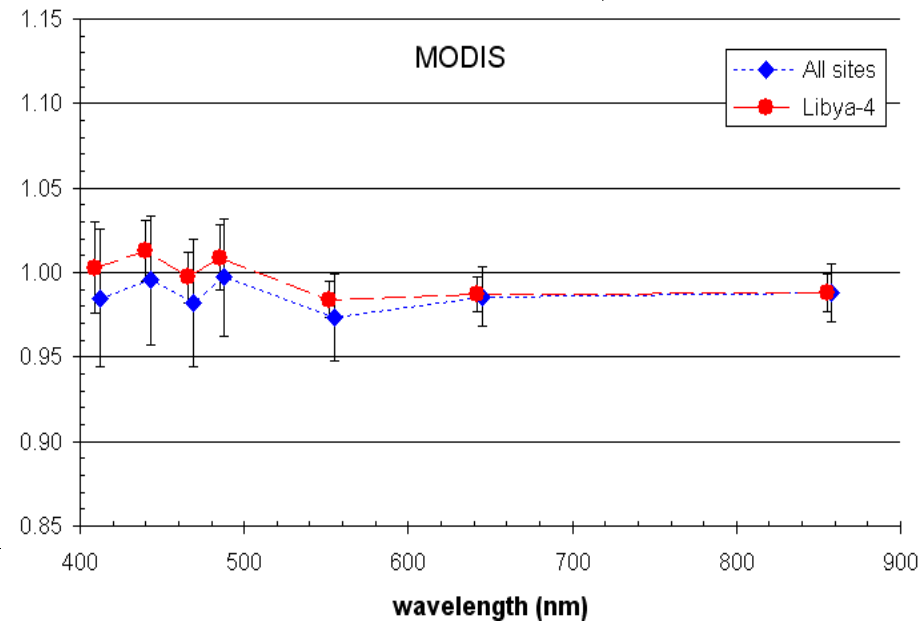
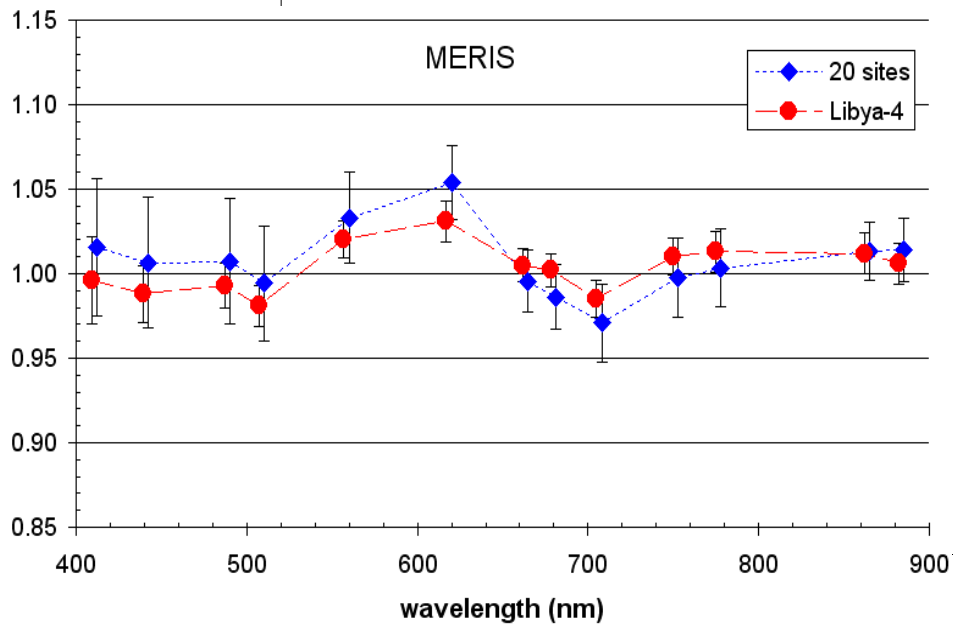
# Consistency between Libya-4 and other sites

- Comparative cross-calibration Libya-4 versus 20 desert sites
  - ◆ cross-calibration of MODIS using MERIS as reference
  - ◆ 3 591 matchups over the 20 desert sites
  - ◆ including 87 matchups over Libya-4
  - ◆ a spectral bias appears
  - ◆ ...to be considered : Libya-4 is the brighter site in the blue
  - ◆ ...to be confirmed over other cross-calibration matchups



# Consistency between Libya-4 and other sites

- Comparative cross-calibration Libya-4 versus 20 desert sites
  - ◆ cross-calibration of MERIS using MODIS as reference
  - ◆ 3 591 matchups over the 20 desert sites including 87 matchups over Libya-4
  - ◆ a spectral bias appears, opposite to MODISvsMERIS in the blue
    - + opposite between blue and red



# Consistency between Libya-4 and other sites

- Statistics – number of matchups
  - ◆ MODIS versus MERIS
    - » 3 591 matchups (mean of 180 per site) – 87 for Libya-4
  - ◆ MERIS versus MODIS
    - » 3 591 matchups (mean of 180 per site) – 87 for Libya-4
  - ◆ MODIS versus PARASOL
    - » 62 970 matchups (mean of 3 150 per site) – 3 445 for Libya-4
  - ◆ PARASOL versus MODIS
    - » 65 680 matchups (mean of 3 290 per site) – 3 484 for Libya-4
  - ◆ MERIS versus PARASOL
    - » 8 891 matchups (mean of 445 per site) – 589 for Libya-4
  - ◆ PARASOL versus MERIS
    - » 8 907 matchups (mean of 445 per site) – 589 for Libya-4
- Why so few matchups over Libya-4 for the MERIS/MODIS combination ?
  - ◆ consequence of orbital cycles ?
  
  - ◆ You want the answer ?... here it is →

# Consistency between Libya-4 and other sites

- Why so few matchups over Libya-4 for the MERIS/MODIS combination ?

- for MERIS and MODIS time series, mean geometries (VZA, SZA) are roughly the same for all sites

- the geometrical matching creates a discrimination between sites : not the same ECT, different swaths, orbit tracks respective to the site location (35/16)

- for Libya-4, only very large SZA are selected - that's not the general behavior !

- this is probably the explanation for the spectral signature on cross-calibrations between Libya-4 and other sites

- somewhere, Libya-4 is not fully appropriate in the case of MERIS/MODIS cross-calibration using our approach → necessity to mix all sites !

|                | <i>theta_v</i> | <i>theta_s</i> | <i>N</i>  |
|----------------|----------------|----------------|-----------|
| Libya-2        | 23,4           | 28,0           | 48        |
| Arabia-2       | 21,2           | 28,2           | 326       |
| Mauritania-1   | 21,1           | 29,2           | 119       |
| Mauritania-2   | 23,0           | 30,1           | 174       |
| Arabia-1       | 20,9           | 31,1           | 453       |
| Sudan-1        | 18,5           | 31,6           | 336       |
| Niger-1        | 20,0           | 31,7           | 415       |
| Mali-1         | 16,4           | 31,8           | 94        |
| Niger-2        | 25,1           | 33,6           | 257       |
| Arabia-3       | 9,6            | 34,1           | 99        |
| Niger-3        | 23,2           | 34,6           | 260       |
| Algeria-1      | 16,6           | 36,4           | 108       |
| Libya-3        | 19,7           | 37,5           | 329       |
| Libya-1        | 19,4           | 40,3           | 116       |
| Algeria-2      | 20,2           | 44,1           | 57        |
| Egypt-1        | 17,8           | 46,7           | 46        |
| Algeria-3      | 20,1           | 49,4           | 126       |
| <b>Libya-4</b> | <b>25,7</b>    | <b>50,4</b>    | <b>87</b> |
| Algeria-4      | 20,0           | 52,3           | 75        |
| Algeria-5      | 20,9           | 53,8           | 66        |



# Cross-calibration results

## Comparative cross-calibrations over the 20 desert sites

### ◆ MERIS = rich spectral information

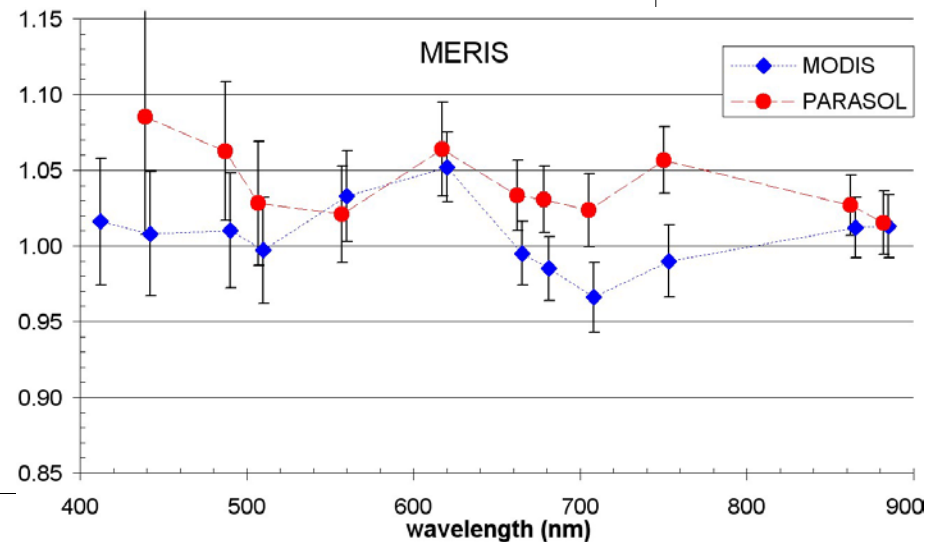
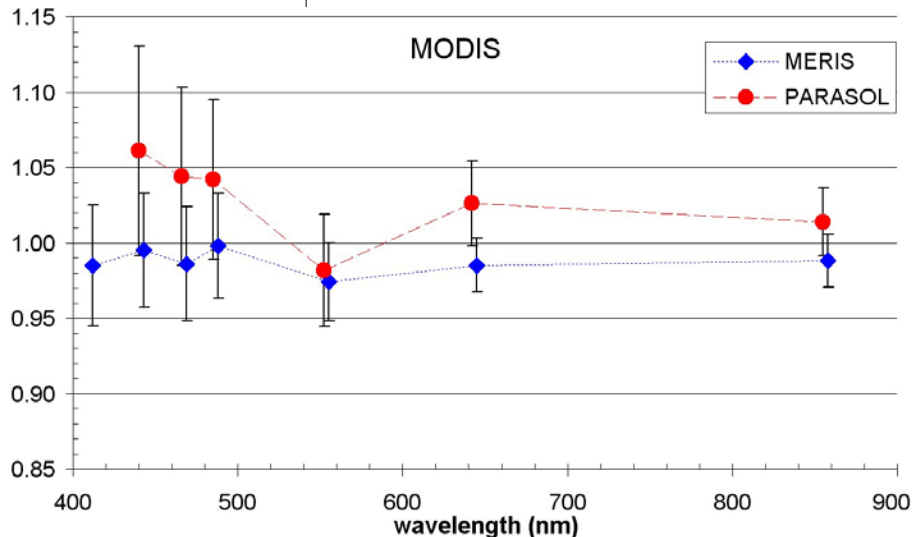
» accurate cross-calibration of MODIS using MERIS as reference : accordance 1-2%

### ◆ MODIS = saturation over bright targets

» bands OC (412/443/488) + Land bands

» spectral inaccuracy of the method when cross-calibrating MERIS around 620 and 700

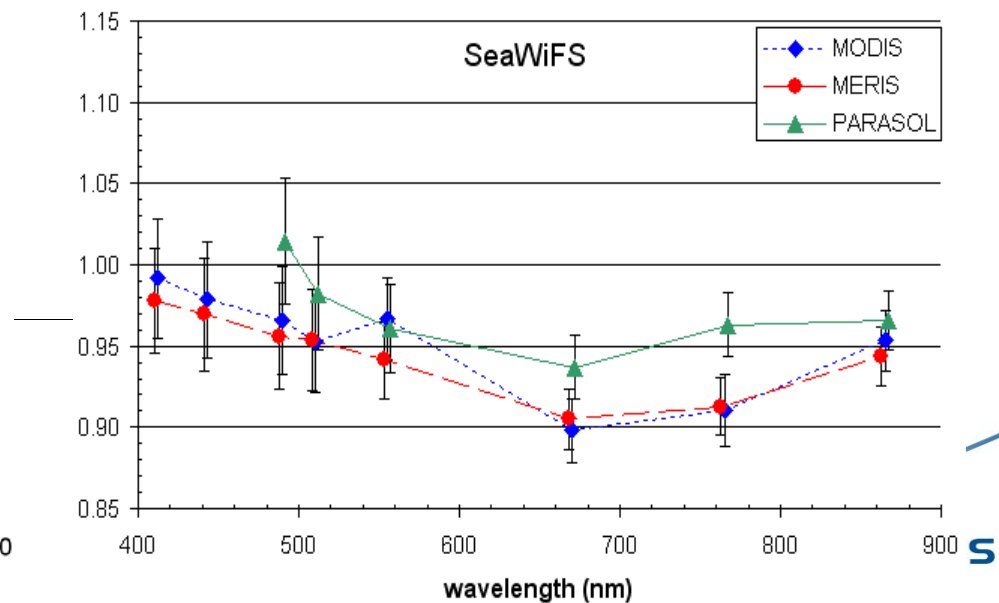
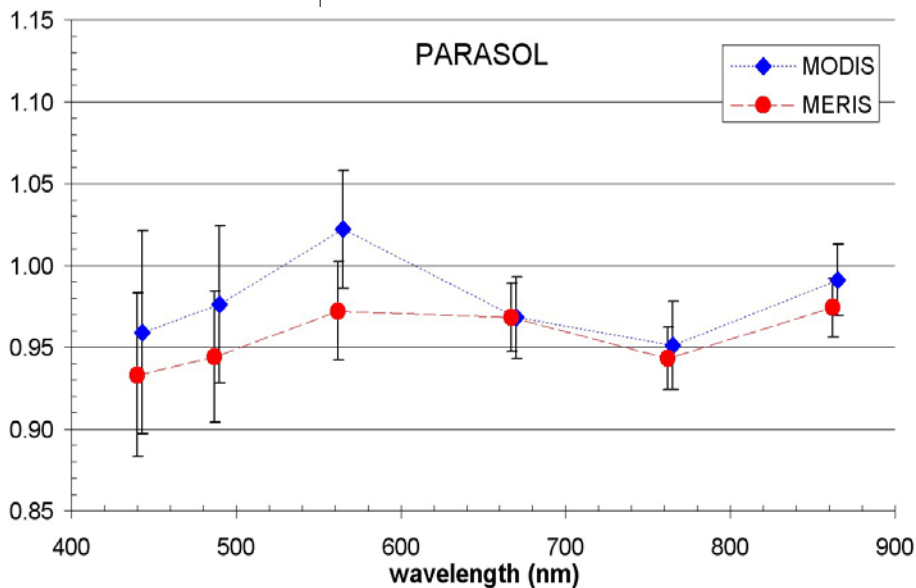
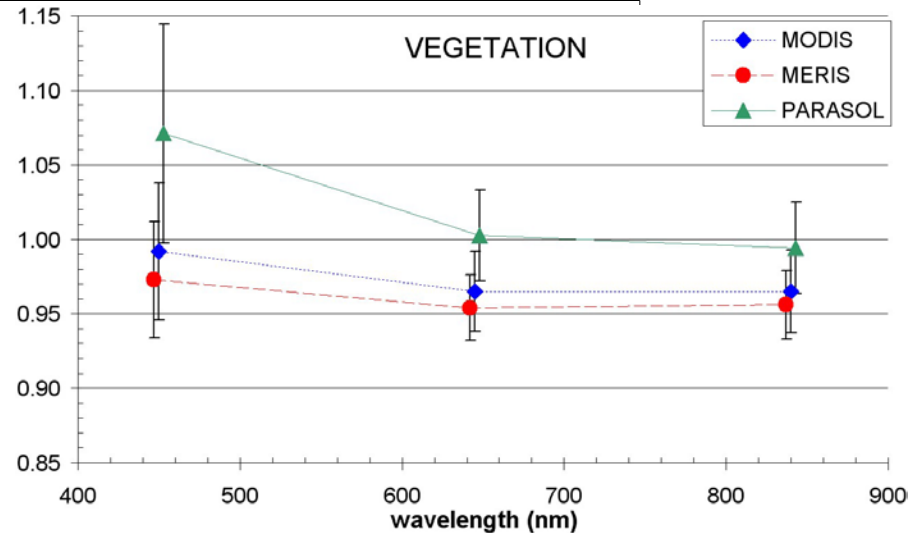
» consistency for other bands



# Cross-calibration results

- Comparative cross-calibrations over the 20 desert sites

- ♦ VGT = broadbands
- ♦ SeaWiFS = mostly “above the knee”
- ♦ PARASOL = bidirectional



# Impact of reciprocity on matchups

- Cross-calibration PARASOL versus MERIS – with/without reciprocity

- ◆ very small impact on mean & stdev but large increase of matchups (x10 in this case)

