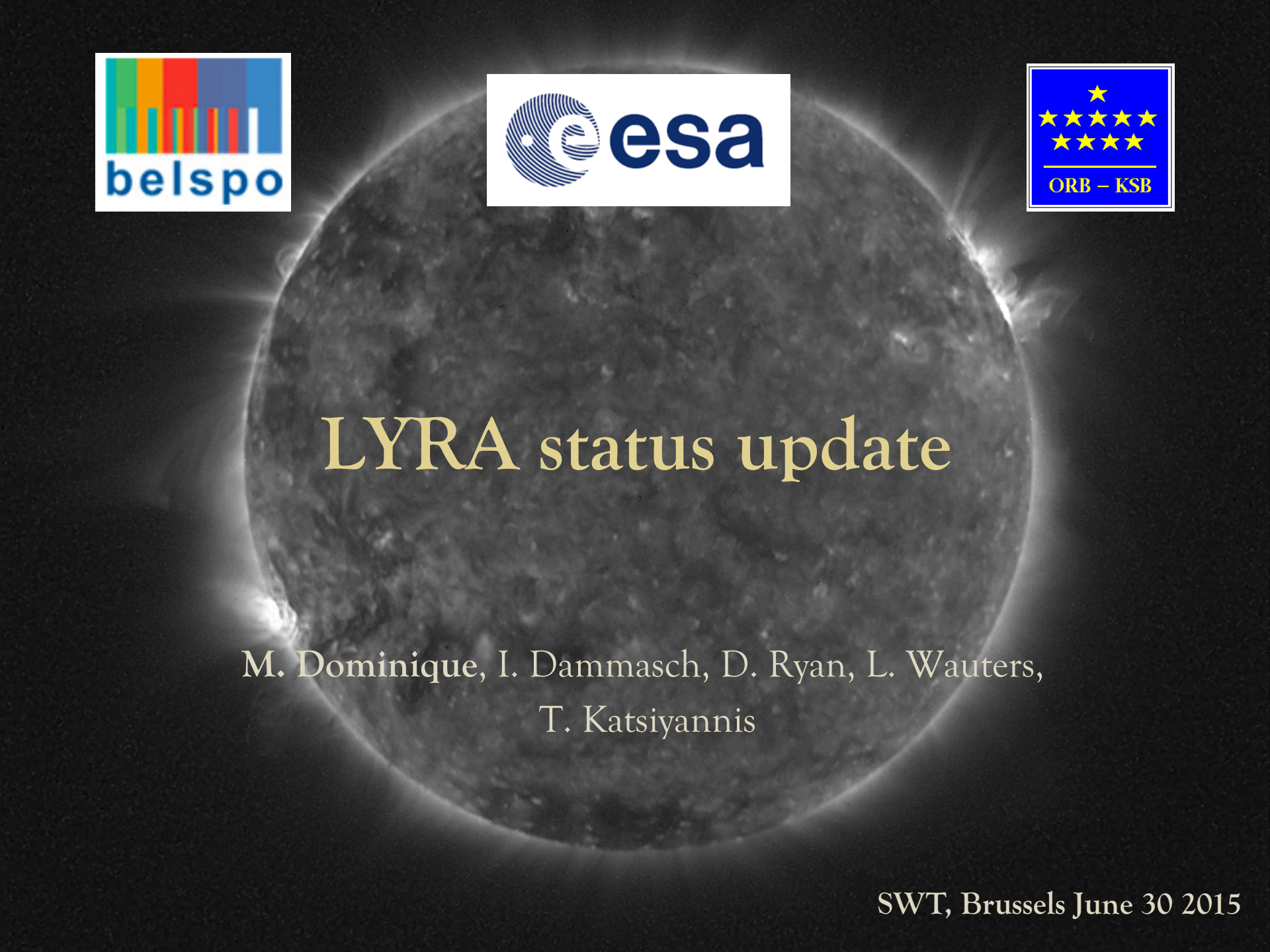


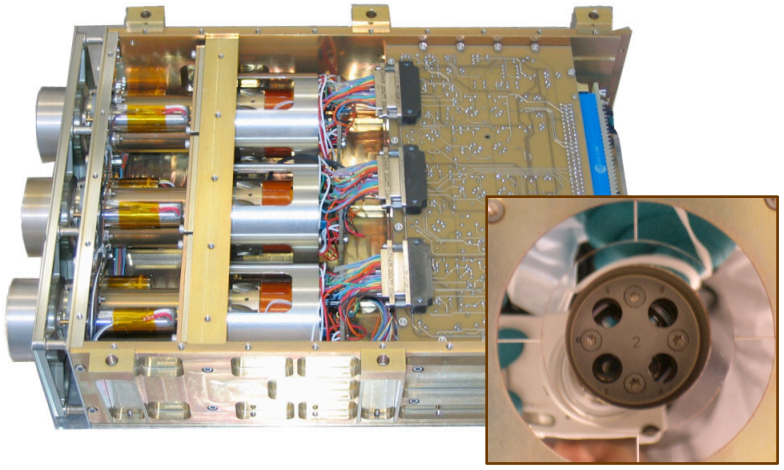
LYRA status update

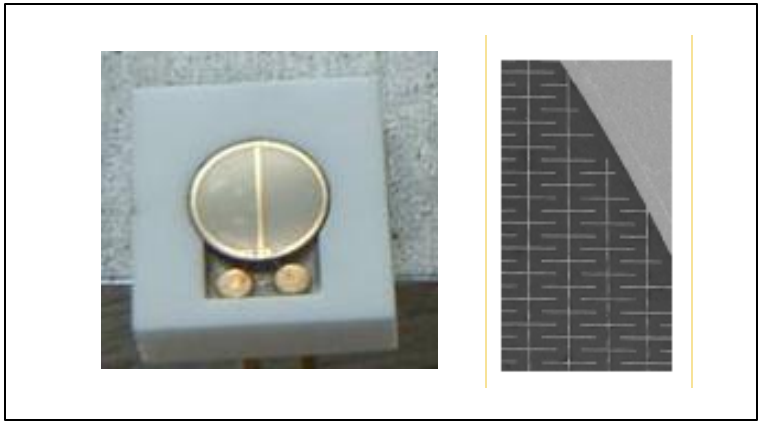
M. Dominique, I. Dammasch, D. Ryan, L. Wauters,
T. Katsiyannis

SWT, Brussels June 30 2015

LYRA highlights

- 3 instrument units (redundancy)
- 4 spectral channels per head
- 3 types of detectors,
  Silicon + 2 types of
  diamond detectors (MSM, PIN):
  - radiation resistant
  - insensitive to visible light
    compared to Si detectors
- High acquisition cadence up to 100 Hz (nominal 20Hz)





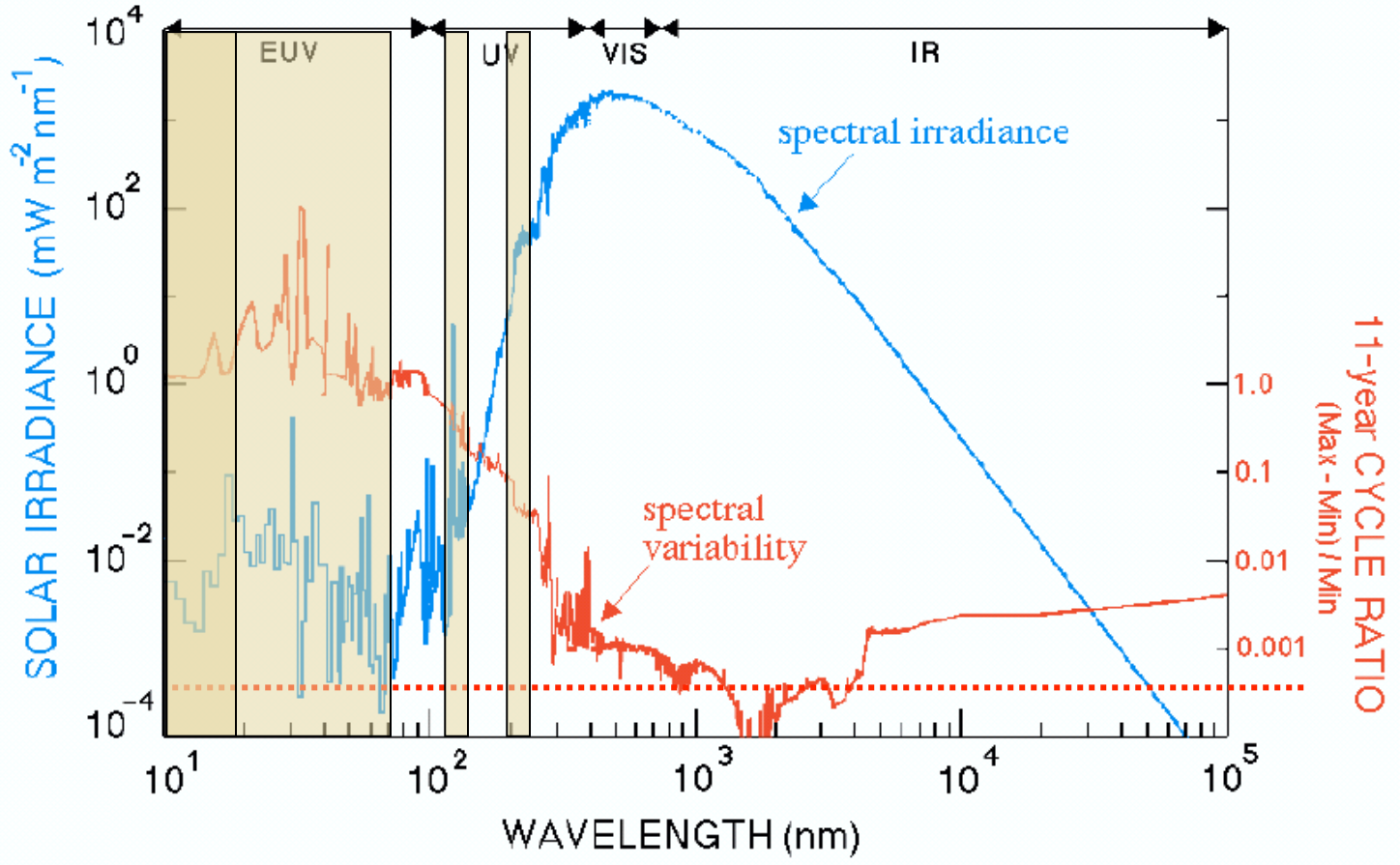
The LYRA channels

Zirconium
6-20 nm + < 2nm

Aluminum
17-80 nm + < 5nm

Lyman alpha
120-123 nm

Herzberg
190-222 nm



In brief …

- Mission currently founded till end 2016, funded by ESA science directorate and SSA
- PROBA2 website: http://proba2.oma.be
- Selection for the sixth Guest Investigator Programme ongoing
- LYRA team: I. Dammasch, T. Katsiyannis, D. Ryan, L. Wauters, M. Dominique

What's new about the data?

- Basic routines to access and read LYRA data in the SolarSoft and in SunPy
- New dark current correction – reprocessing on-going
- Removal of the comb-like structures in the occultation season
- Reviewed degradation correction

Degradation – Unit 1

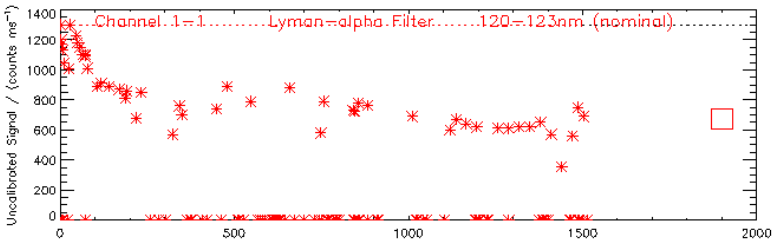
Response on 20 March 2015

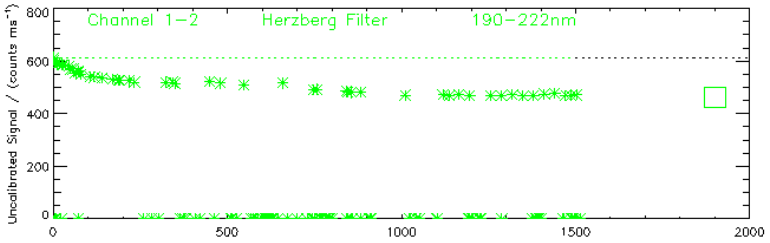
ch1-1 52%

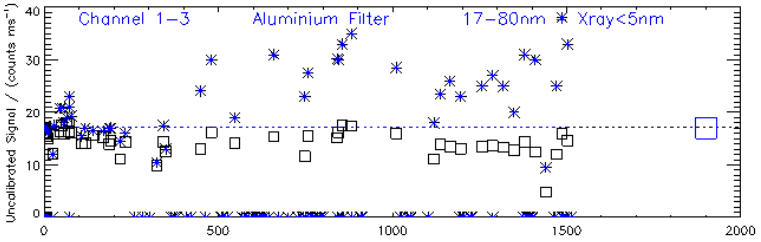
ch1-2 75%

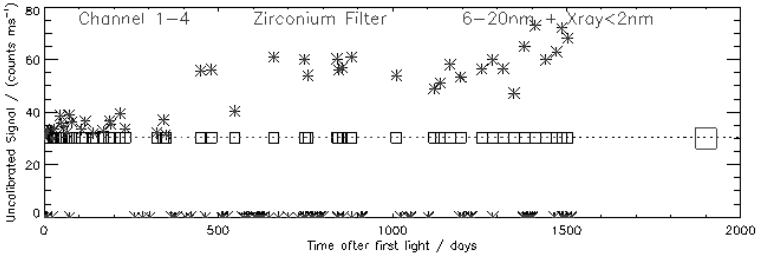
ch1-3 100%

ch1-4 100%









Degradation – Unit 2

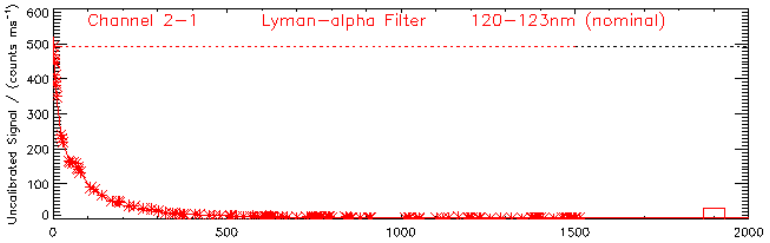
Response on 20 March 2015 after 1900 *days* :

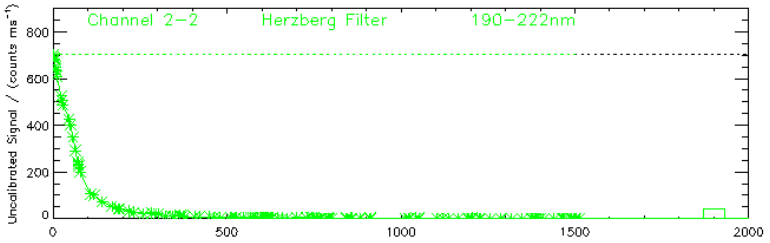
ch2-1 0.3%

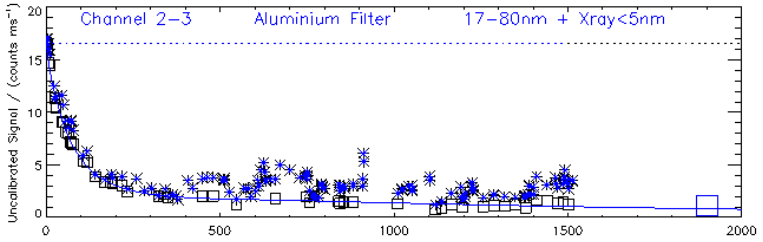
ch2-2 0.01%

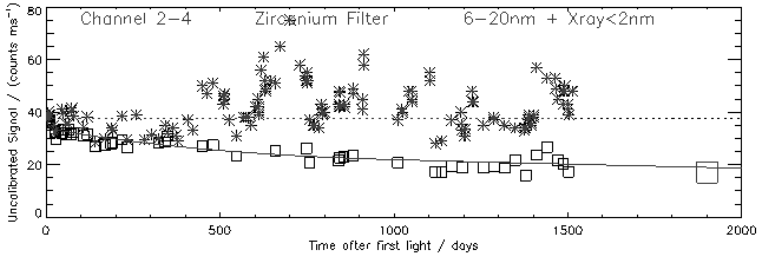
ch2-3 7%

ch2-4 44%









Degradation – Unit 3

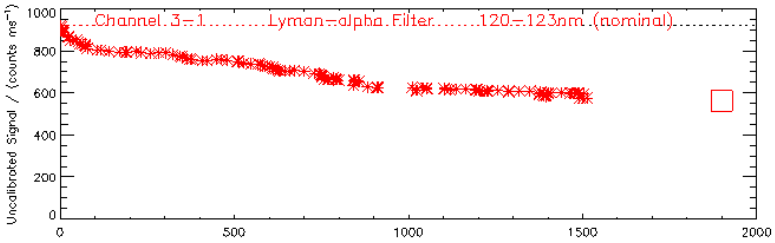
Response on 20 March 2015

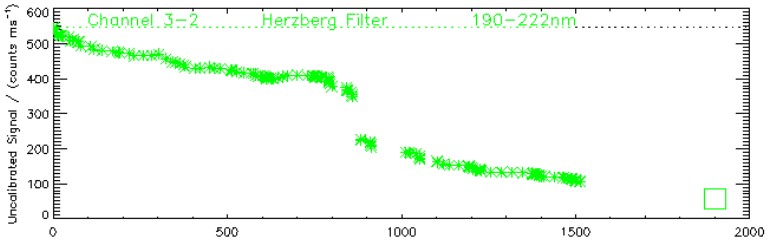
ch3-1 61%

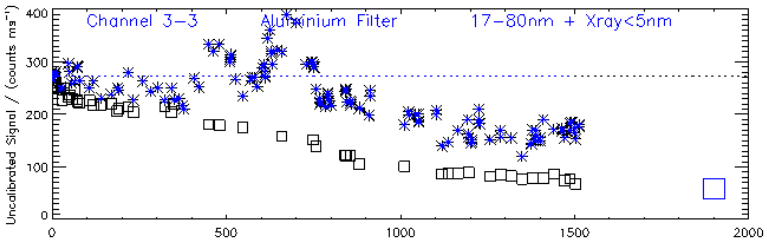
ch3-2 10%

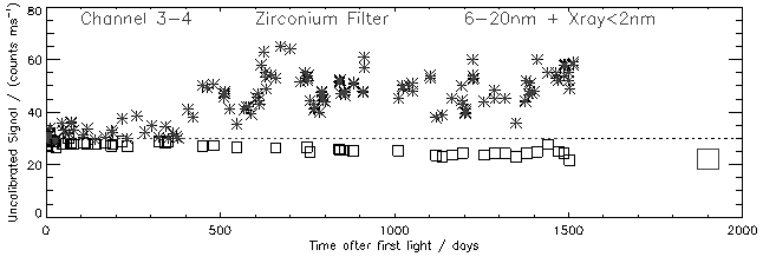
ch3-3 21%

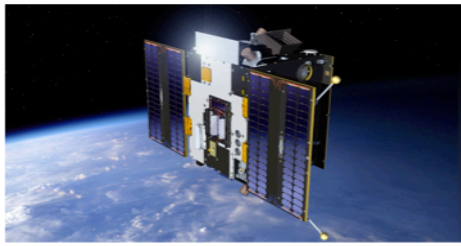
ch3-4 72%







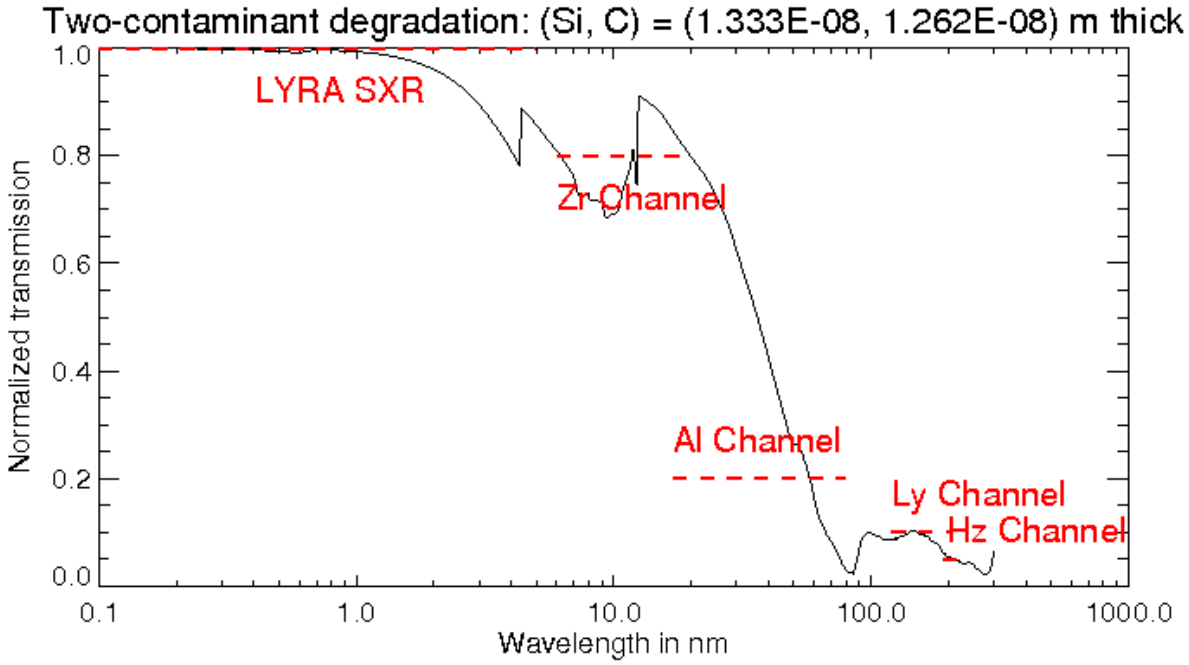




Model of degradation due to a contaminant layer on the filters

Two identified candidates, both in the front door mechanism:

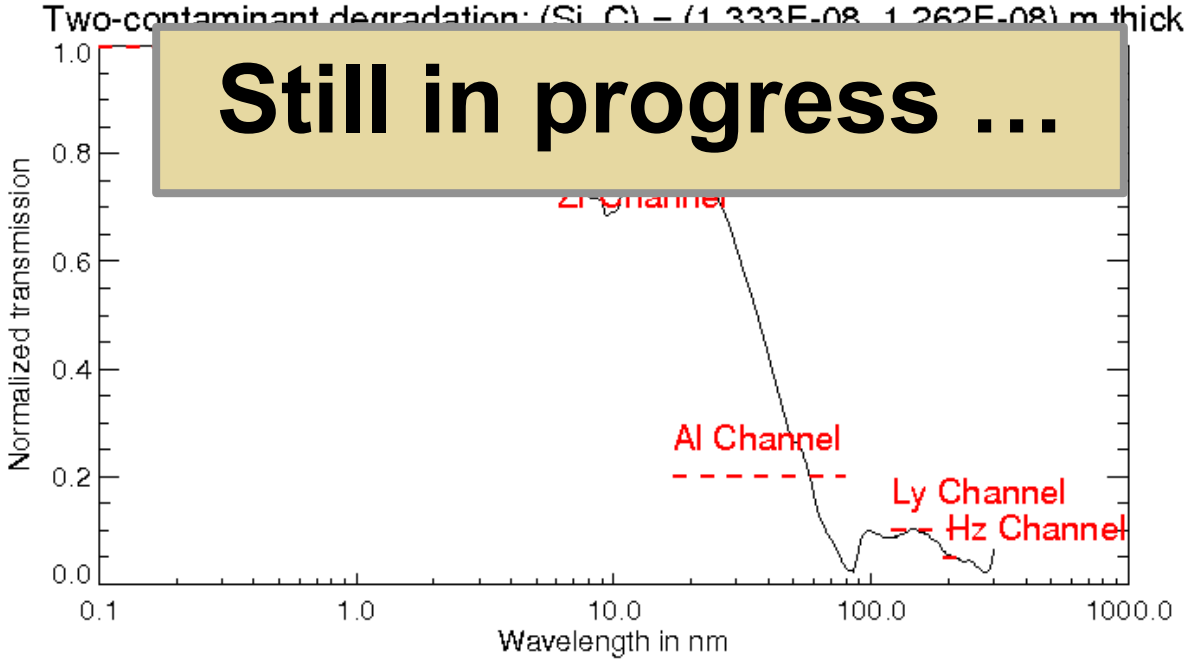
- Silicone RTV566
- EpoxyAV138 / HV 998



Model of degradation due to a contaminant layer on the filters

Two identified candidates, both in the front door mechanism:

- Silicone RTV566
- EpoxyAV138 / HV 998

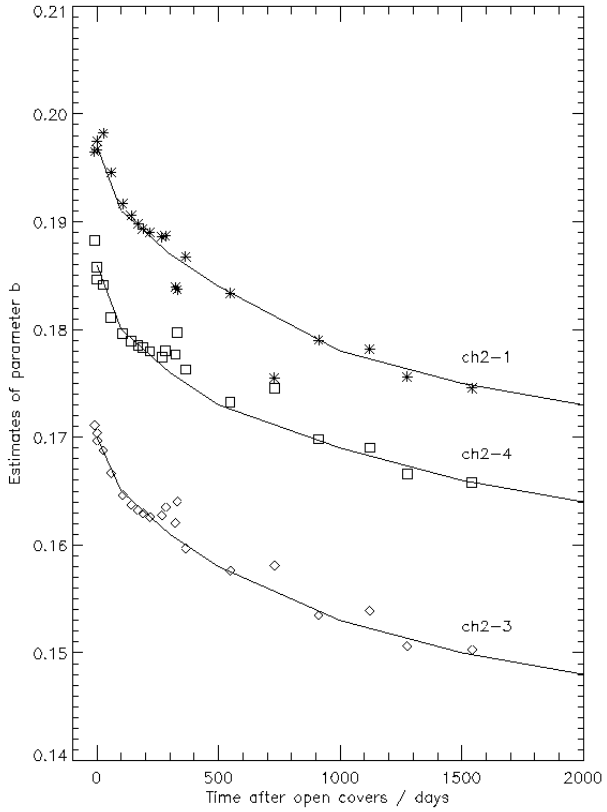


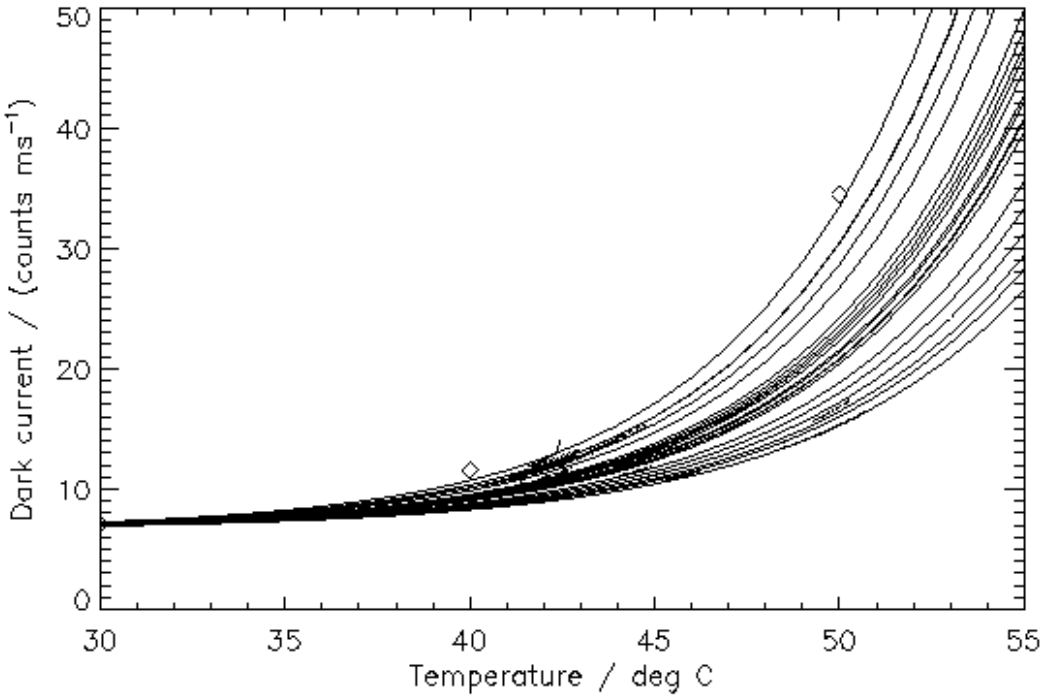
Degradation …

- … was addressed in several papers and communications: a.o. Dominique et al (2013), BenMoussa et al. (2013)
- … is discussed during annual meetings of the “Solar EUV irradiance working group”, most of which were organized by STCE
- … was the chosen topic of three guest investigators

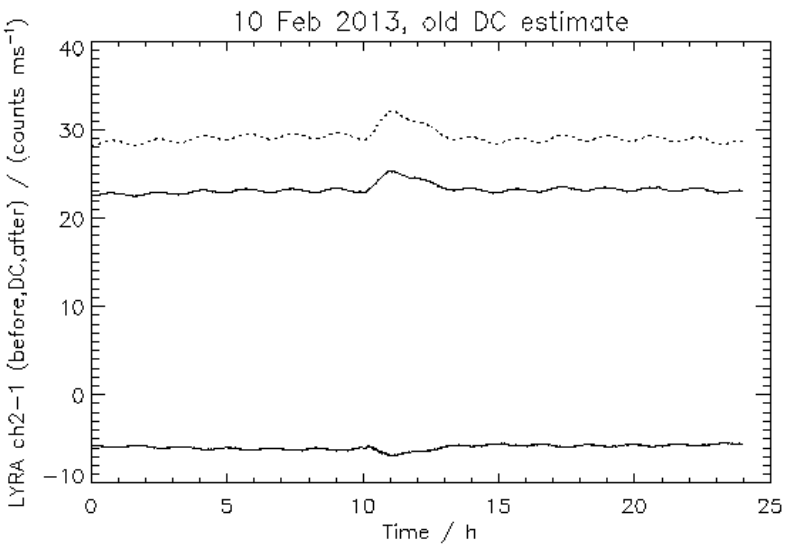
New estimations of dark current

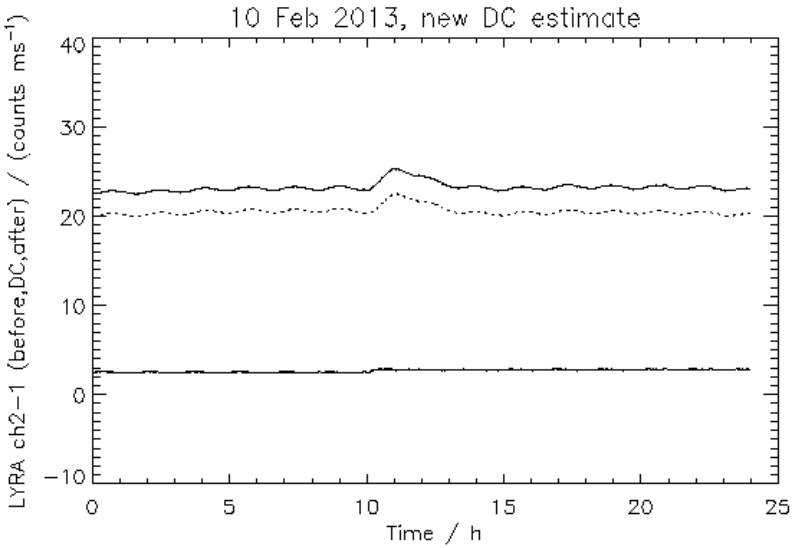
- Dark currents prove to evolve with time
  => led to over- and under-estimations of DC

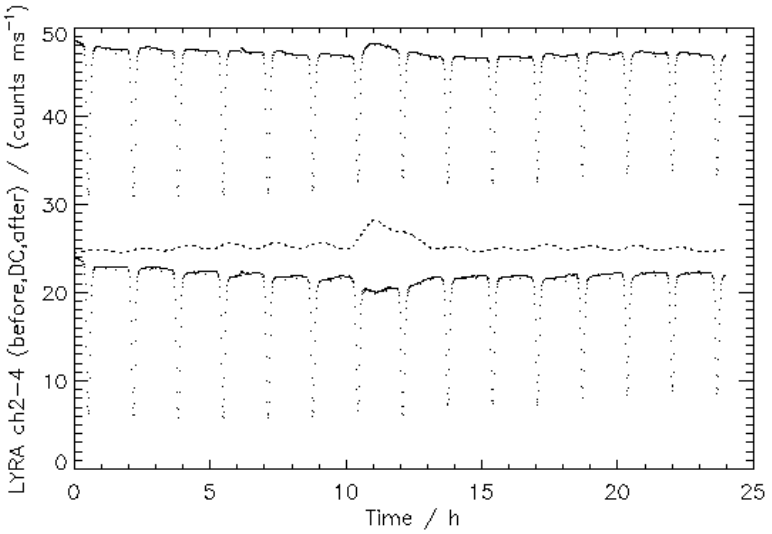


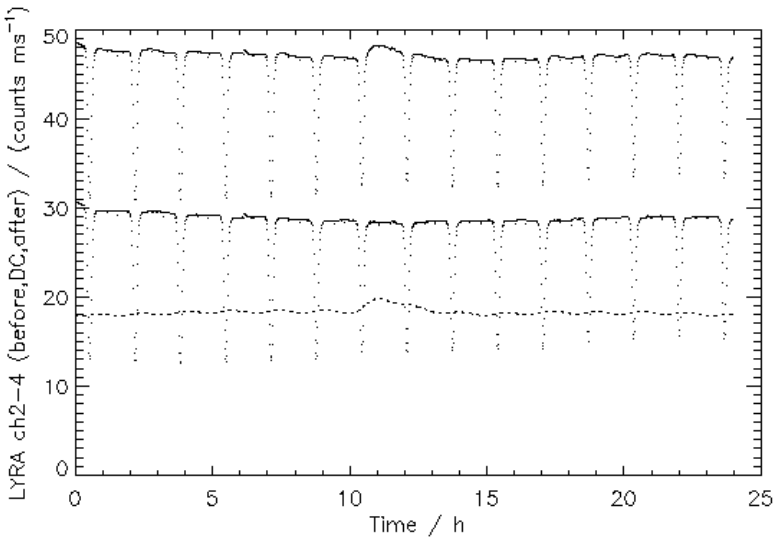


New estimations of dark current

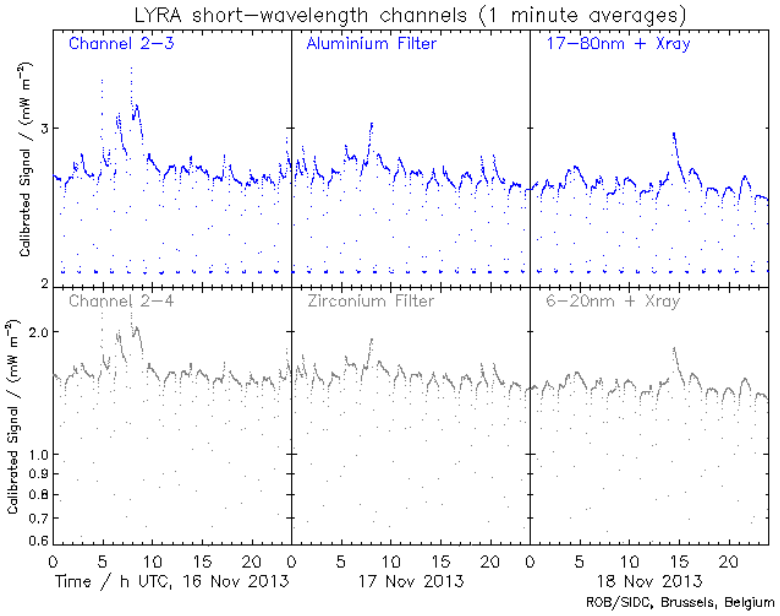




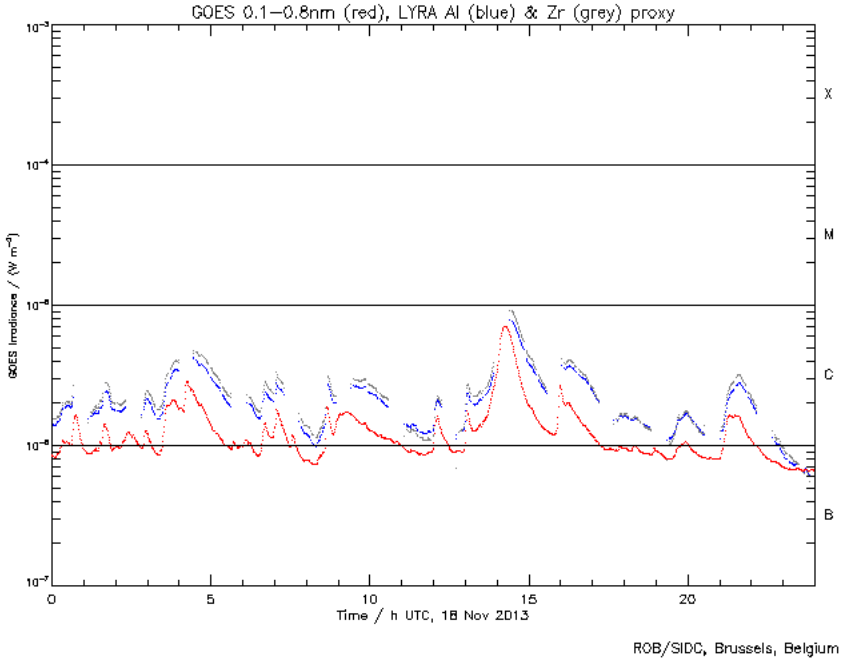




Removal of “comb-like” structures

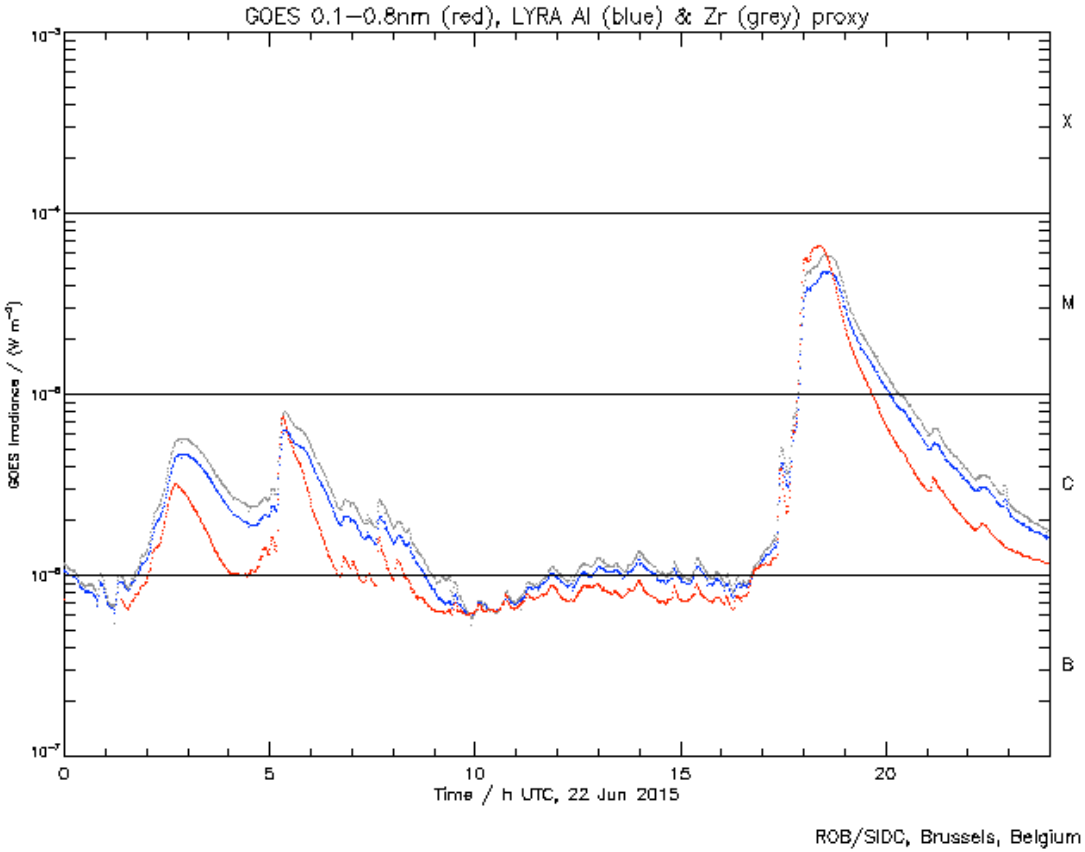


LYRA data exhibit “comb-like” patterns due to the atmospheric absorption during the occultation season …



… pattern which is now removed in some of our quicklooks.

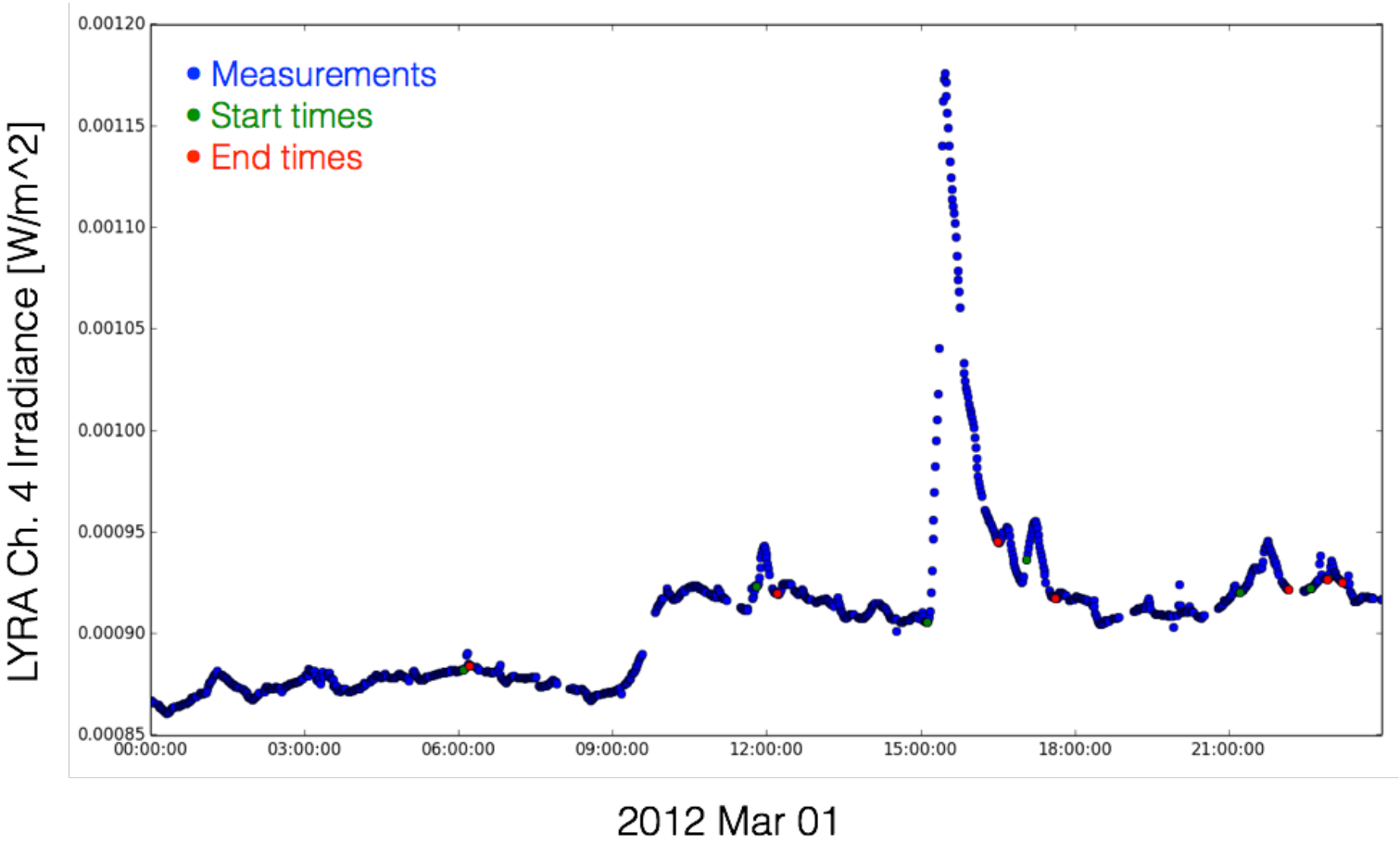
Flares detection and prediction



http://proba2.oma.be/ssa

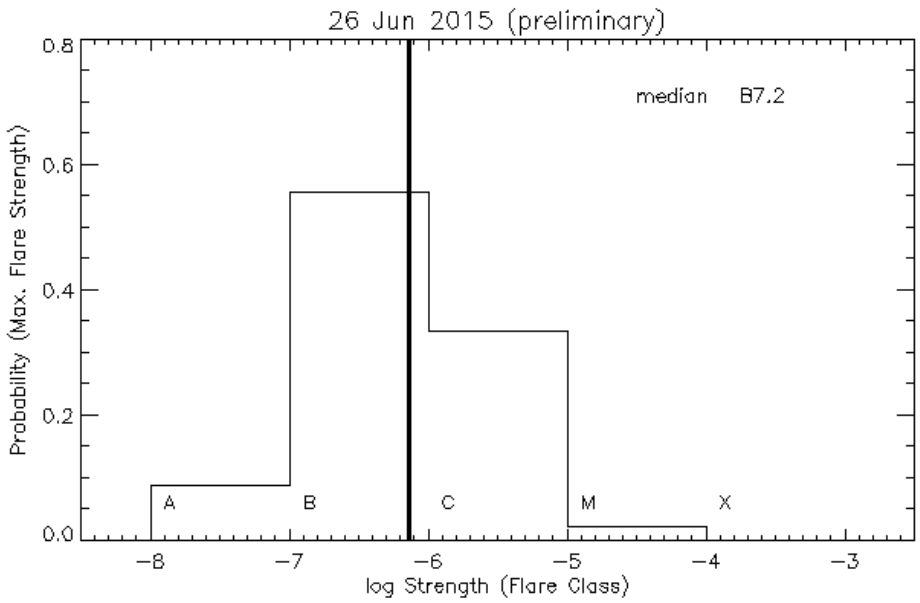
Flares detection and prediction

LYRA Flare Finder (LYRAFF)



Flares detection and prediction

Estimated Flare Probability ("Var" 2.0)



based on		A[%]	B[%]	C[%]	M[%]	X[%]	median
LYRA ch2-3 =	1.05254e-05	8	76	15	1	0	B4.9
LYRA ch2-4 =	1.16019e-05	10	67	23	0	0	B6.7
GOES Xray =	1.13126e-07	2	20	73	5	0	C1.6
est. ISN =	19.0000	15	59	23	3	0	B3.6
together		8.75	55.50	33.50	2.25	0.00	B7.2

http://solwww.oma.be/users/dammasch/flares/FlareProbability.html

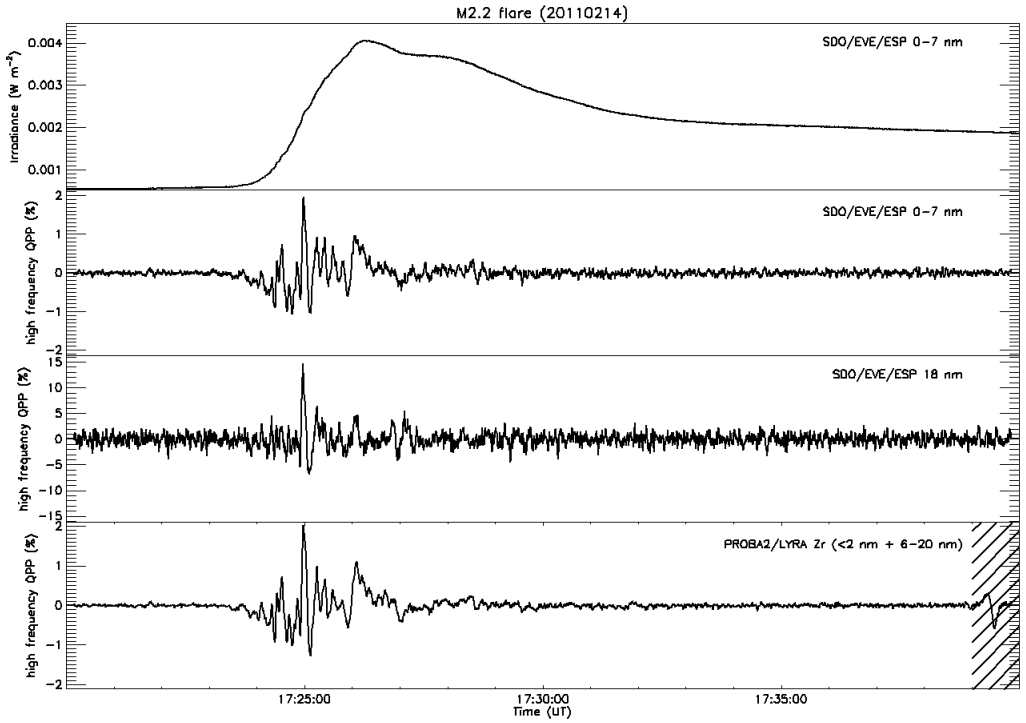
http://solwww.oma.be/users/dammasch/flares/FlareProbabilityVar.html

An overview of the main topics investigated

Flares with LYRA: QPP

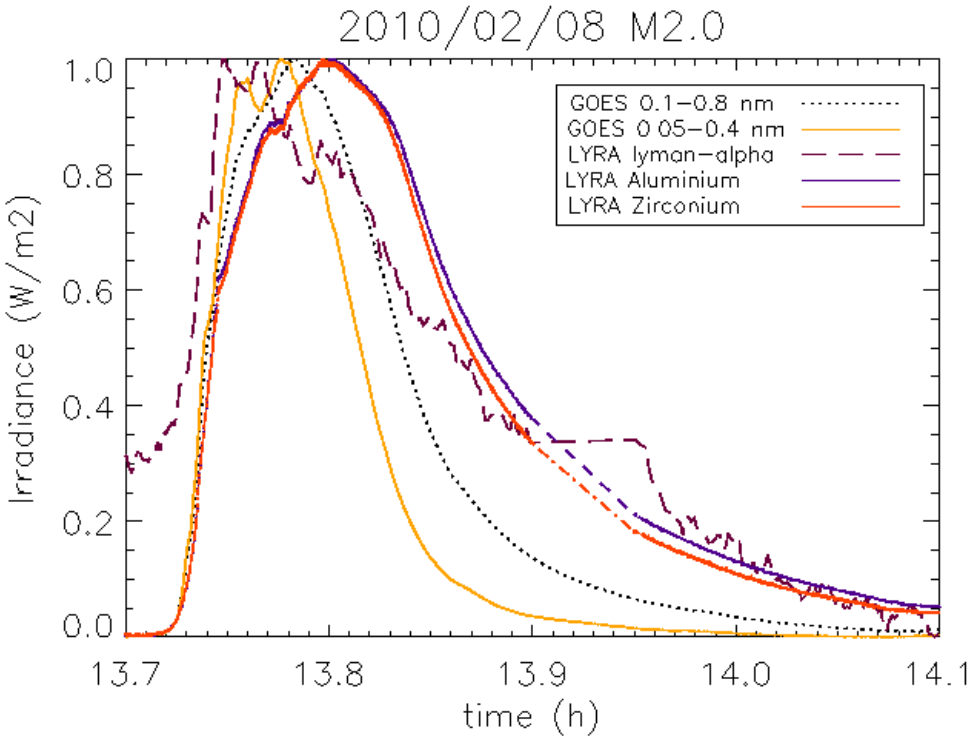
Analysis of sub-minute quasi periodic pulsations (QPP) during the onset of the flare

- **One PhD in collaboration with KUL**
- **Three guest investigators**



Van Doorsselaere et al. (2011), Dolla et al. (2012)

Flares with LYRA: lyman-alpha



Kretzschmar et al. (2013)

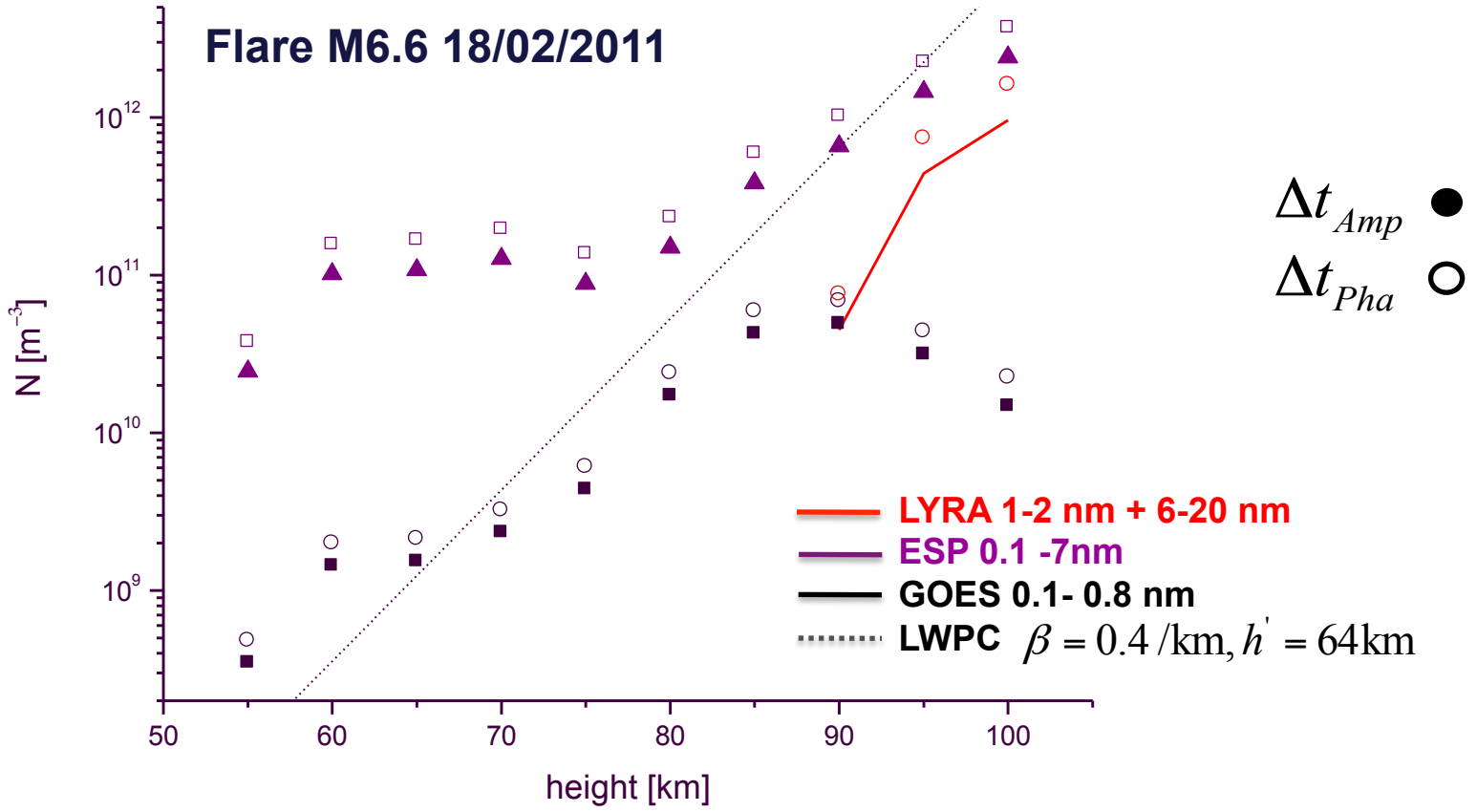
Detection of flares in lyman-alpha:

about 10 cases observed

- **Three guest investigators**

Height distribution of flare induced maximum electron density

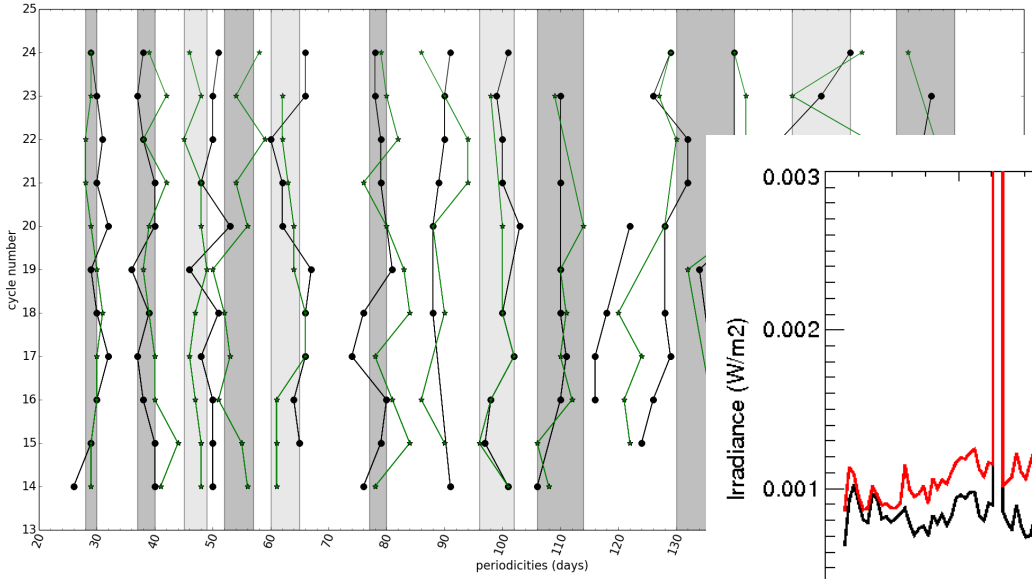
- One guest investigator



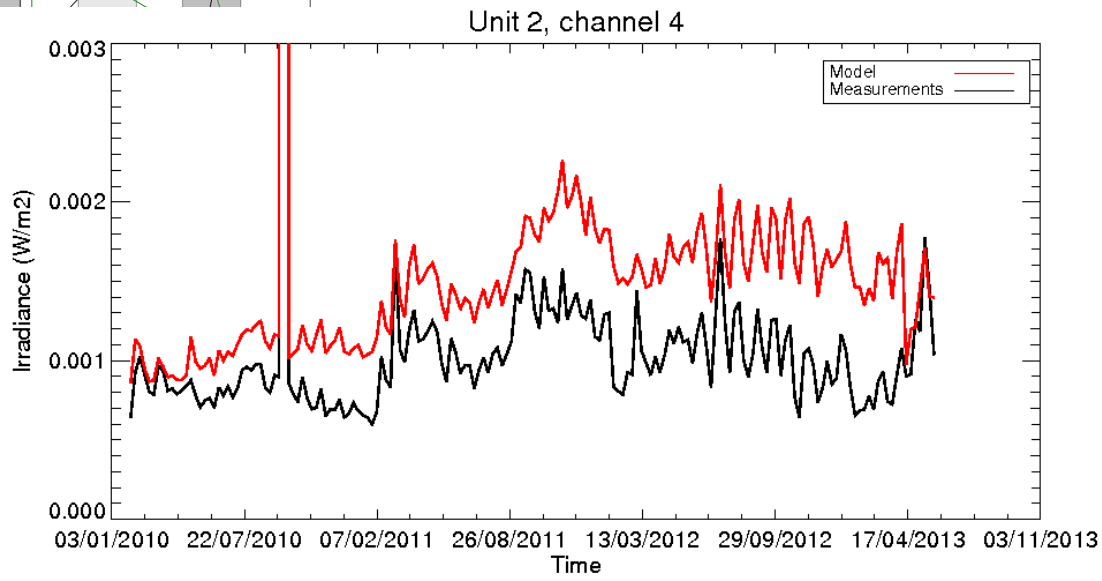
Solar irradiance evolution

Monitoring the EUV irradiance over time
Modeling the irradiance based on empirical models
Detecting the main periodicities present in the signal

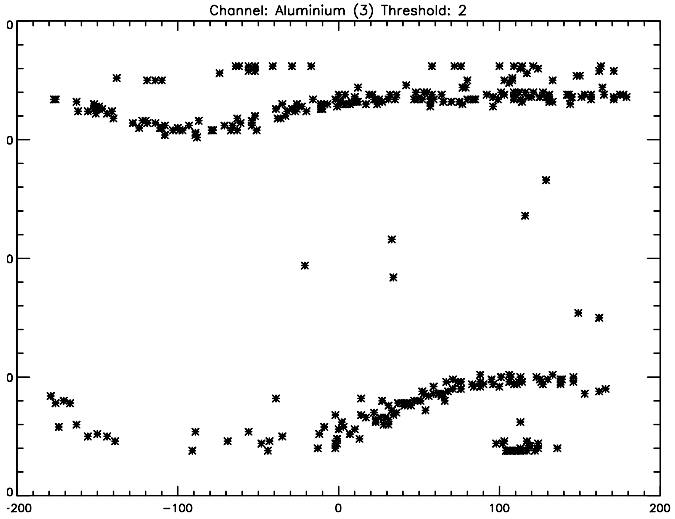
- **One guest investigator**

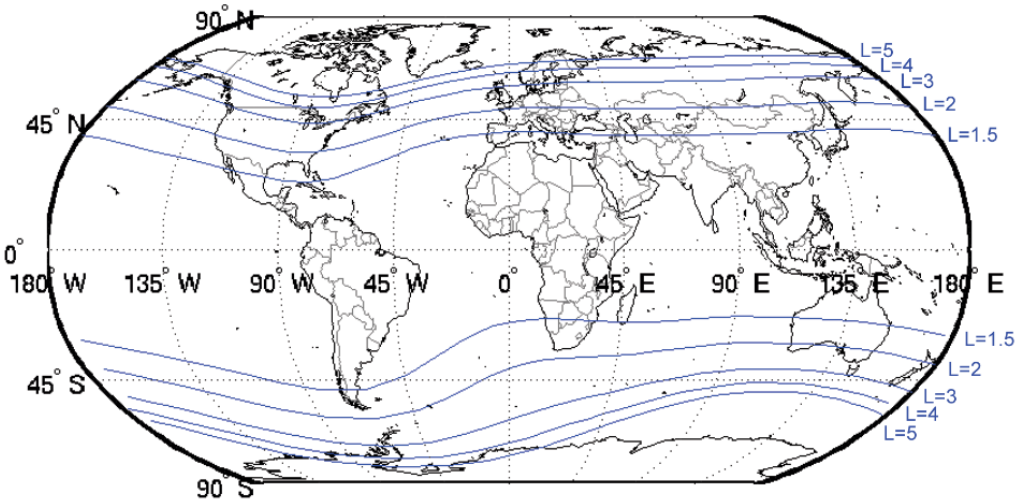


Cessateur et al. (2011), Kretzschmar et al. (2012)

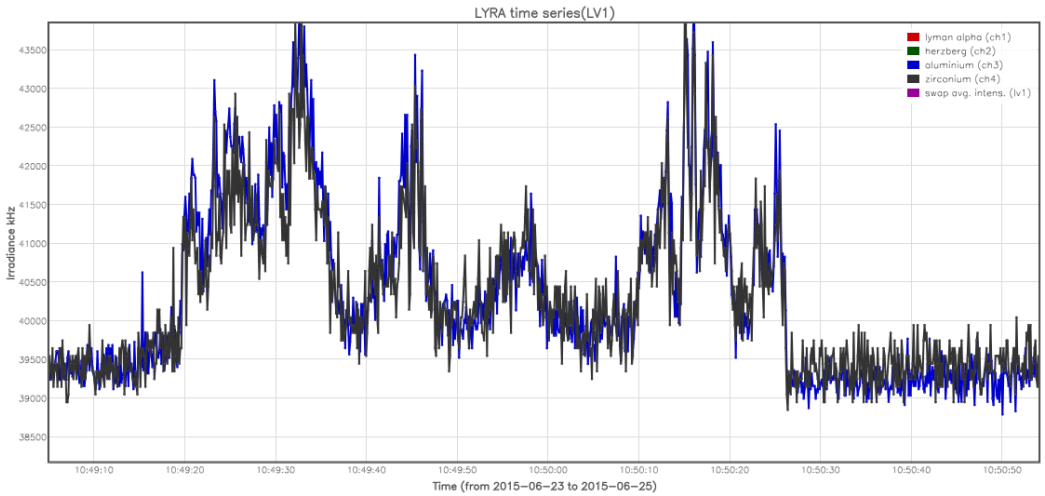


Auroral perturbations



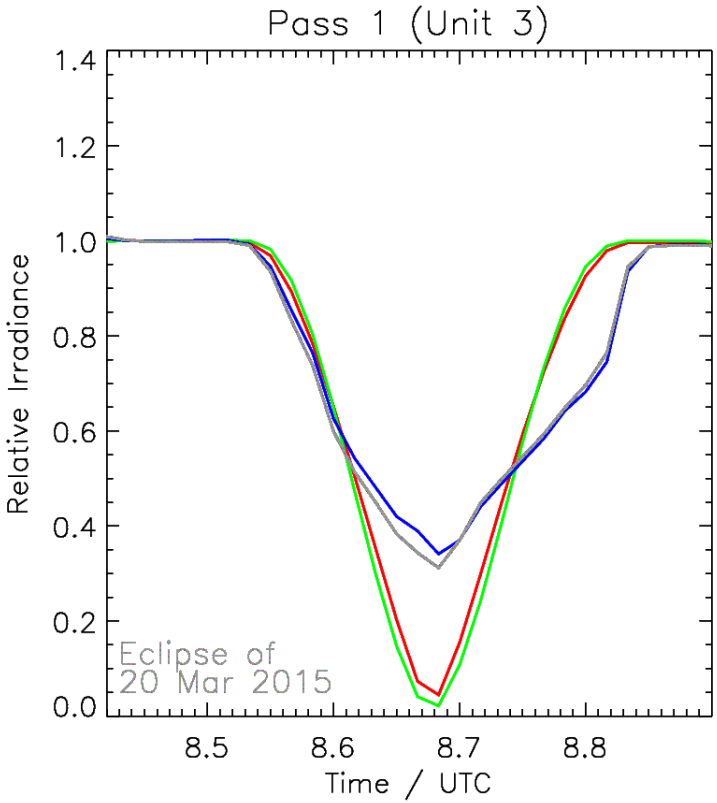


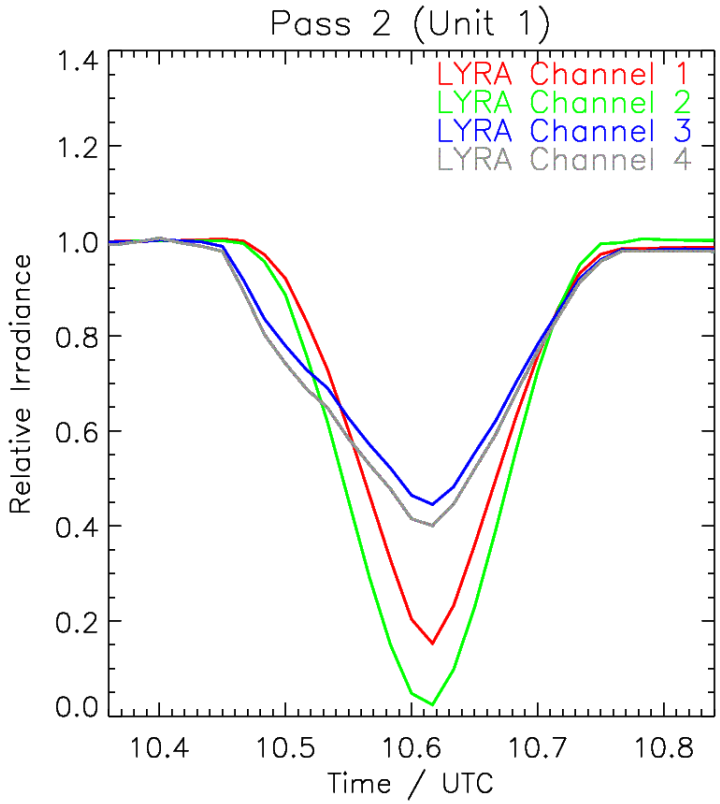
- Only after a geomagnetic storm
- Origin unknown …



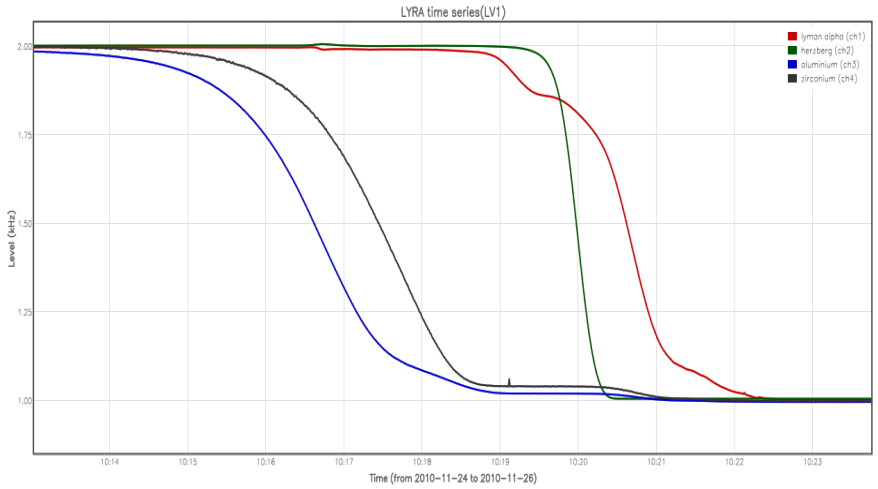
Solar eclipses

Shapiro et al. (2013)





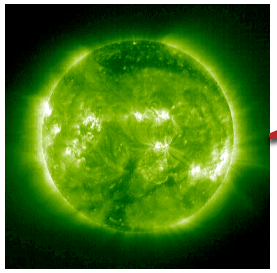
Occultations: scanning the Earth's atmosphere

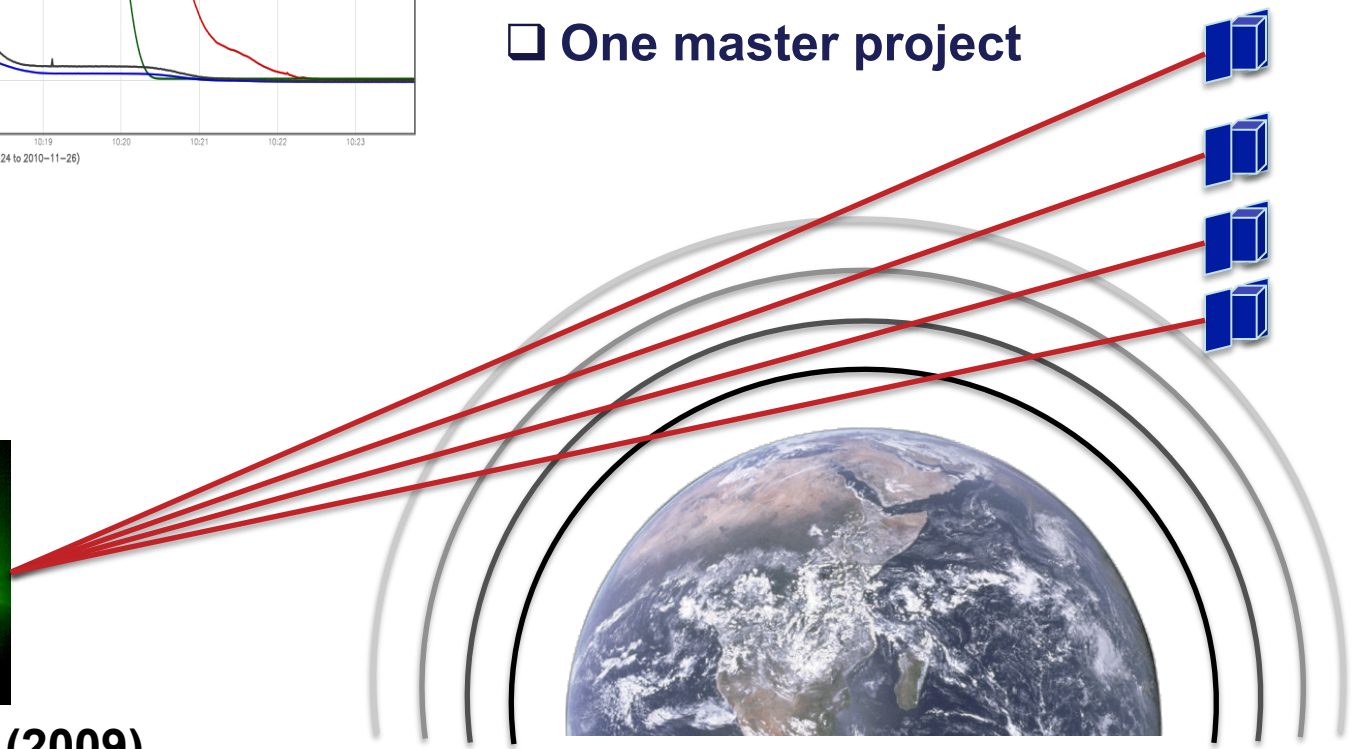


Model the absorption by the Earth atmosphere

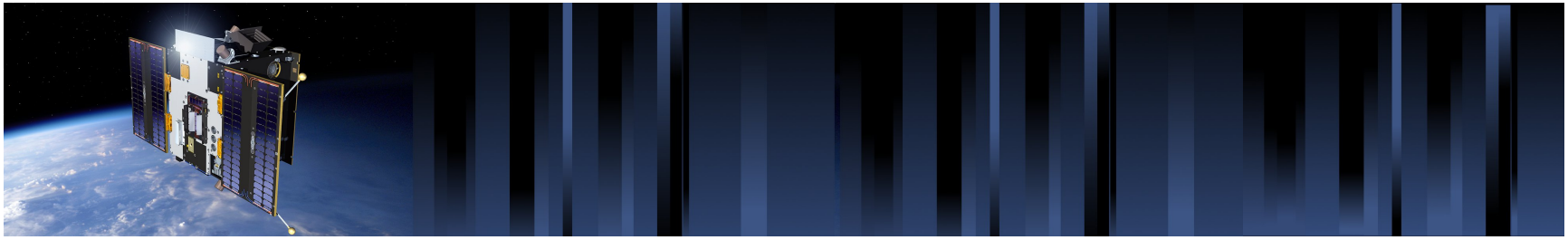
Probe the atmospheric constituents

- **One master project**





Dominique et al. (2009)



ORB – KSB

wrc pmod

esa

CSL

THANKS!

LASP

P.N.Lebedev Physical Institute of the Russian Academy of Science

LPC2E

belspo

MPS

Max-Planck-Institut für Sonnensystemforschung