

Quality assessment of data from CHRIS/PROBA

CHRIS (Compact High Resolution Imaging Spectrometer) - new imaging spectrometer carried on board a space platform **PROBA (Project for On Board Autonomy)**
 The satellite was successfully launched in late **October 2001, Sriharikota (India)**

Region of interest – Thorney Island (UK), Chichester harbour
 Chichester harbour has **unique wetland environment** : place for rare bird colonies.
 Monitoring this place - important ecological task for environmental managers

CHRIS/PROBA images characteristics:

- 18 bands
- 7th Oct 2004
- 17m ground resolution
- region: Thorney Island

Quality of CHRIS images is affected by two types of noises (J.C.Garcia, J. Moreno):

- **vertical noise** (vertical stripes; can be corrected by comparing values of neighbouring pixels)
- **horizontal noise** (easy to detect and correct using the horizontal profile of each file)

Correction of noises can be made through **DiELMO 3D Methodology** (J.C.Garcia, J. Moreno)

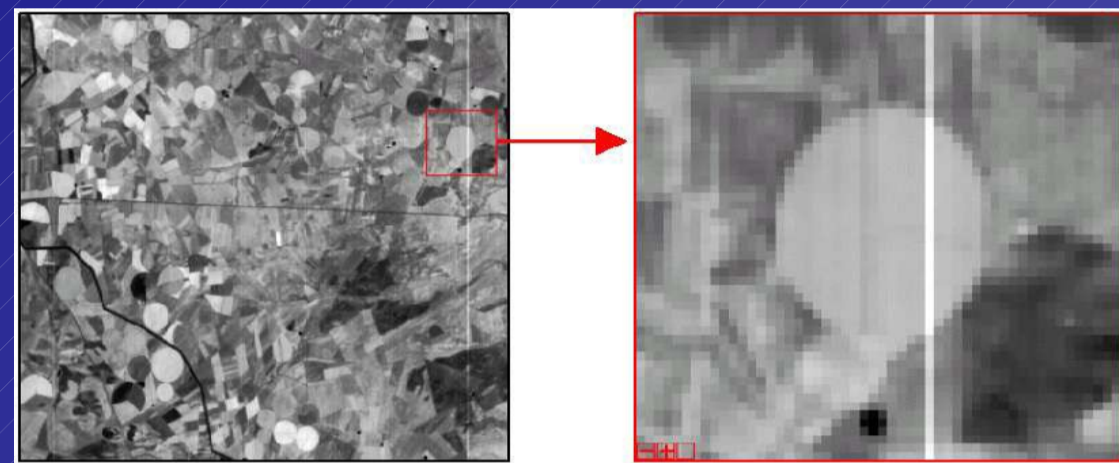


Fig4. Example of vertical noises in CHRIS image
 Photo taken from *Removal of noises* (J.C.Garcia, p.3)

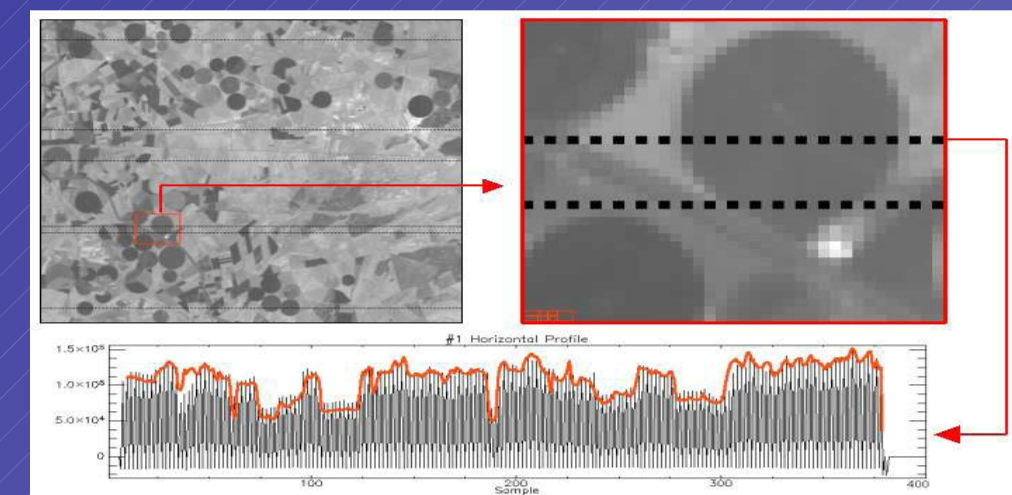
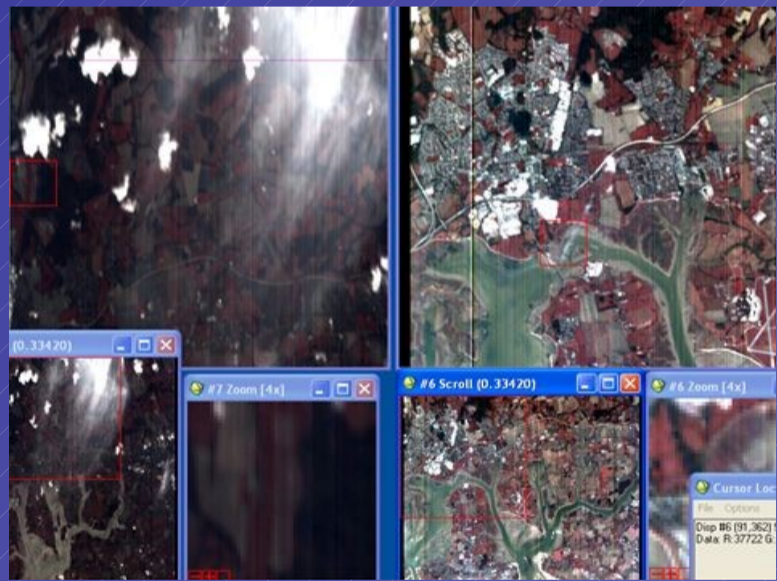


Fig.5. Example of horizontal noises in CHRIS image
 Photo taken from *Removal of noises* (J.C.Garcia, p.1)

For the quality of CHRIS images .hdr files were examined:

- 1) CHRIS...47AO_41.hdr (taken at +36°)
- 2) CHRIS...47A1_41.hdr (taken at -36°)
- 3) CHRIS...47A2_41.hdr (taken at +55°)
- 4) CHRIS...47A3_41.hdr (taken at -55°)
- 5) CHRIS...479F_41.hdr (taken at nadir)

Images taken at the nadir are of good quality, while those at different angles have defects:



Comparing images taken at +55° dgr (47A2_41) and nadir images (479F_41) right



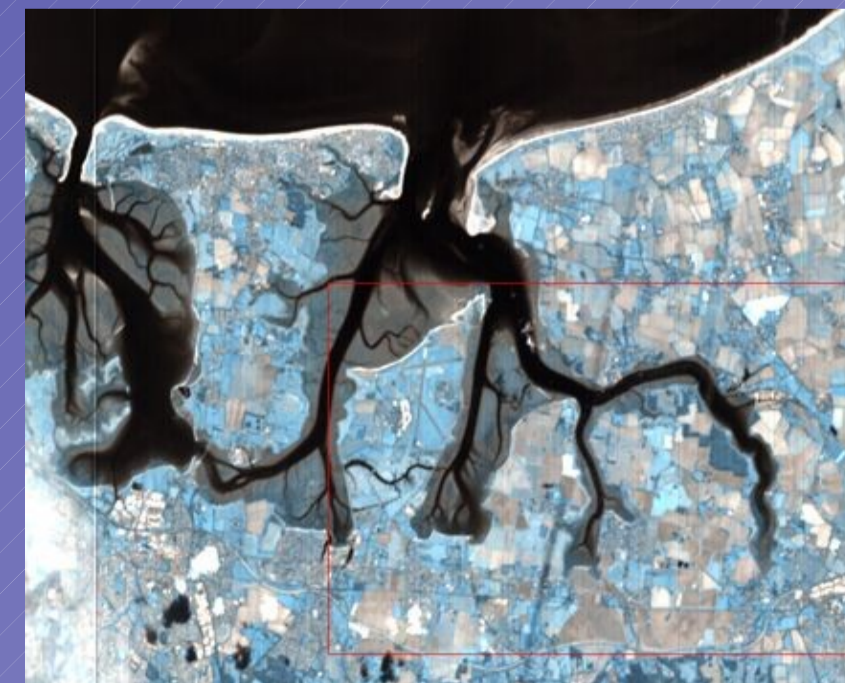
Images taken at +36° dgr (47A0_41), left and nadir images (479F_41) right.



Images taken at +36° and -36°dgr (CHRIS 47A0_41 and CHRIS 47A1_41) both have inverted direction.



Inverted Image received from bands Combination 13-12-11, Envi



Inverted Image received from bands Combination 9(red)-10(green)-11(blue).



Image received from bands Combination 11(R)-4(G)-2(B)



Image received from bands Combination 6(R)-5(G)-2(B)



Image received from bands Combination 15(R)-4(G)-1(B)

To obtain a good-quality natural-coloured image of wetlands we need:
nadir-taken colour CHRIS image with bands combination of corresponding spectral channels:

Number of spectral channel	Corresponding colour
1	Indigo blue (cyan)
2	blue
3	green
4	green
5	green
6	red
7	red
8	red
9	red
10	red
11	red
12	red
13	NIR
14	NIR
15	NIR
16	NIR
17	NIR
18	NIR



Inverted Image received from bands Combination 4(R)-2(G)-1(B)

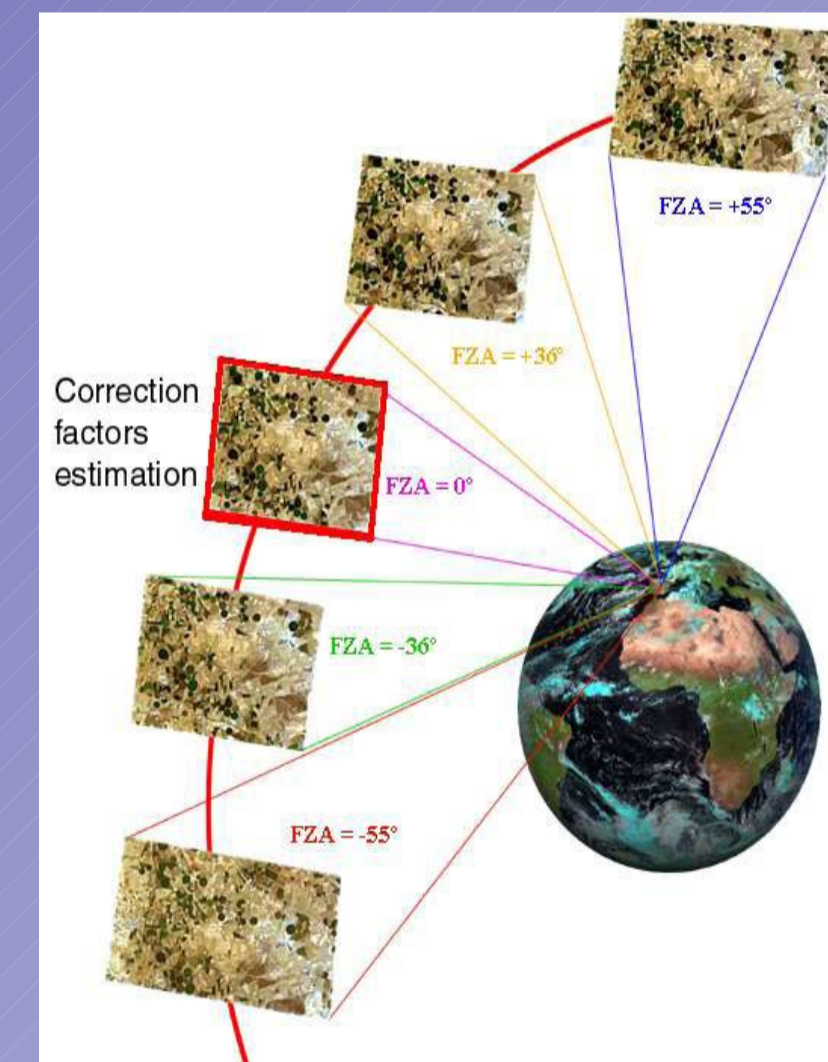
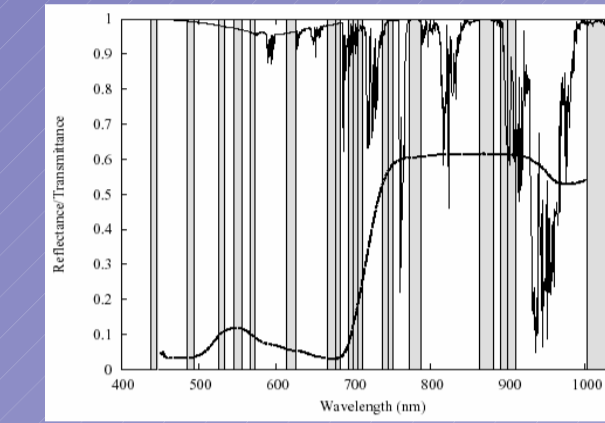
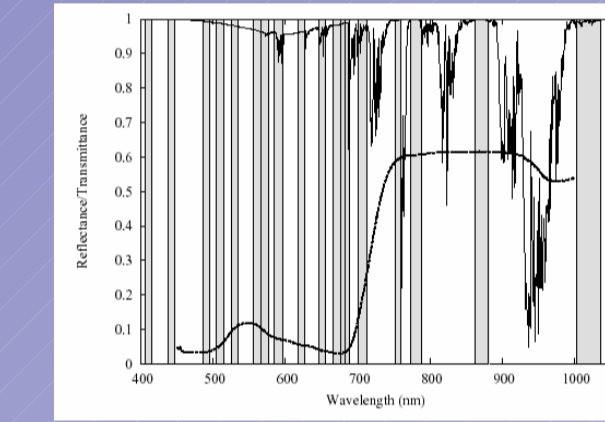


Fig. 3. Viewing angles in a CHRIS / PROBA acquisition (J.C.Garcia, p.3)



CHRIS Superspectral Land: Many narrow bands around the red-edge (Barnsley M.J. p.5)



CHRIS Superspectral Water: many narrow bands in the visible wavelengths (Barnsley M.J., p.5)



Fig. 1. Vertical air photo of Thorney Island



Fig.2. Oblique air photo Thorney island



CHRIS_CH_041007_479F_41 Bands_12-8-1



CHRIS_CH_041007_479F_41_Bands_7-4-1, best natural-colours band combination for Thorney Island wetlands monitoring

References:

- Barnsley M.J. et al. *The PROBA/CHRIS Mission: A Low-Cost Smallsat for Hyperspectral, Multi-Angle, Observations of the Earth Surface and Atmosphere.*
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- Cutter M.A., Lobb D.R. Cockshott R. (2000) *Compact High Resolution Imaging Spectrometer.* Elsevier Science Ltd, Kent, UK
- Garcia J.G., Moreno J. *Removal of noises in CHRIS/PROBA images: Application to the Sparc Campaign Data*
- <http://www.chris-proba.org.uk/>
- <http://earth.esa.int/missions/thirdpartymission/proba.html>
- Kuusk A., Kuusk J., Lang M.. *A dataset for the validation of reflectance models.* Remote Sensing of Environment 113 (2009) 889–892