A large, detailed image of the full moon is centered on the slide, showing its characteristic craters and maria.

POLO
Pleiades Orbital Lunar Observations
-
**Intensive Study of the Moon
and Comparison to ROLO Model**

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*22nd CALCON Technical Conference
August 2013, Logan, UT*

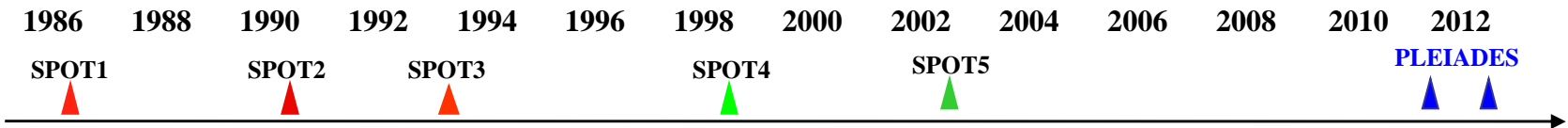
from SPOT to PLEIADES



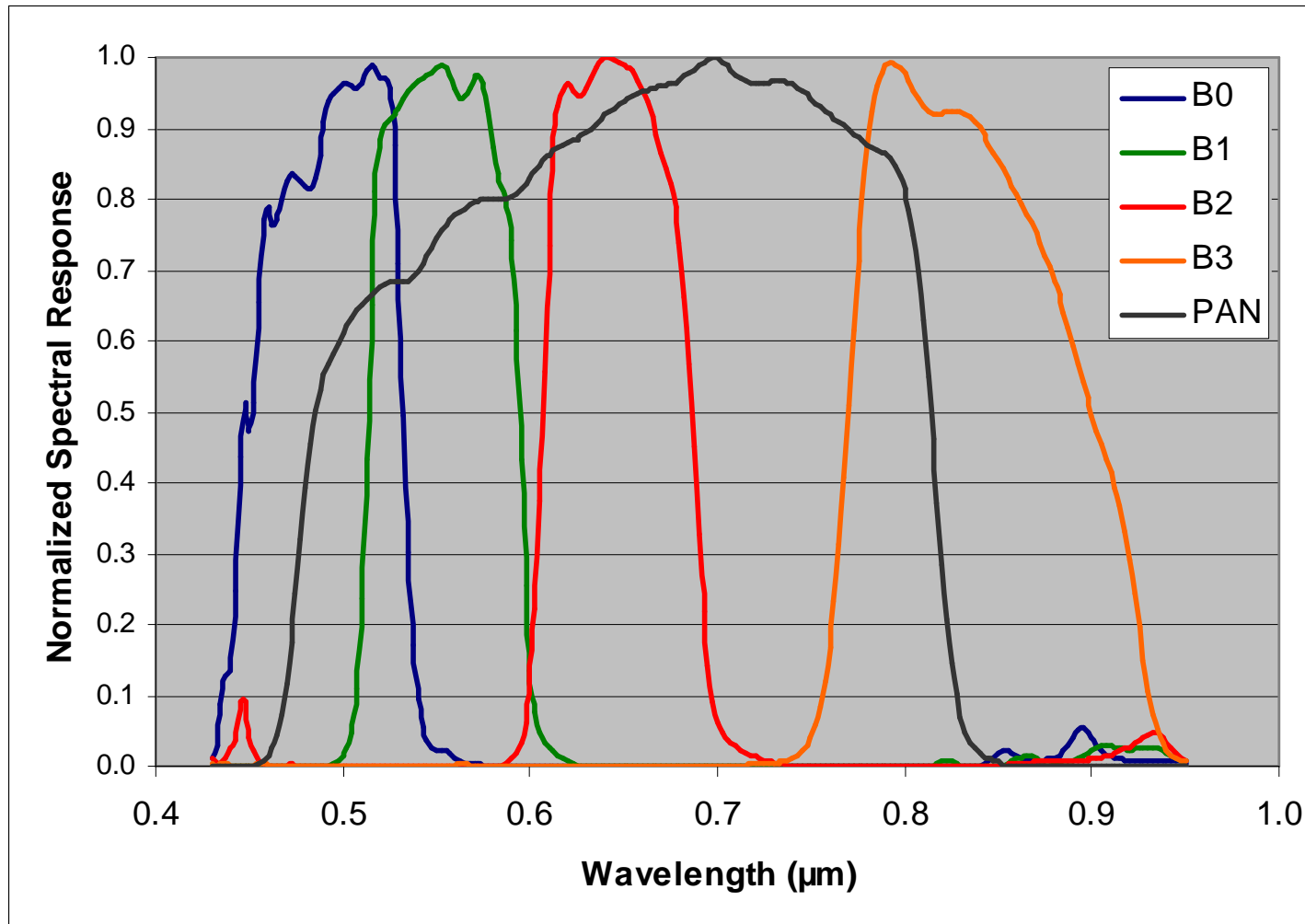
swath 60 km , 2 instruments
East/West tilt $\pm 27^\circ$
SPOT 1- 4 : 10m PA, 20m XS
SPOT 5 : 2.5m PA, 10m XS



swath 20 km, 1 instrument
agile Satellite
70 cm PA, 2.80 XS



The PLEIADES system (spectral bands)





Moon (spatial resolution: 380m)





Moon (extract)





Moon (extract)





The Moon seen by PLEIADES



What does the Moon seen by PLEIADES look like ?

Before ground processing



The Moon: more than 4 Million of pixels !

Equalization →



After ground processing



The PLEIADES lunar calibration



Lunar calibration is a multi-temporal calibration method

→ Based on ROLO *

→ Considering than the radio

$$I_{obs} = \frac{\sum_{i=1}^{N_p} L_i \cdot \Omega_i}{A_l(\alpha_l)} \cdot \left(\frac{D_{l-obs}}{384400} \right)^2 \left(\frac{D_{l-s}}{1AU} \right)^2 \text{ is constant}$$

Radiance of the instrument

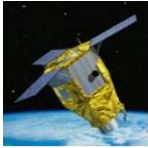
ROLO Albedo integrated in the PHR spectral bands

Normalization of the distances

→ Regular acquisition of the moon – fixed phase of $\pm 40^\circ$ every month

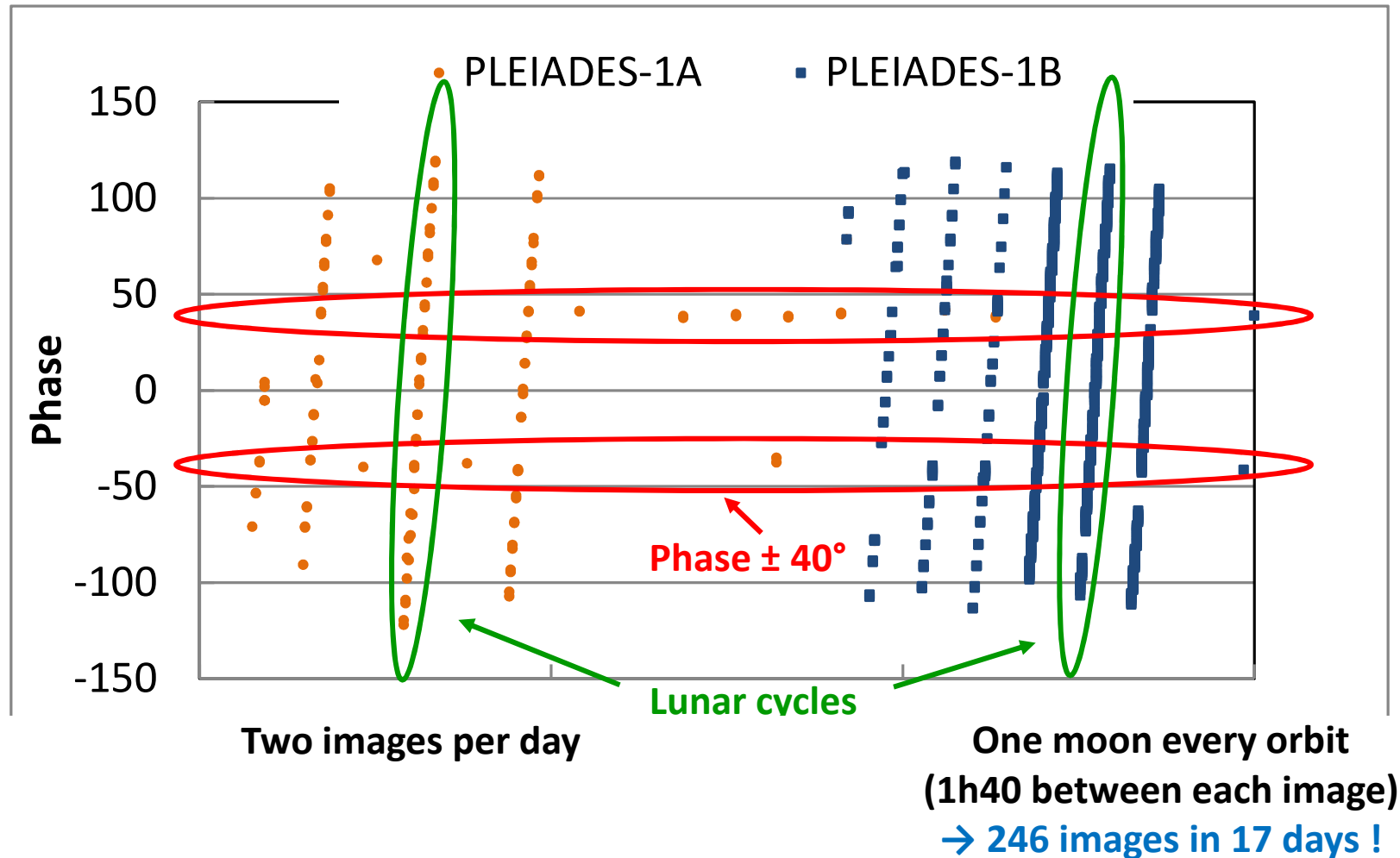
() ———

* H.H. Kieffer, T.C. Stone, R.A. Barnes, S. Bender, R.E. Eplee, J. Mendenhall, L. Ong
On-orbit radiometric calibration over time and between spacecraft using the moon
SPIE 4881, pp. 287-298, 2003.



The Moon seen by PLEIADES

- **153 images** acquired by PLEIADES1A since its launch (12/2011)
- **832 images** acquired by PLEIADES1B since its launch (12/2012)





The Moon seen by PLEIADES



Overview of the images:

(the yaw angle is not constraint during lunar acquisitions)



LUNE_PLEIADES2_PH...



LUNE_PLEIADES2_PH...



LUNE_PLEIADES2_PH...



LUNE_PLEIADES2_PH...



LUNE_PLEIADES2_PH...



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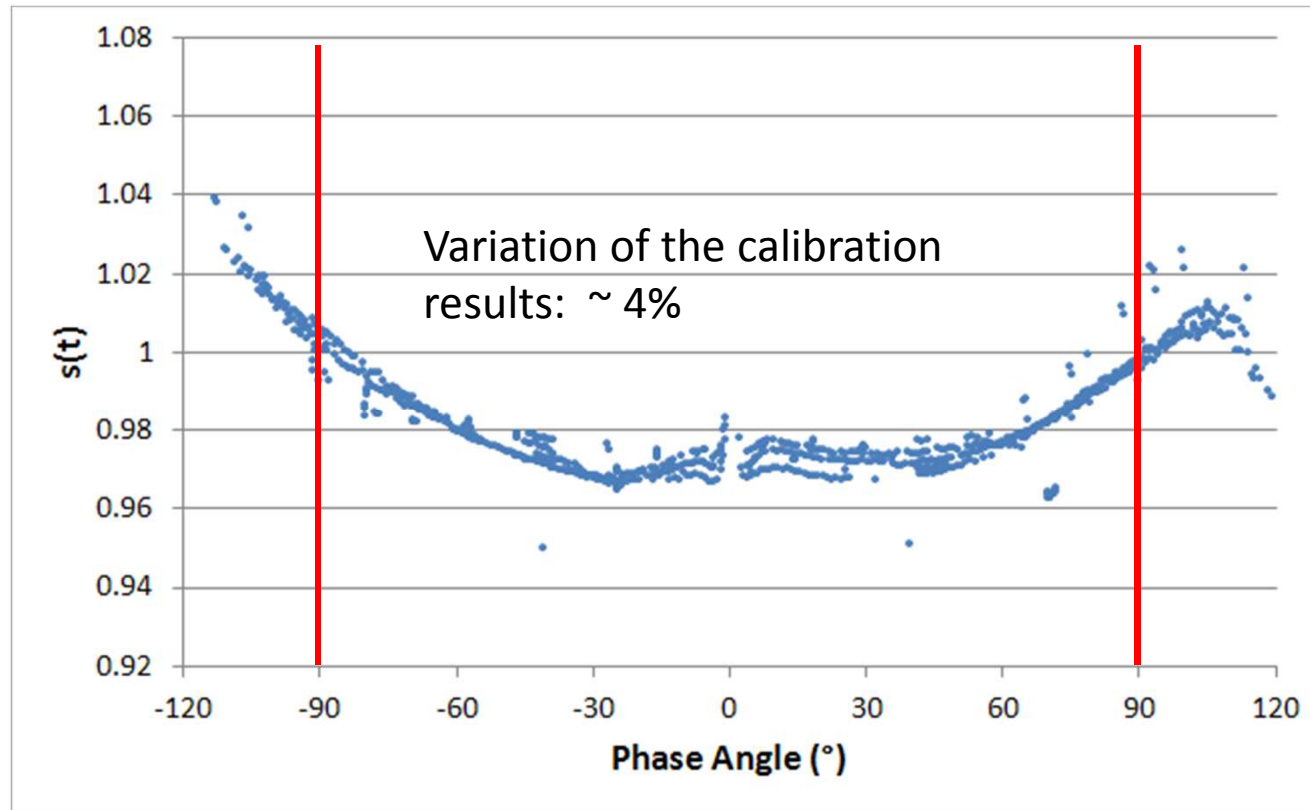
LUNE_PLEIADES2_PH...



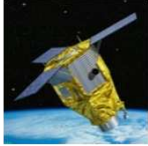
The Moon seen by PLEIADES: results



Dense lunar cycles acquired with PLEIADES 1B (one image every 1h40)
→ more than 700 images in 3 months !



Calibration results obtained for the red band :
Very few dispersion of the measurements but
→ important dependency of results to the lunar phase !



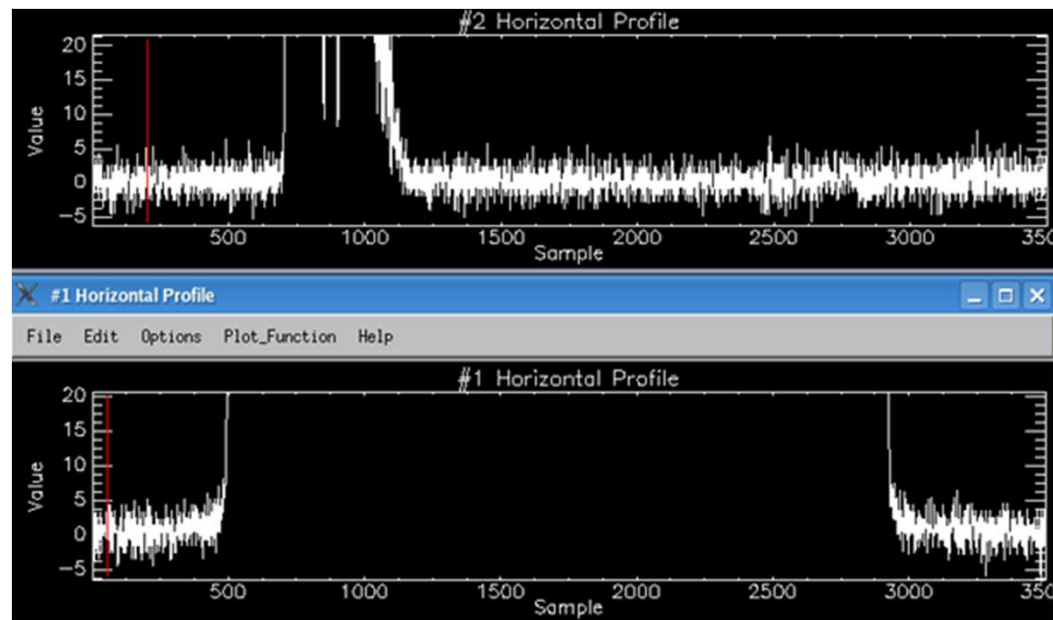
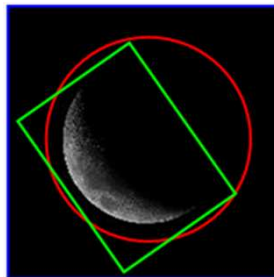
The PLEIADES lunar calibration

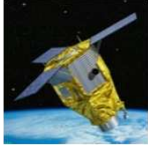


The Moon : a powerful calibration site
BUT are we very confident in the results ?

Is the implemented method the best one ? In term of:

< 0.05% - computation of the integrated Moon signal
(u/o sampling) – consideration of the background signal





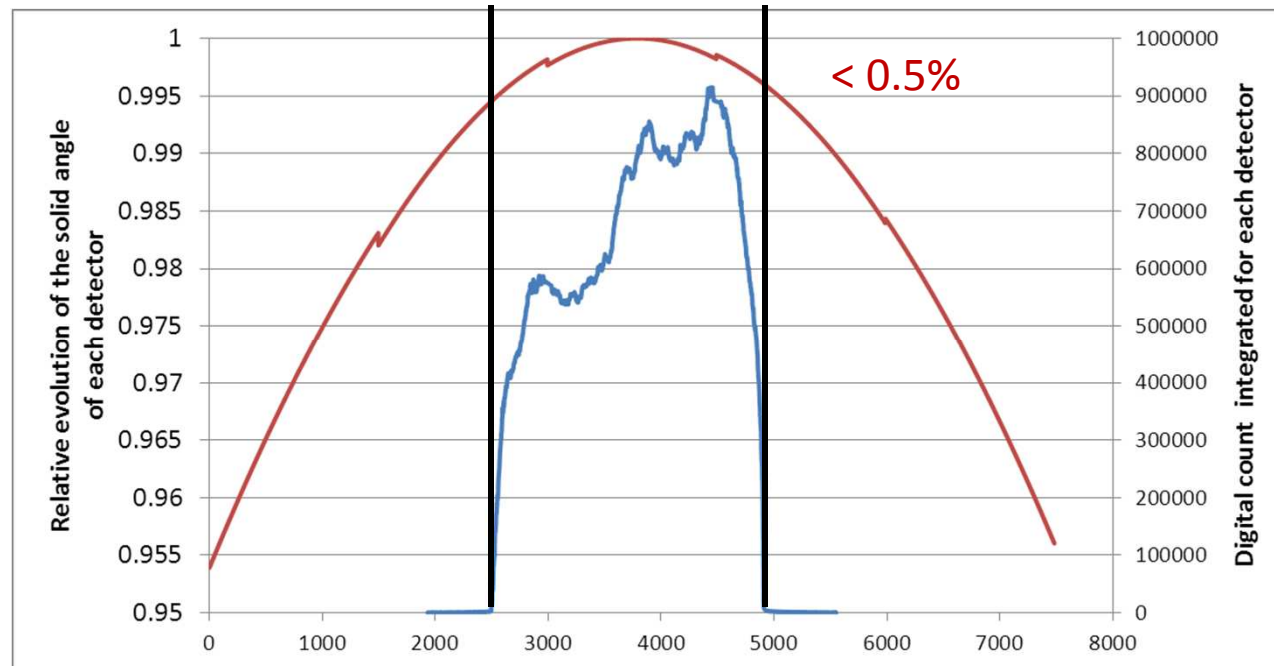
The PLEIADES lunar calibration

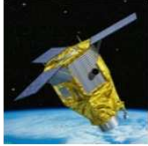


The Moon : a powerful calibration site
BUT are we very confident in the results ?

Is the implemented method the best one ? In term of:

< 0.15% - consideration of the solid angle variation within the field of view of the instrument ?





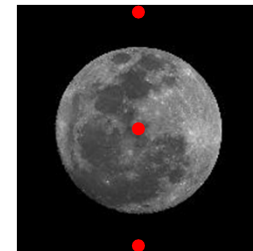
The PLEIADES lunar calibration



**The Moon : a powerful calibration site
BUT are we very confident in the results ?**

Is the implemented method the best one ? In term of:

- < 0.05%** - computation of the integrated Moon signal (u/o sampling) – consideration of the background signal
- < 0.15%** - consideration of the solid angle variation within the field of view of the instrument ?
 - are the observed effects due to ancillary variables (body-fixed coordinates)?
- < 0.07%**
 - ?** - due to ROLO ?

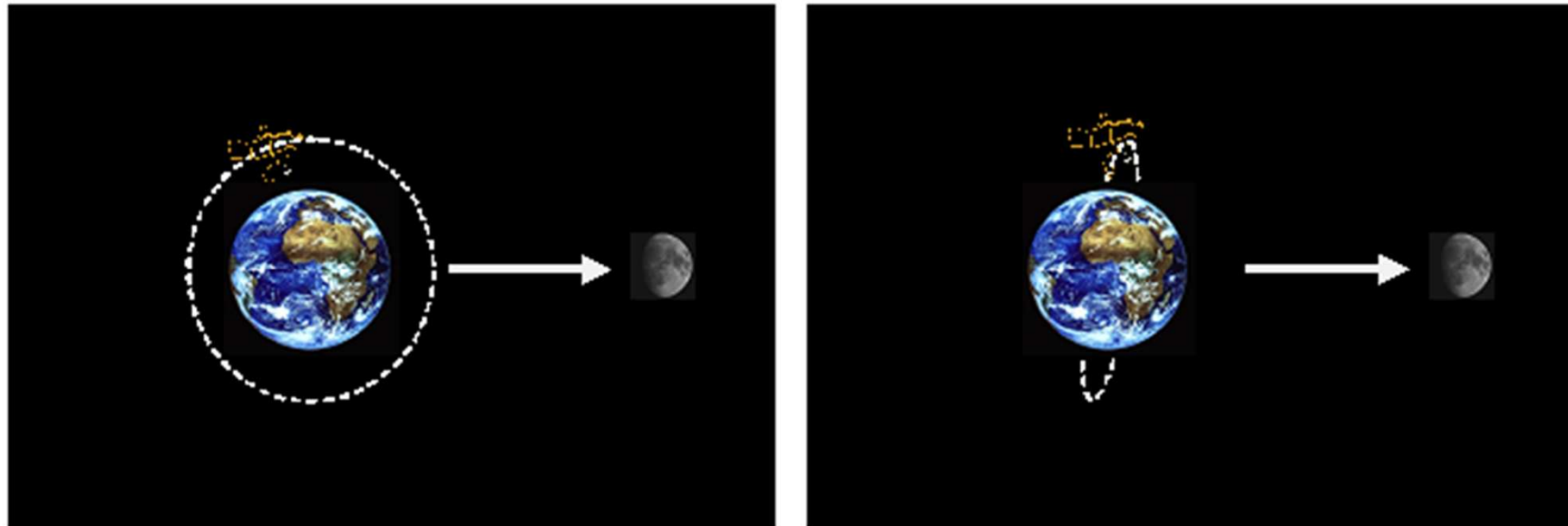




Lunar calibration – New experiments



Check if the calibration results are sensitive to the position of the sensor on its orbit



Acquisition of 1 « Moon » every 2.5s in two different configurations

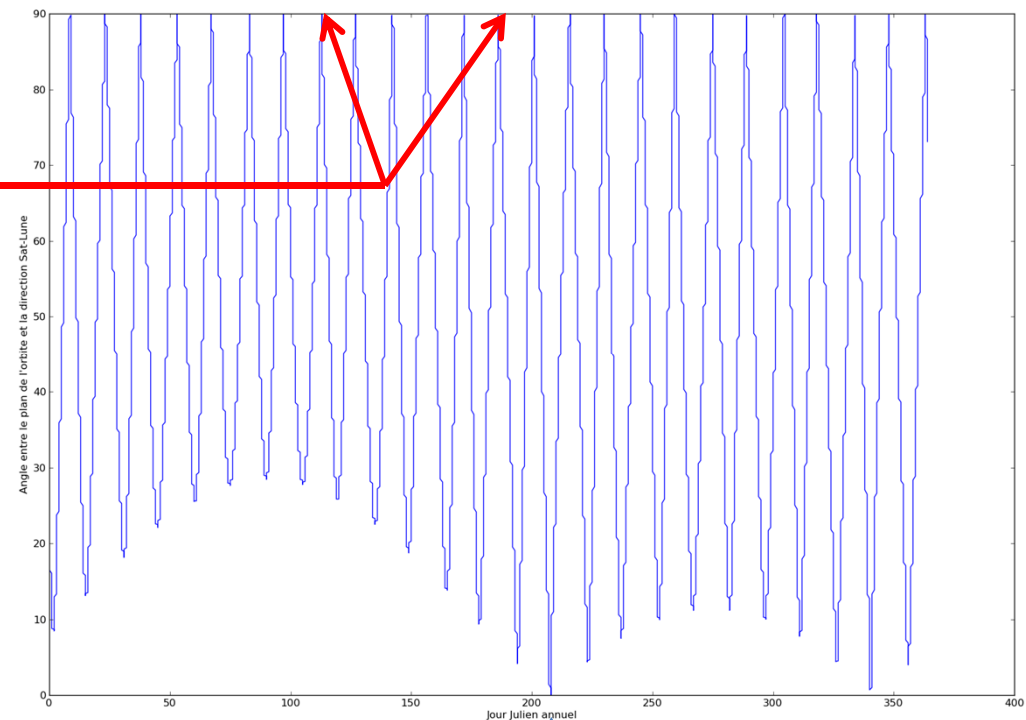
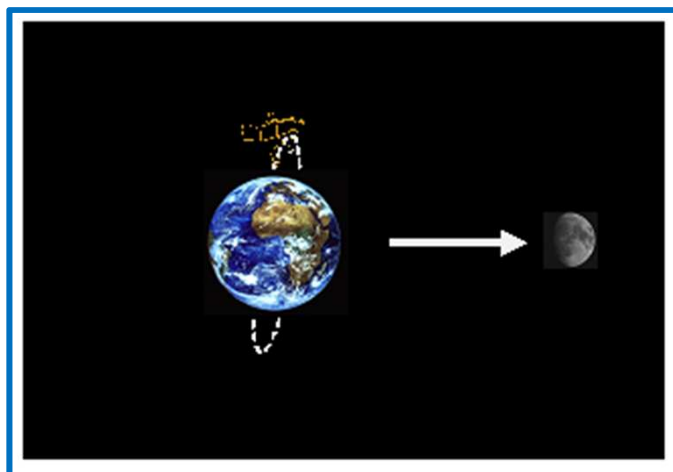
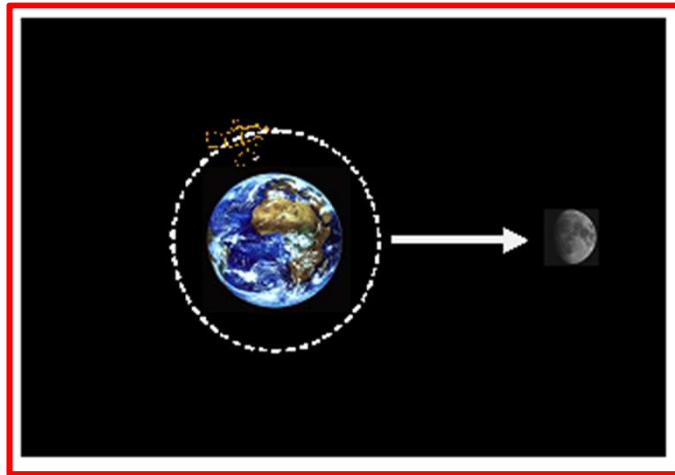
- > orbit parallel to the direction Earth-Moon
- > orbit perpendicular to the direction Earth-Moon



Lunar calibration

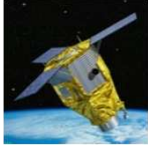


- > orbit parallel to the direction Earth-Moon: every 14 days
- > orbit perpendicular to the direction Earth-Moon: only once a year



Opportunity on July 2013

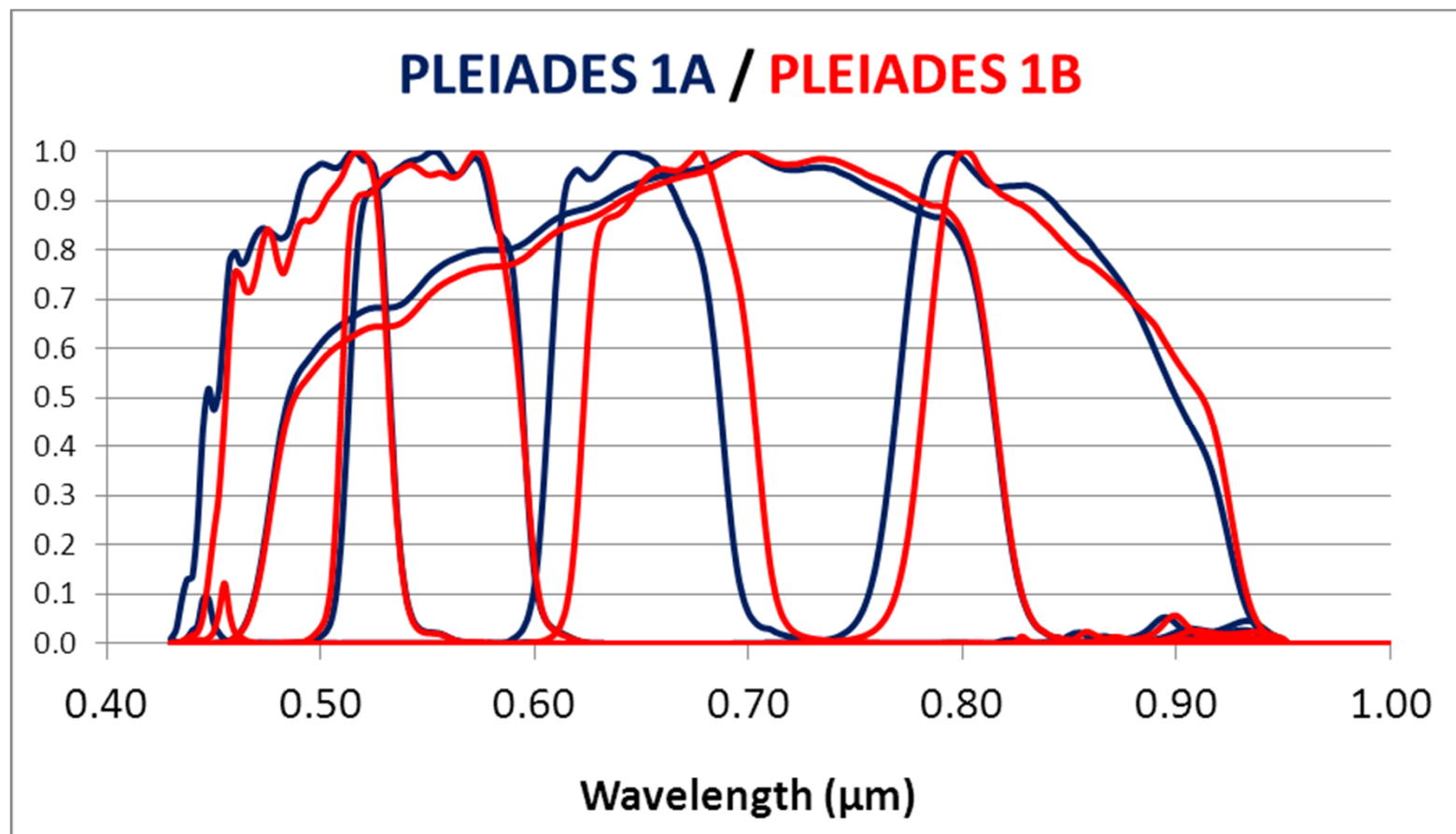
Processings in progress !



Cross-calibration on the Moon

Two important elements involved in the cross-calibration:

- difference of the spectral responses to be cross-calibrated
- spectral knowledge of the Moon response (given by ROLO)

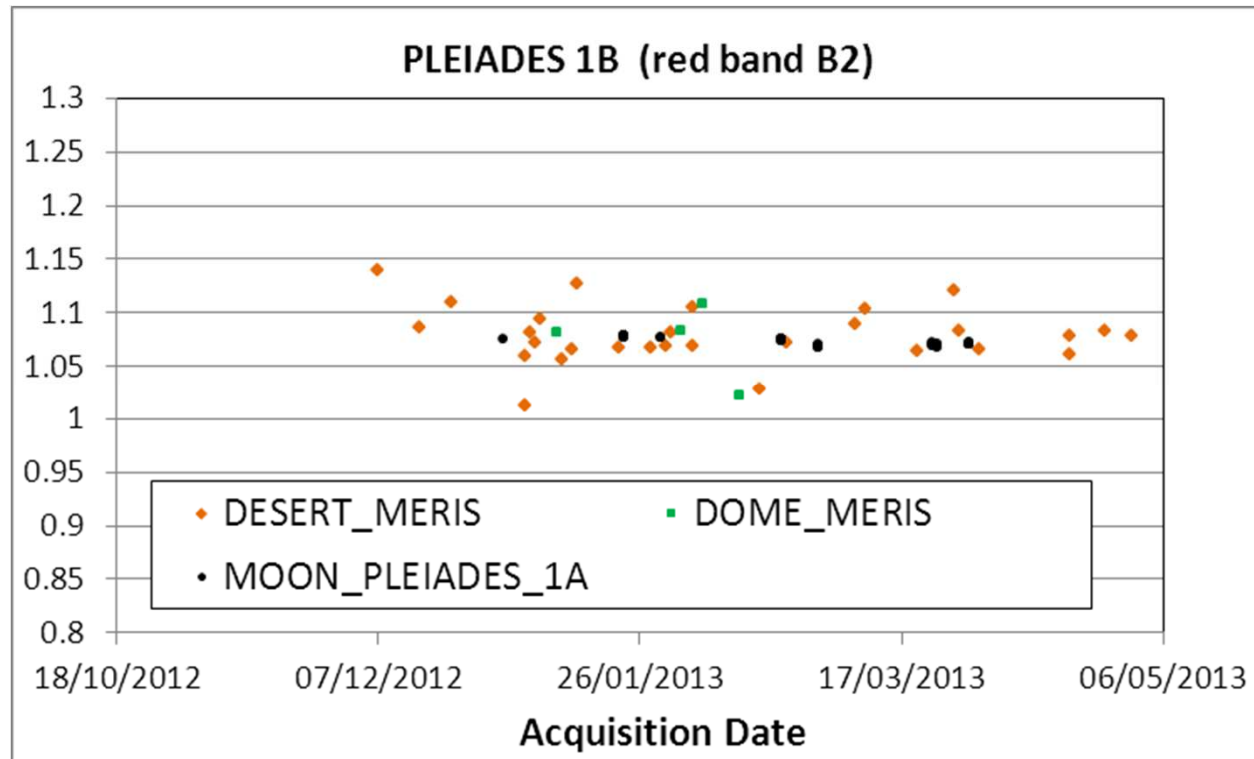




Cross-calibration on the Moon



First results for the cross calibration between PLEIADES 1A and PLEIADES 1B (limitation to phase 40):



Reference: PLEIADES 1A images acquired in december 2012 (phase 40)

→ **Very good agreement with the other calibration methods**

This method seems to be very efficient with very few dispersion !



POLO: Pleiades Orbital Lunar Observations

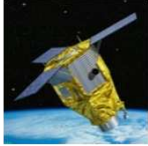


CONCLUSIONS:

The commissioning phase of PLEIADES-1A and PLEIADES-1B

- opportunity to acquire a unique dataset of Moon images with a very high spatial resolution (~300m)
- more than **800 images** of the Moon in only 6 months (guaranty of the stability of the instrument over this time slot).
- lot of analysis performed to determine the sensitivity of the method to the different parameters: **precision better than 0.5%**


Next step: **The use of this POLO dataset to improve the ROLO model ?**



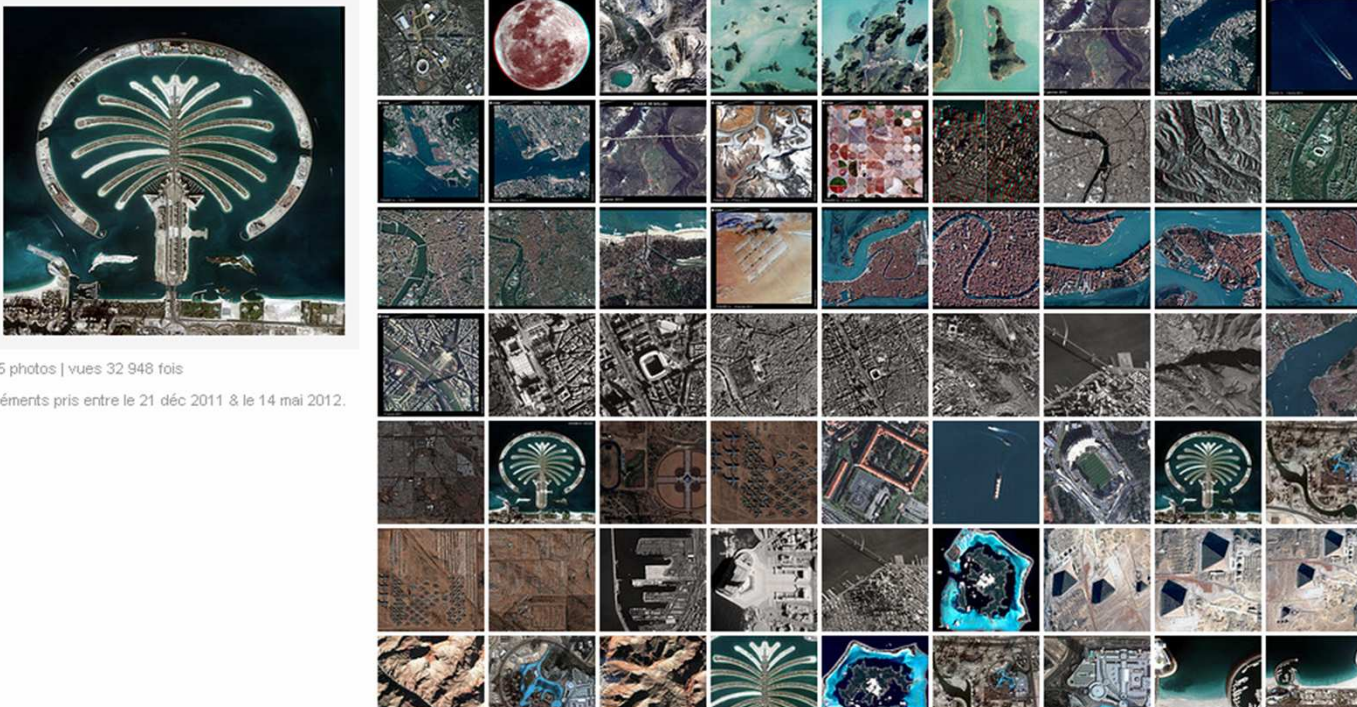
Where to get some PLEIADES images ?



- http://smc.cnes.fr/PLEIADES/premieres_images.htm
- <http://image-cnes.fr/tag/pleiades/>
- <http://www.flickr.com/photos/pkpro/sets/72157628743311535/>
- <http://www.astrium-geo.com/en/19-gallery?search=gallery&type=&sensor=1371>

 **Images Pléiades** Diaporama Partager

Miniatures | Détail | 1 commentaire



65 photos | vues 32 948 fois
éléments pris entre le 21 déc 2011 & le 14 mai 2012.

