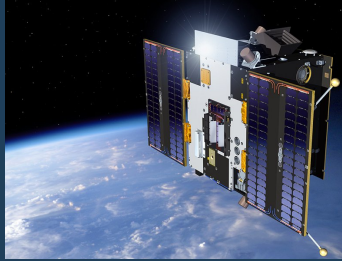


LYRA on-board PROBA2

Instrument overview

M. Dominique, J.-F. Hochedez, I. Dammasch et al.
CESRA/SWT Meeting
La Roche en Ardennes, 2010

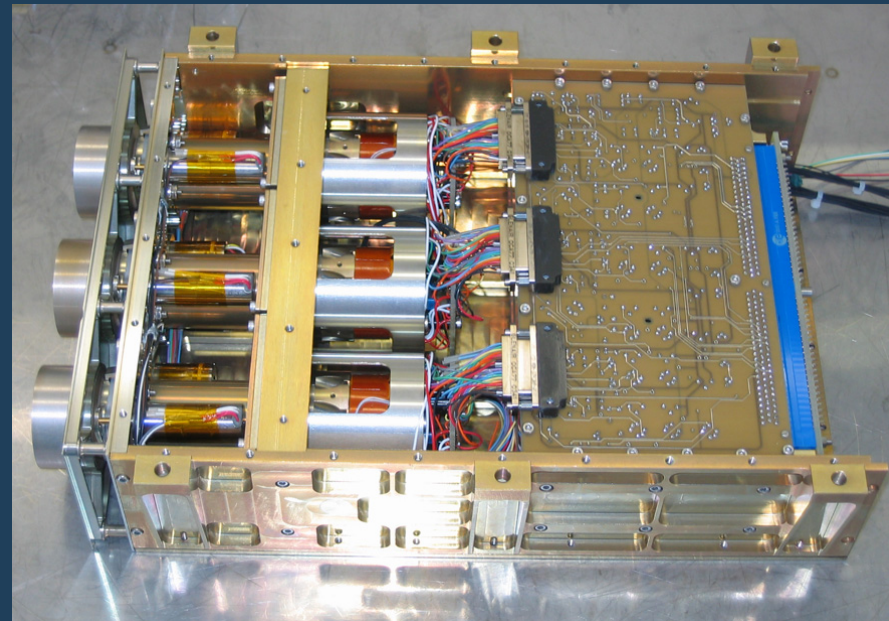
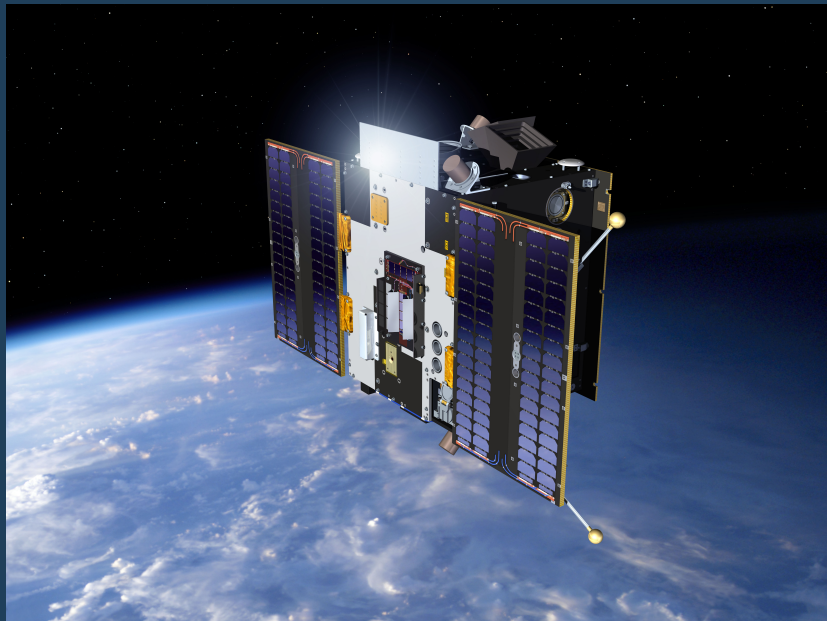
Mission overview



LYRA: a large yield radiometer on-board PROBA2

PROBA2 :

- ❑ an ESA micro-satellite
- ❑ hosting 17 technological demonstrators + 4 scientific instruments
- ❑ launched on November 2, 2009





LYRA highlights

- ❑ 4 spectral channels covering a wide emission temperature range
 - ❑ 200-220 nm Herzberg continuum range (interference filter)
 - ❑ Lyman-alpha (120-123 nm, interference filter)
 - ❑ Aluminium filter channel (17-80 nm) incl. He II at 30.4 nm
 - ❑ Zirconium filter XUV channel (1-20 nm)

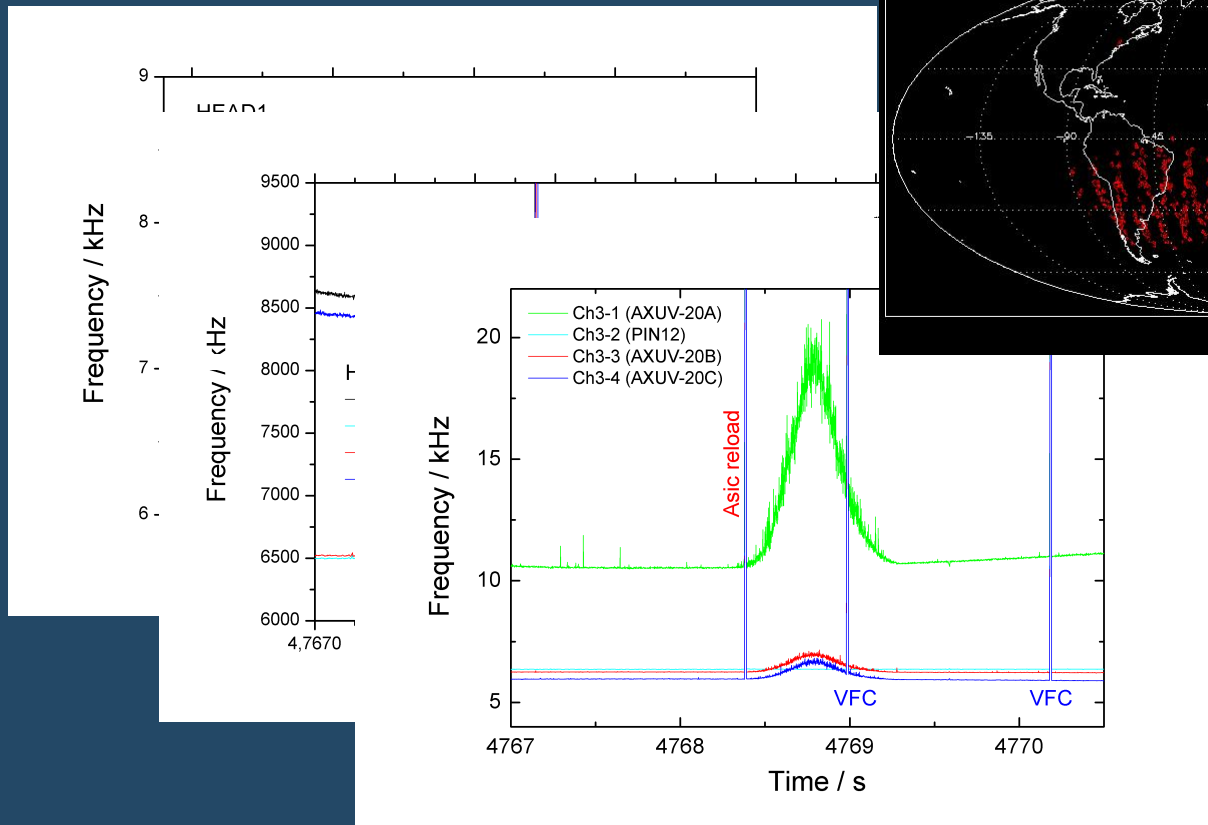
- ❑ Redundancy (3 units) gathering three types of detectors
 - ❑ Rad-hard, solar-blind diamond UV sensors (PIN and MSM)
 - ❑ AXUV Si photodiodes

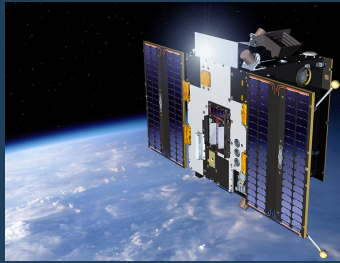
	Ly	Hz	Al	Zr
Unit1	MSM	PIN	MSM	Si
Unit2	MSM	PIN	MSM	MSM
Unit3	Si	PIN	Si	Si

- ❑ 2 calibration LEDs per detector ($\lambda = 465$ nm and 390 nm)
- ❑ High cadence (up to 100Hz)
- ❑ Quasi-continuous acquisition during mission lifetime

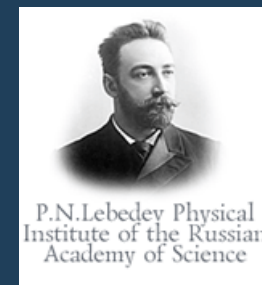


South Atlantic Anomaly



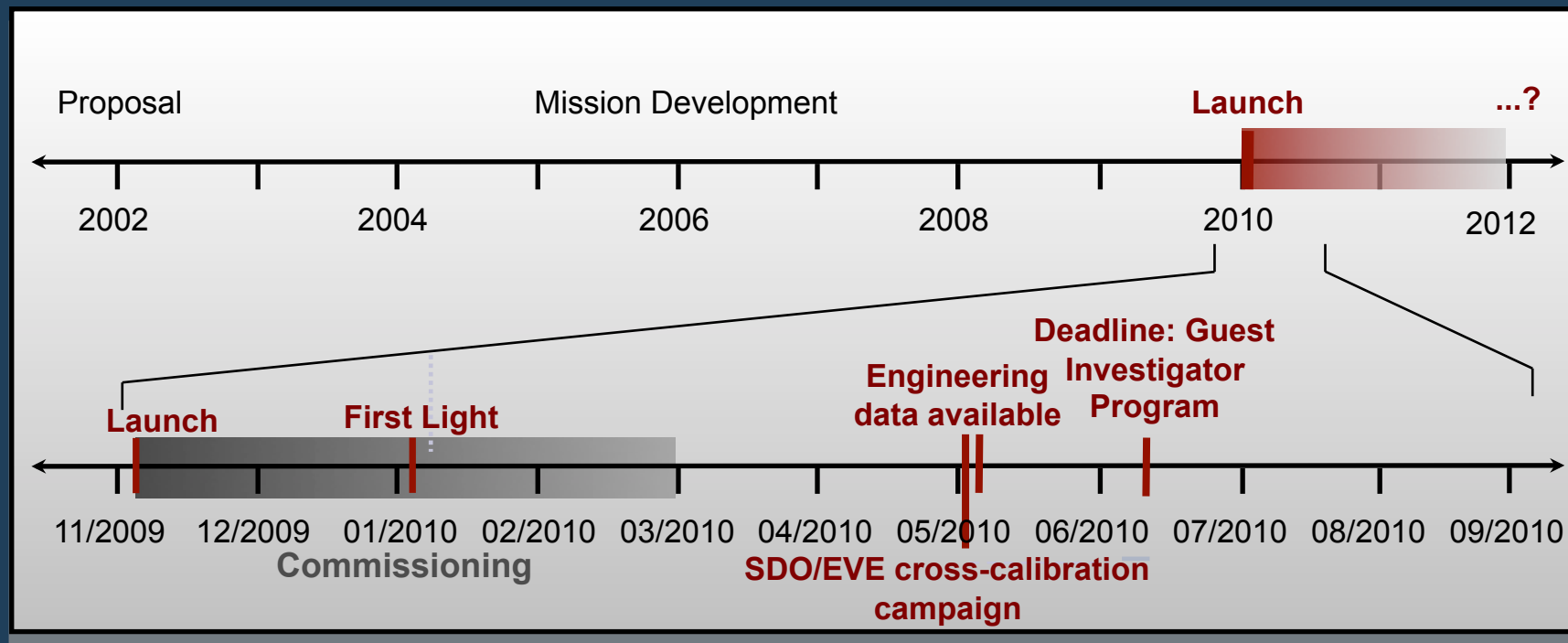


Collaborations





Timeline



State of the data processing pipeline

Telemetry packets

LY-TMR:

LY-EDG

LY-BSDG

Other tools



Raw data (in counts)



Lv1: Engineering data (in Hz)



Lv2: Calibrated data (in W/m^2)

Higher level
data products

Current state

Not distributed

Daily basis

Not available

Plots + flare list
available
irregular

In the future

Not distributed

After each
contact

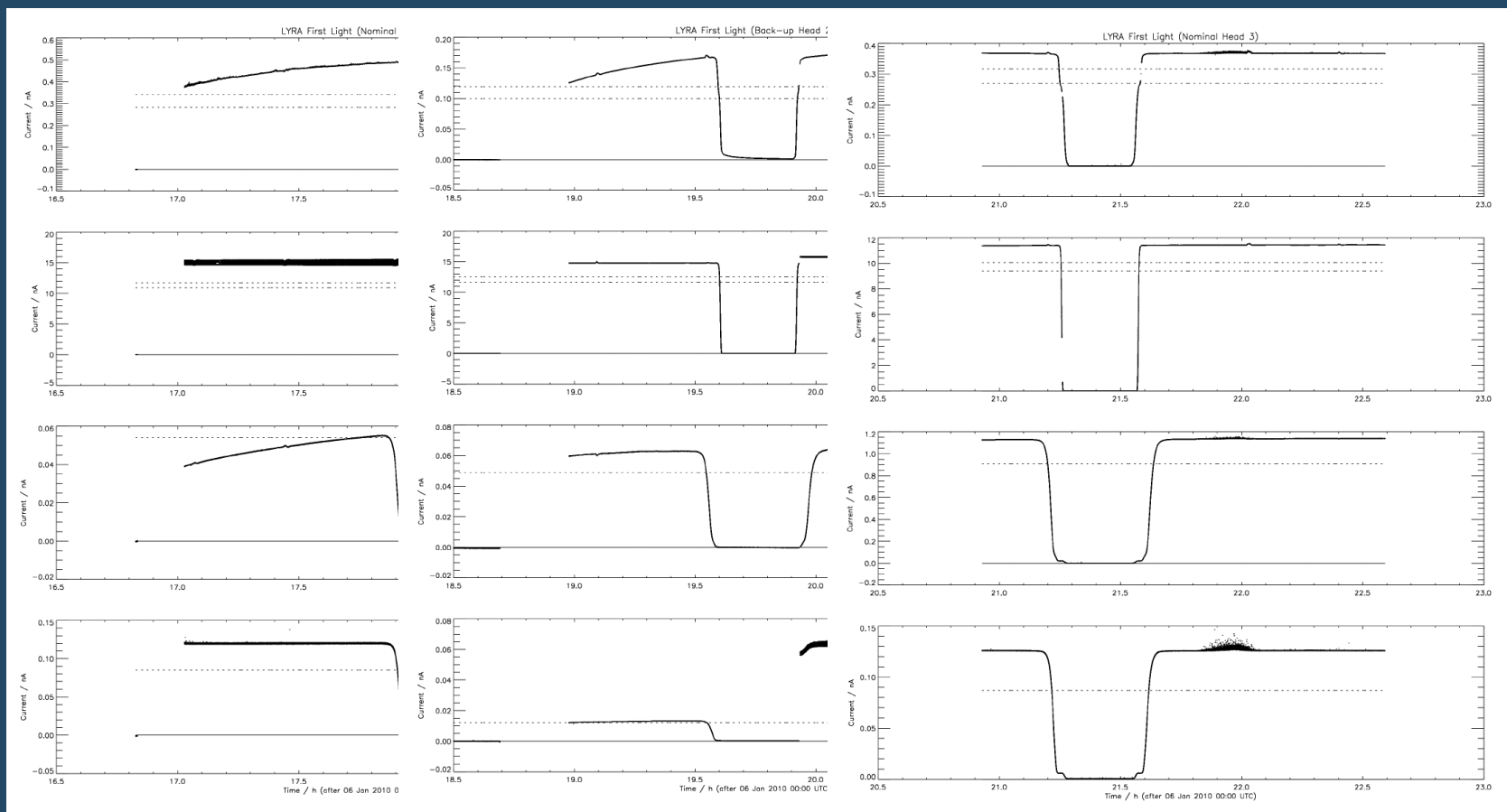
After each
contact

systematic

What do the data look like?

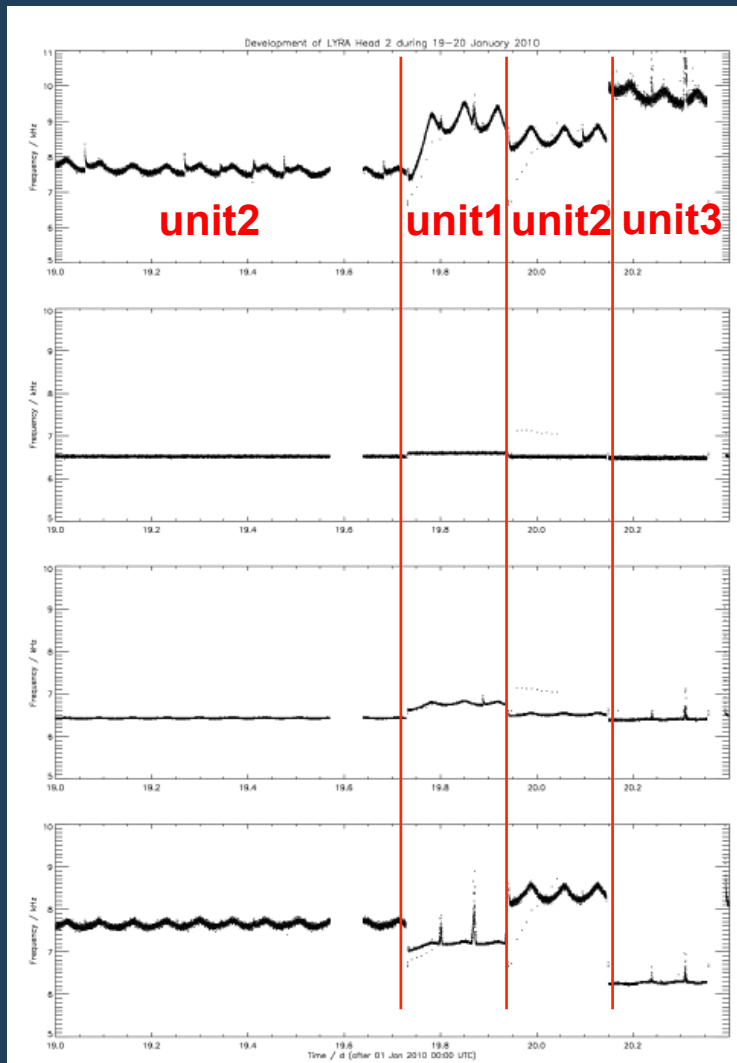


First light acquisition





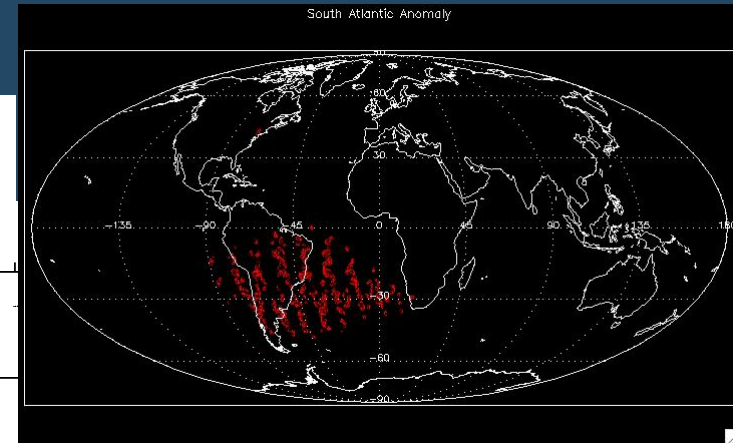
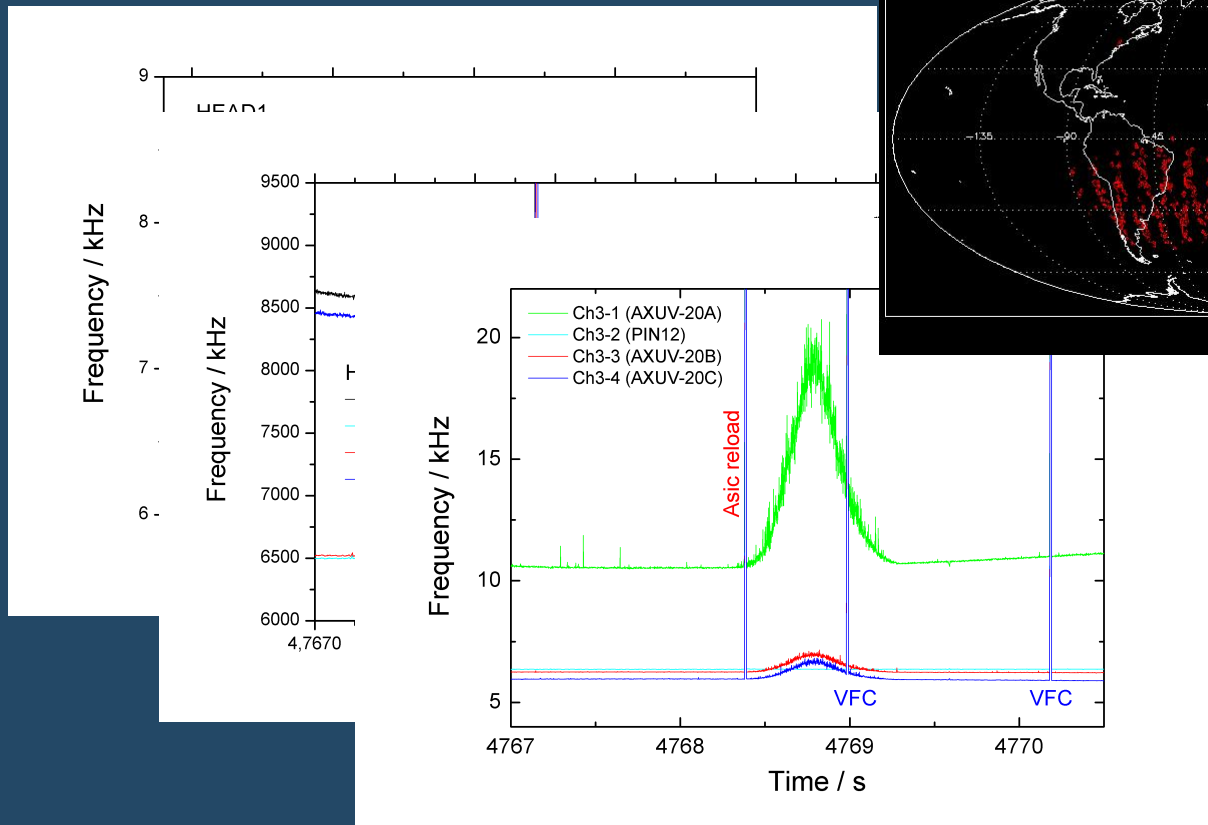
Dark current : LYRA door closed



- ❑ Orbital temperature variations observed in dark current for channels amplified by a factor 10.
- ❑ Remark: Pre-flight campaign, above 40°C, the dark current increases dramatically



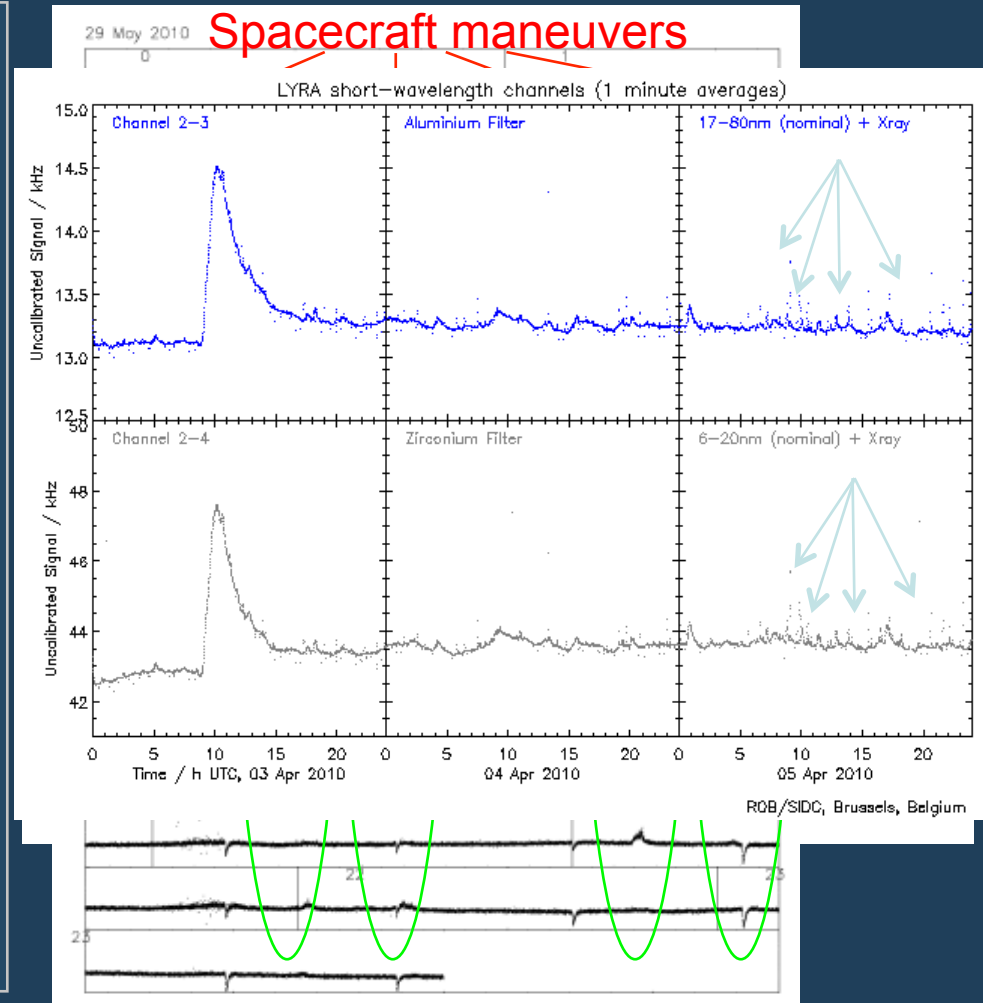
South Atlantic Anomaly





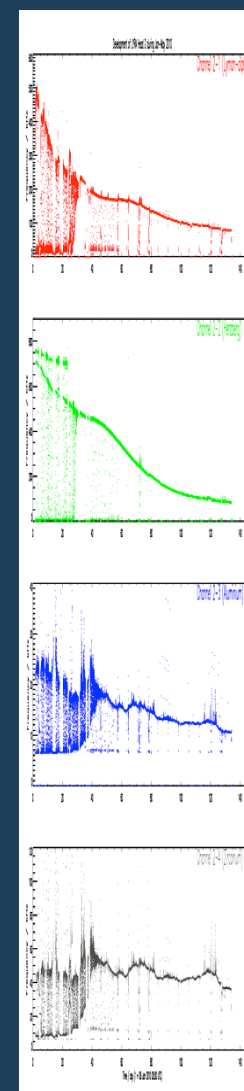
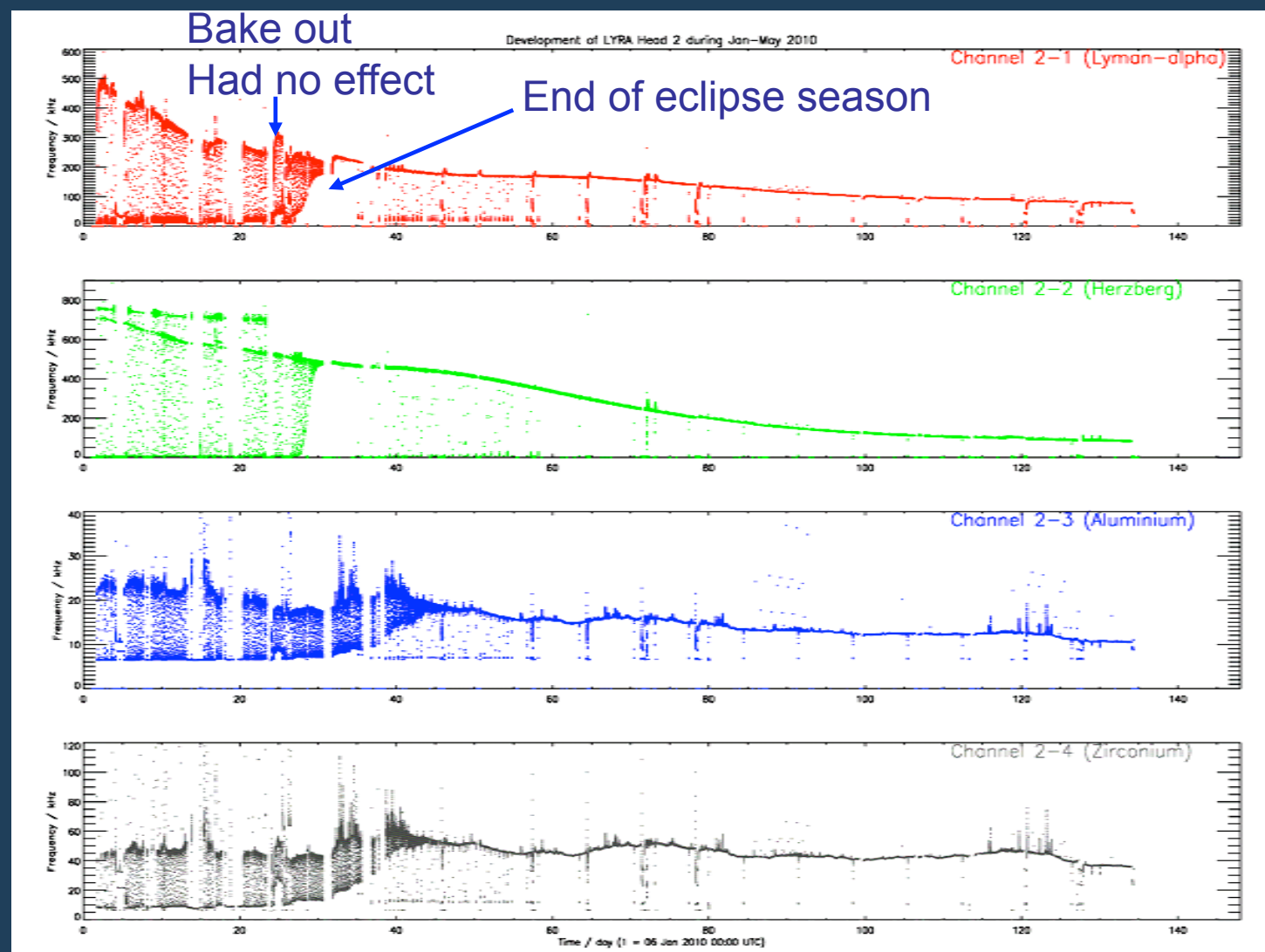
Auroral Oval

- ❑ Perturbations appearing around 75° latitude
- ❑ 2-3 days after a CME, flare ...
- ❑ Associated to geomagnetic perturbations





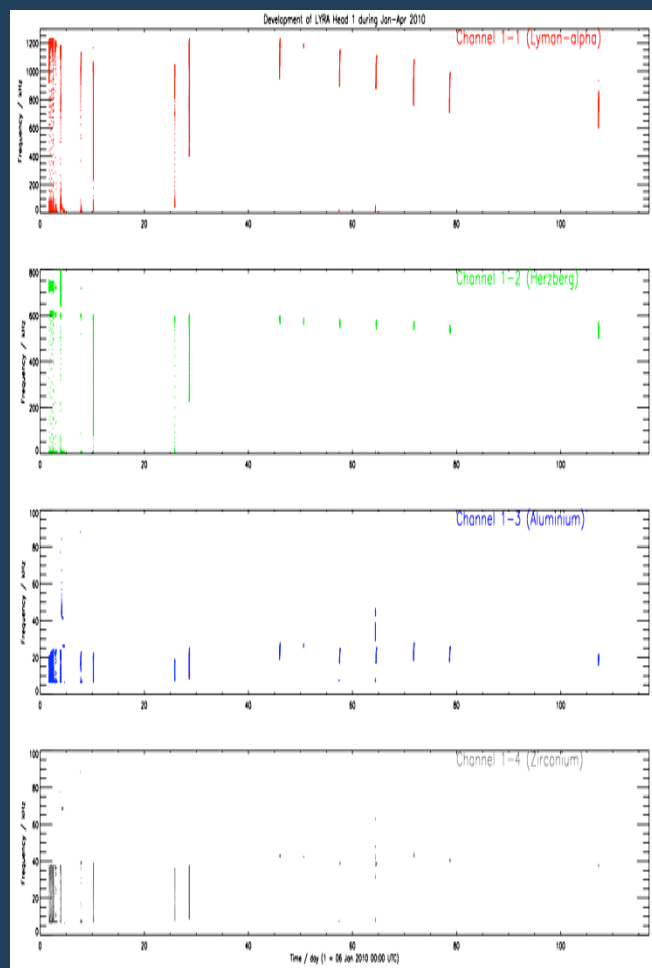
Degradation Nominal unit (#2)





Degradation

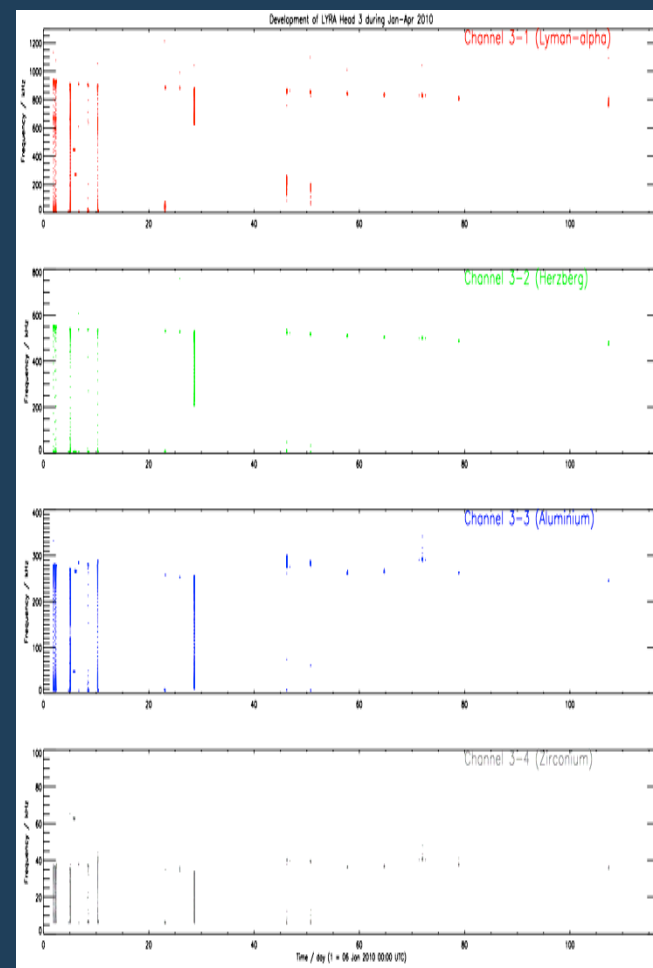
Back-up units (#1 and #3)



The signal of calibration LEDs is constant



Degradation at the filters level

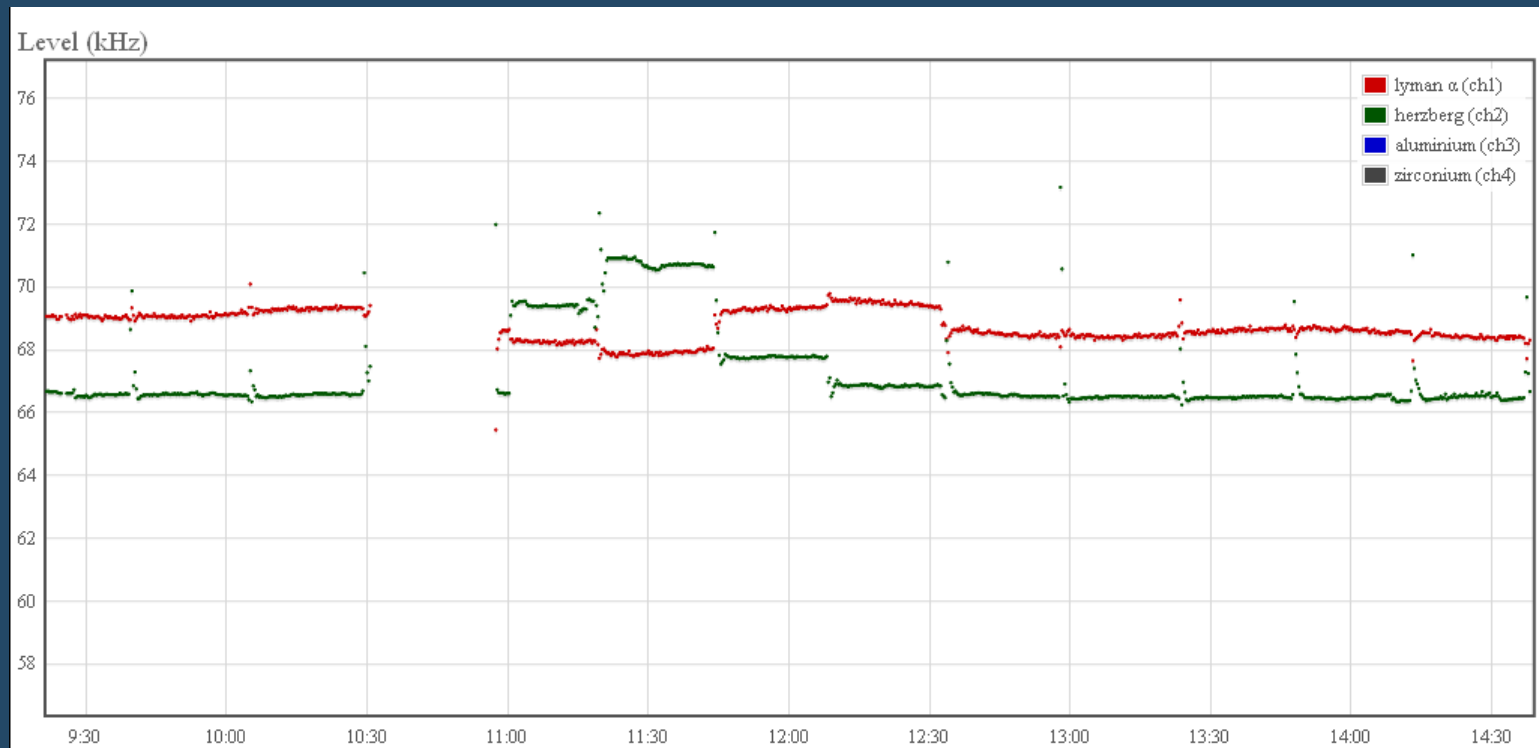




Jumps when off-pointing

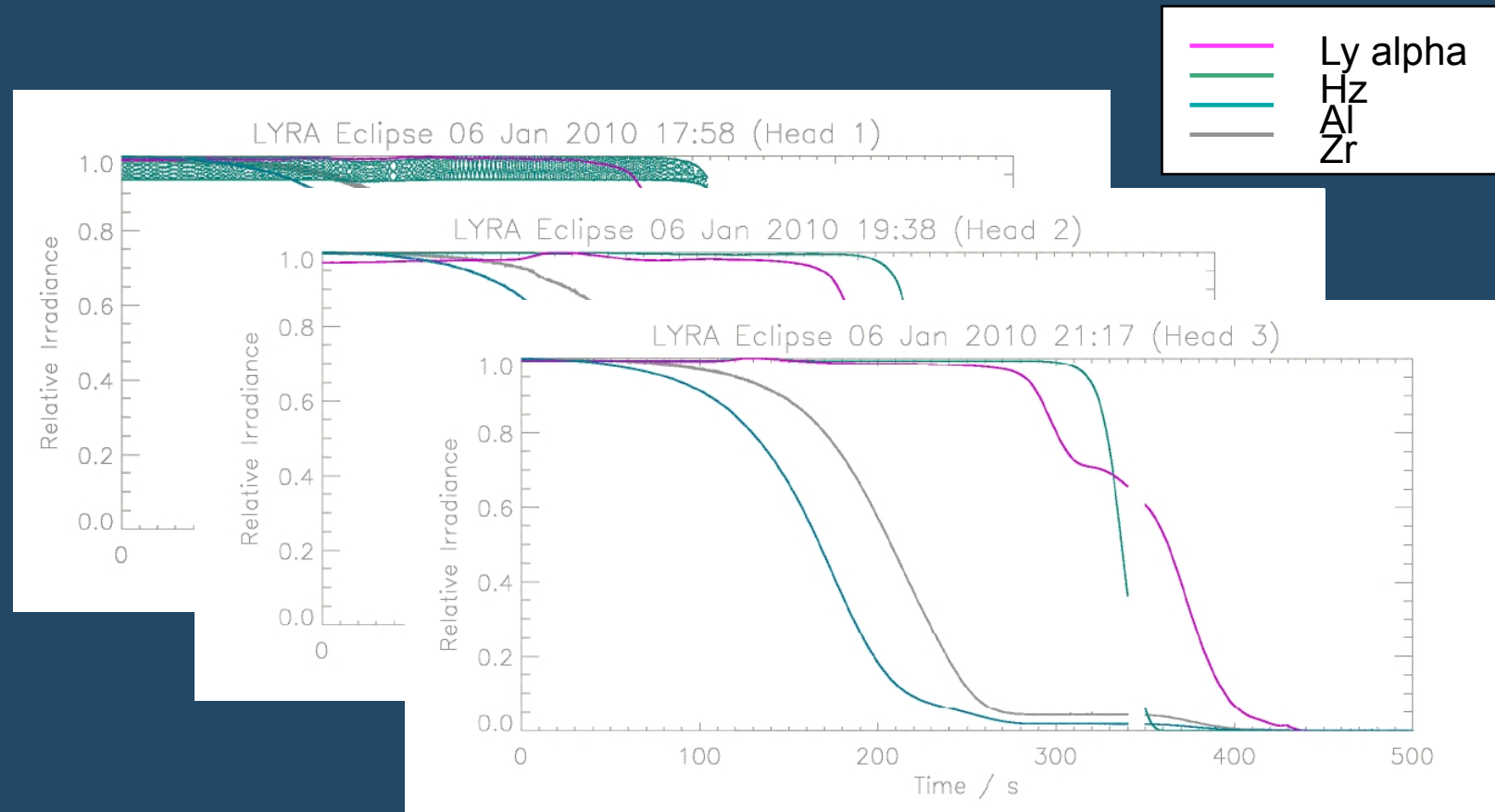
When off-pointing the spacecraft, the Hz channel signal doesn't fit the modeled behavior

⇒ Imprinted degradation ???





Occultations



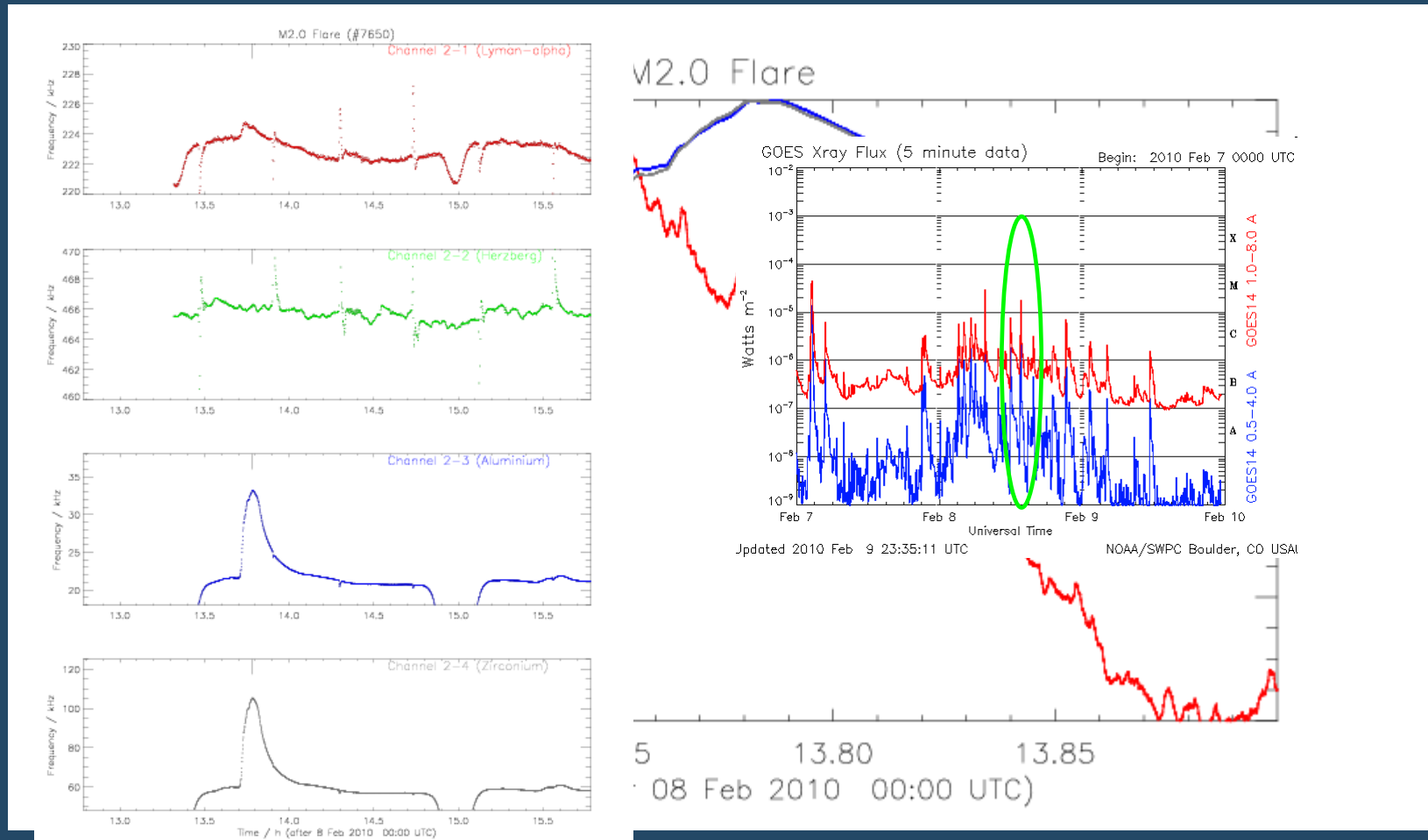


Flares

- ❑ Lyra senses flares down to B1.5 at least
- ❑ LYRA list of flares is in agreement with the one of GOES
- ❑ Always visible in the two XUV-EUV channels
- ❑ Some strong and impulsive flares are also visible in Lyman-alpha, which can then be used as a precursor



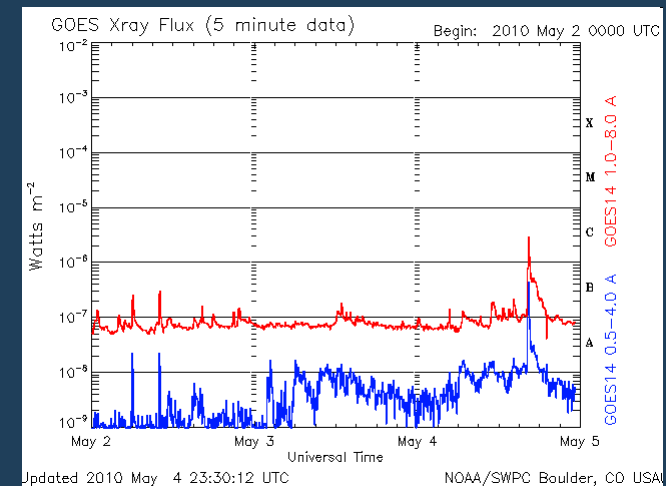
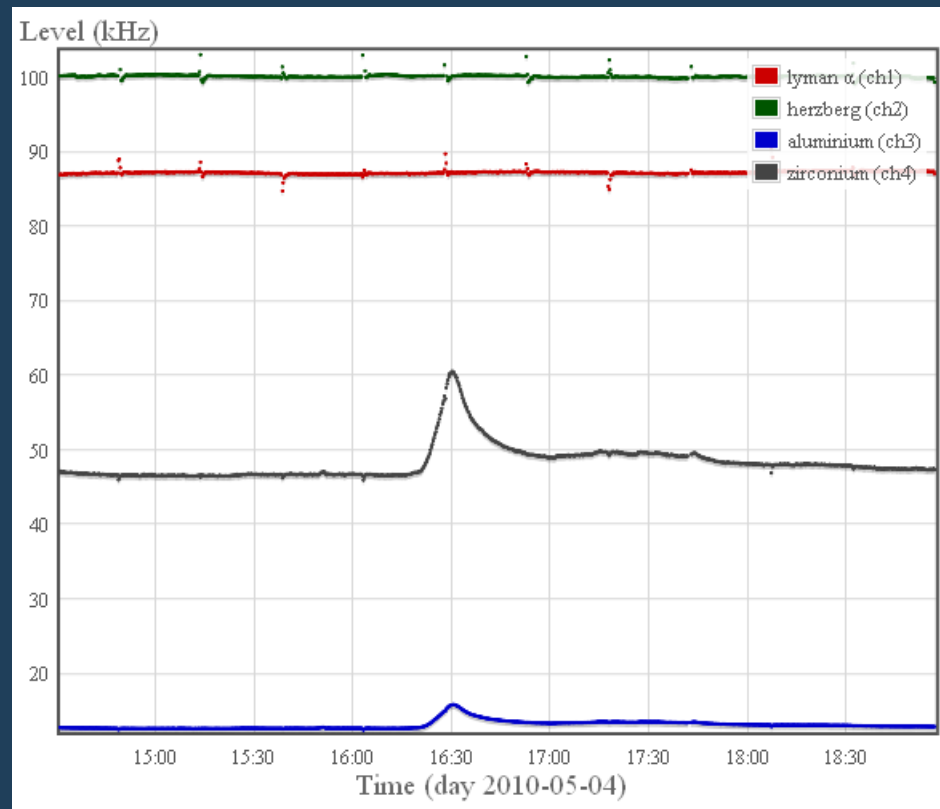
□ M2.0 flare 2010/02/08 – 22h33



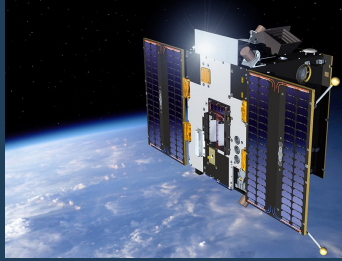


Flares

□ C3.6 flare 2010/05/04 – 16h30



Operations



Routine activities

<input type="checkbox"/> Nominal acquisition: <ul style="list-style-type: none"><input type="checkbox"/> Unit2<input type="checkbox"/> Integration time = 50 ms	Nominal
<input type="checkbox"/> Calibration <ul style="list-style-type: none"><input type="checkbox"/> Dark current<input type="checkbox"/> LED signal	Weekly
<input type="checkbox"/> Back-up acquisition <ul style="list-style-type: none"><input type="checkbox"/> Acquisition with units1 and 3	Monthly
<input type="checkbox"/> Flat-field analysis <ul style="list-style-type: none"><input type="checkbox"/> Off-pointing sequence	Monthly
<input type="checkbox"/> Bake out - decontamination <ul style="list-style-type: none"><input type="checkbox"/> Switch on of heaters (temperature reaches 50°C)	Once every 6 months



Specific campaigns

- ☐ Sun-Moon eclipses

January 15 (annular from LYRA)

July 11 (partial from LYRA)

- ☐ Stray light analysis

March 18-19

- ☐ SDO/EVE cross-calibration campaign

May 3