Environment for **H**uman **E**xploration and **RO**botic **E**xperimentation in **S**pace

SRC-PAS contribution

www.eheroes.eu

eHeroes

SRC-PAS

Space Research Centre, Polish Academy of Sciences, Solar Physics Division
51-622 Wrocław, ul. Kopernika 11
http://www.cbk.pan.wroc.pl/?l=EN&act=1

SRC-PAS Research

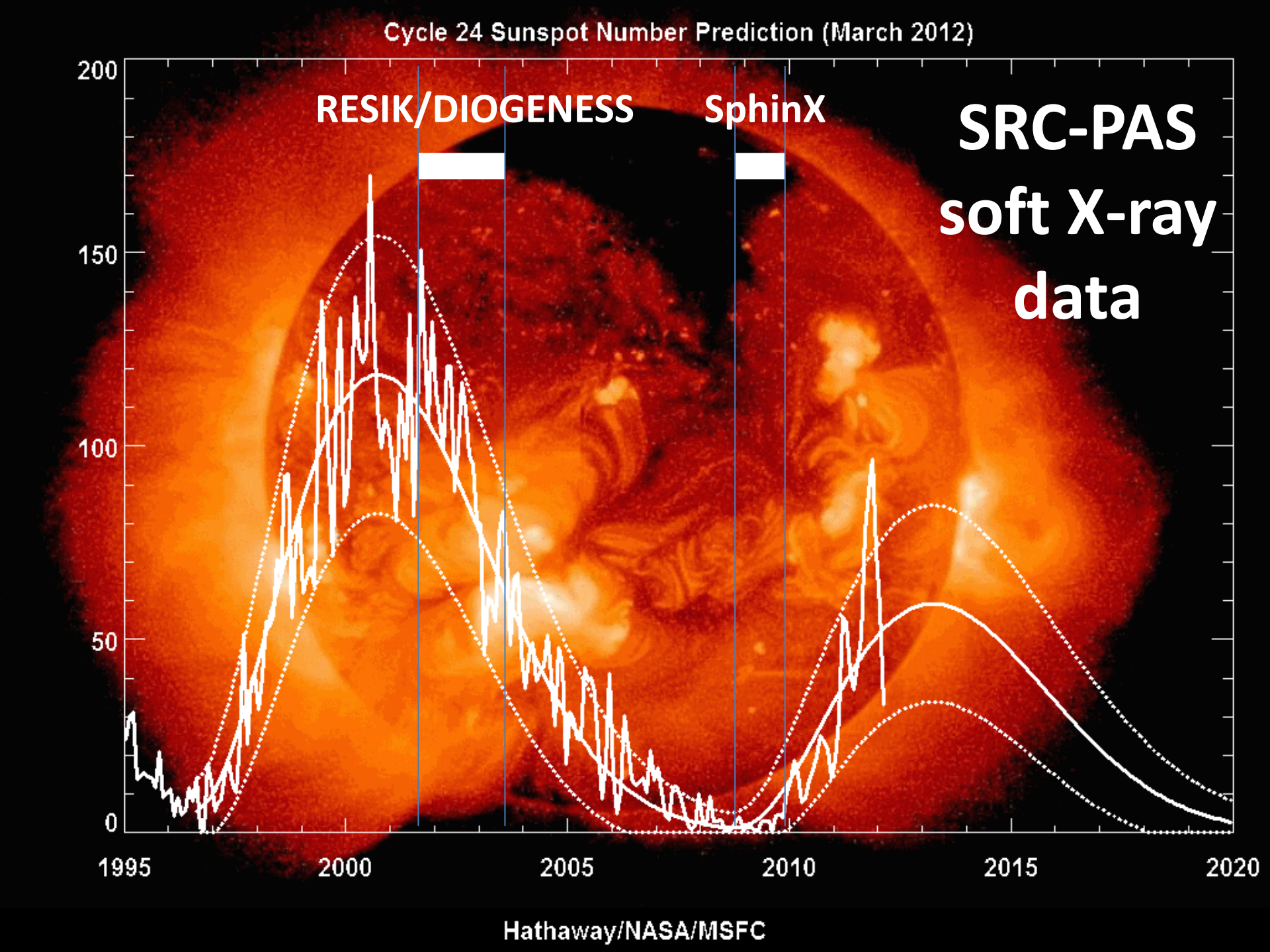
- Solar observation in X-rays.
- Space instruments construction
- Data analysis and interpretation
- Diagnostics of energy release in solar corona
- Physical conditions of flaring plasma parameters
- Hydrodynamic modeling of solar flares
- Abounndances and chemical plasma composition in solar corona.

Solar Maximum Mission, Yohkoh, Exosat, ROSAT, ASCA, SoHO, CORONAS-F, CORONAS-Photon, TRACE, HINODE, ground based data.

Satellite: *CORONAS*-Photon
Instrument: SphinX
Data: spectra, lightcurves
1.0 keV – 15 keV (0.8 Å - 2.4 Å)
Feb 20, 2009 - Nov 28, 2009

Satellite: *CORONAS-F*
Instrument: RESIK – bent crystal spectrometer
Data: spectra, lightcurves
2.0 keV - 3.8 keV (3.3 Å - 6.1 Å)
Aug 24, 2001 - May 22, 2003

Satellite: *CORONAS-F*
Instrument: DIOGENESS – flat crystal spectrometer
Data: spectra, lightcurves
1.9 keV - 4.4 keV (2.8 - 6.7 Å)
Operated only in early mission phase


Cycle 24 Sunspot Number Prediction (March 2012)
RESIK/DIOGENESS
SphinX
SRC-PAS soft X-ray data
200
150
100
50
0
1995
2000
2005
2010
2015
2020
Hathaway/NASA/MSFC

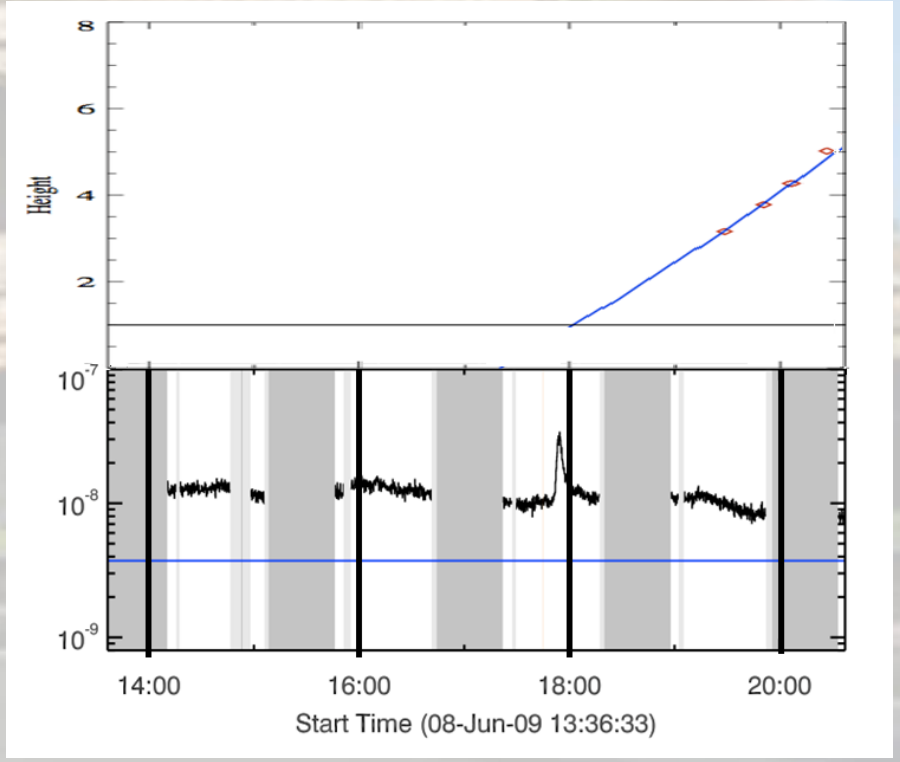
WP2: Value Added Data on Solar Sources (KO)

Task 2.4: Study of the plasma heating and eruptive processes (nanoflares, bright points, micro-dimmings etc.) in small-scale coronal structures and their relevance with transient slow solar wind. Lead – LPI, KUL, ROB, UCL, SRC-PAS

D2.4 Online report "Small-scale solar activity as the source of the transient solar wind".

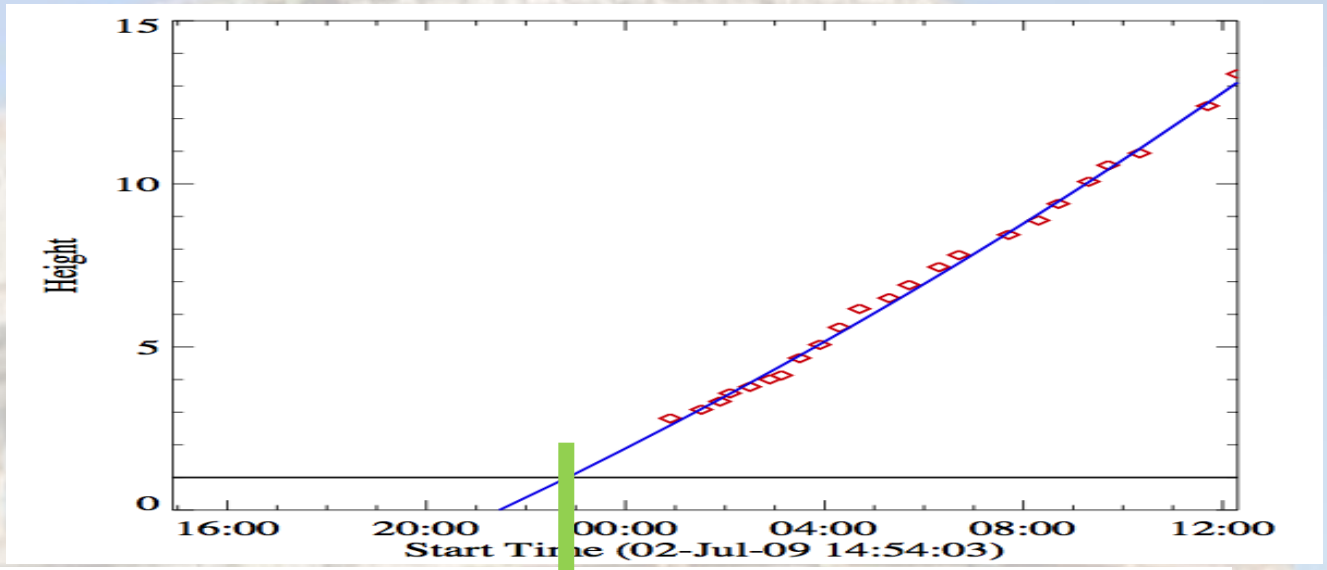
Instruments
SphinX

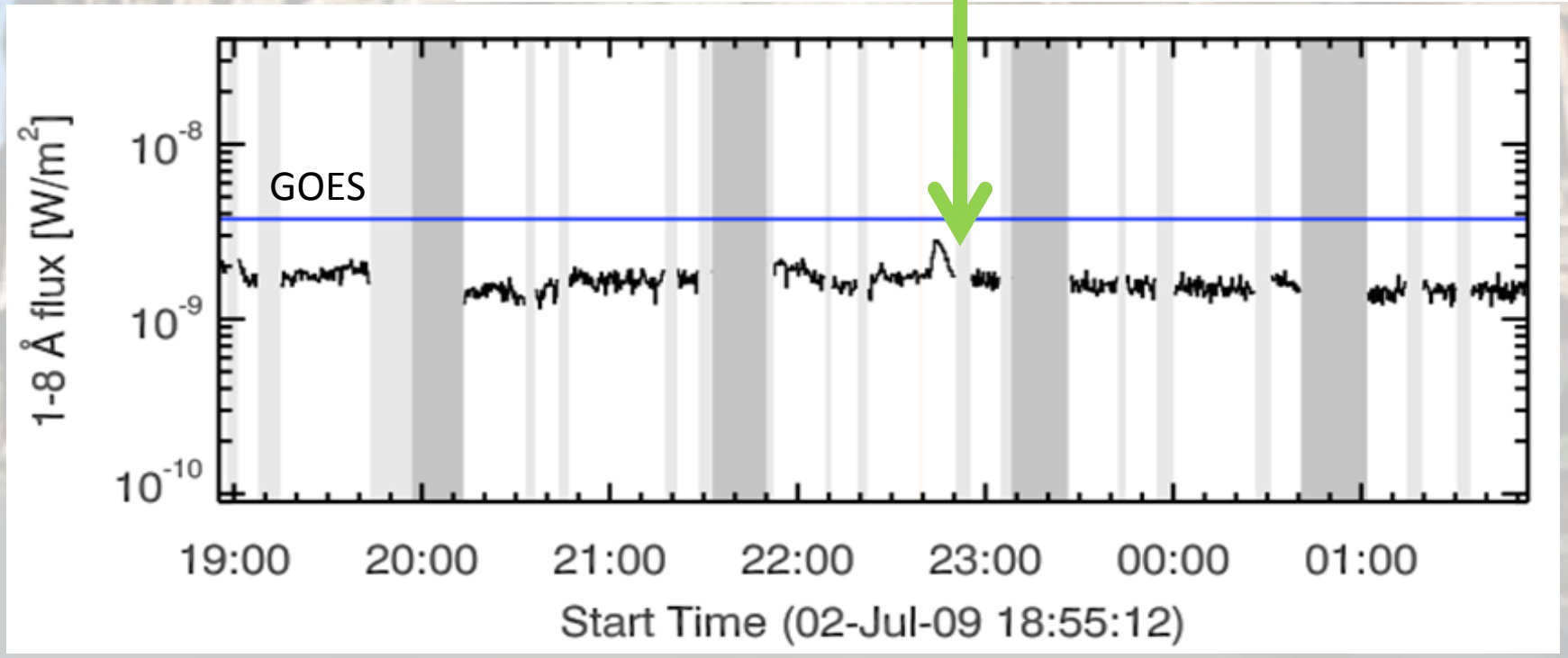
- **Level 1 SphinX small event catalogue with physical params T, EM, E_{th} …**
- **Identification of evens related to transient phenomena in SW**
- **Comparison ot their parameters with the rest of events**
- **Dissemination (in cooperation with WP6)**



2009-07-03 00:54:03
first C2 obs.
v = 178 km/s,
a=1.0 m/s²

(Event below GOES sensitivity)





WP3: Solar and Space events and their evolution: (CNRS)

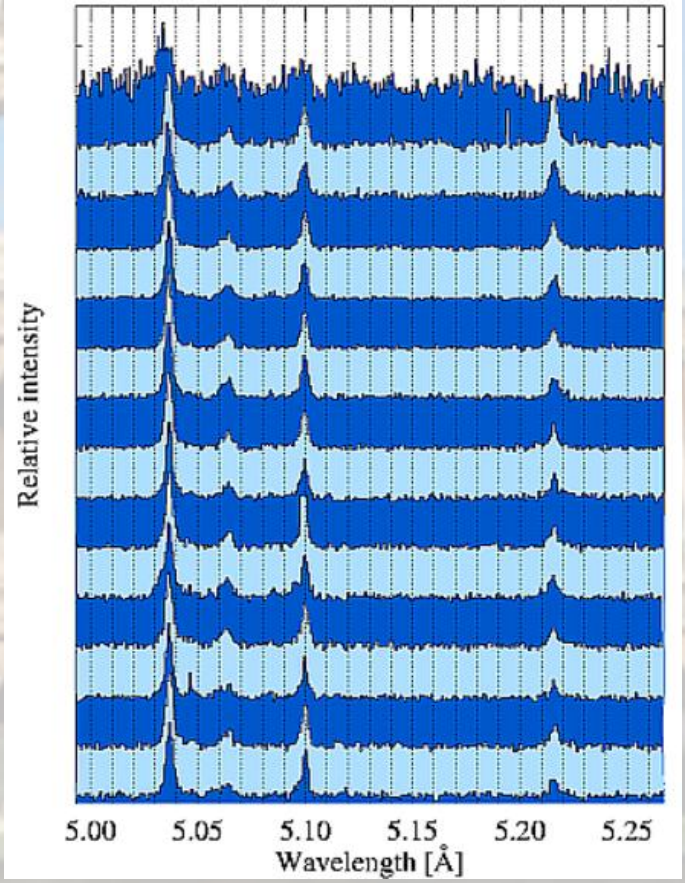
Task 3.4: Flare plasma: plasma composition, thermal energy, FIP composition bias.

Lead – SRC-PAS, participants - UCL, LPI

D3.3 Flare plasma properties, FIP composition bias – Diogeness and RESIK database.

Instruments: Diogenes, RESIK, SphinX, RHESSI

- **Reduction of RESIK and DIOGENESS data**
- **Conversion to FIT format**
- **hi-res spectroscopy**
- **RESIK/DIOGENES data interpretation**
  data interpretation DEMs
- **Abundances, FIP bias, plasma motions, chemical composition and properties of plasma in solar flares and AR**
- **Event-to-event variability interpretation in within existing models.**
- **Dissemination (in cooperation with WP6)**



DIOGENESS

25 August 2001 X5.3 flare spectra

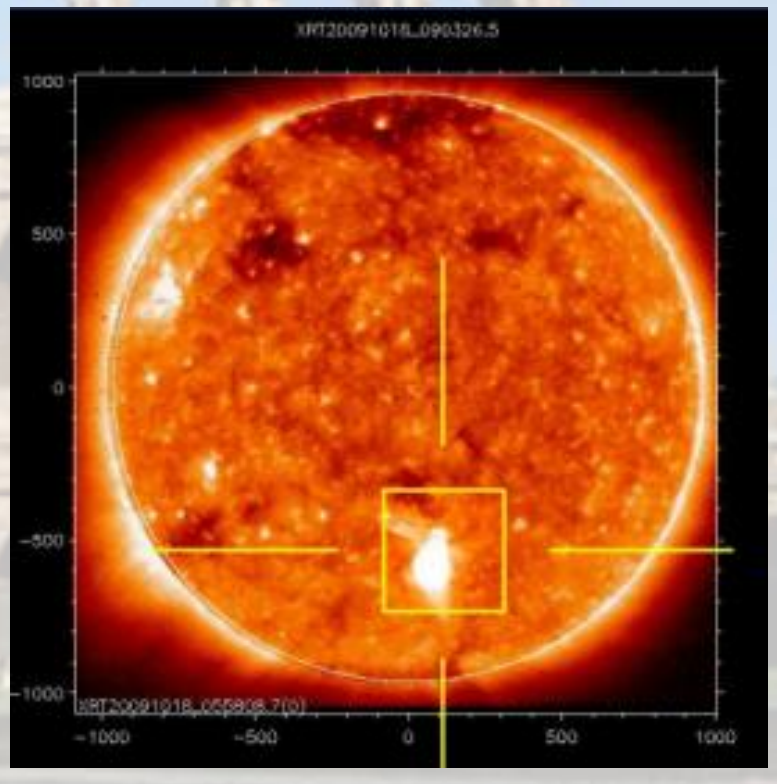
$\lambda / \Delta\lambda \sim 1000$

WP4: Exploring Space in Time: (lead UOulu)
Task 4.2: Parameters for spatial-temporal distributions of flares and CMEs.
(Lead – UOulu, participants – ROB, SRC-PAS)
D4.2) Report on optimum parameters for the spatial-temporal distribution of flares and CMEs.

Instruments
SphinX

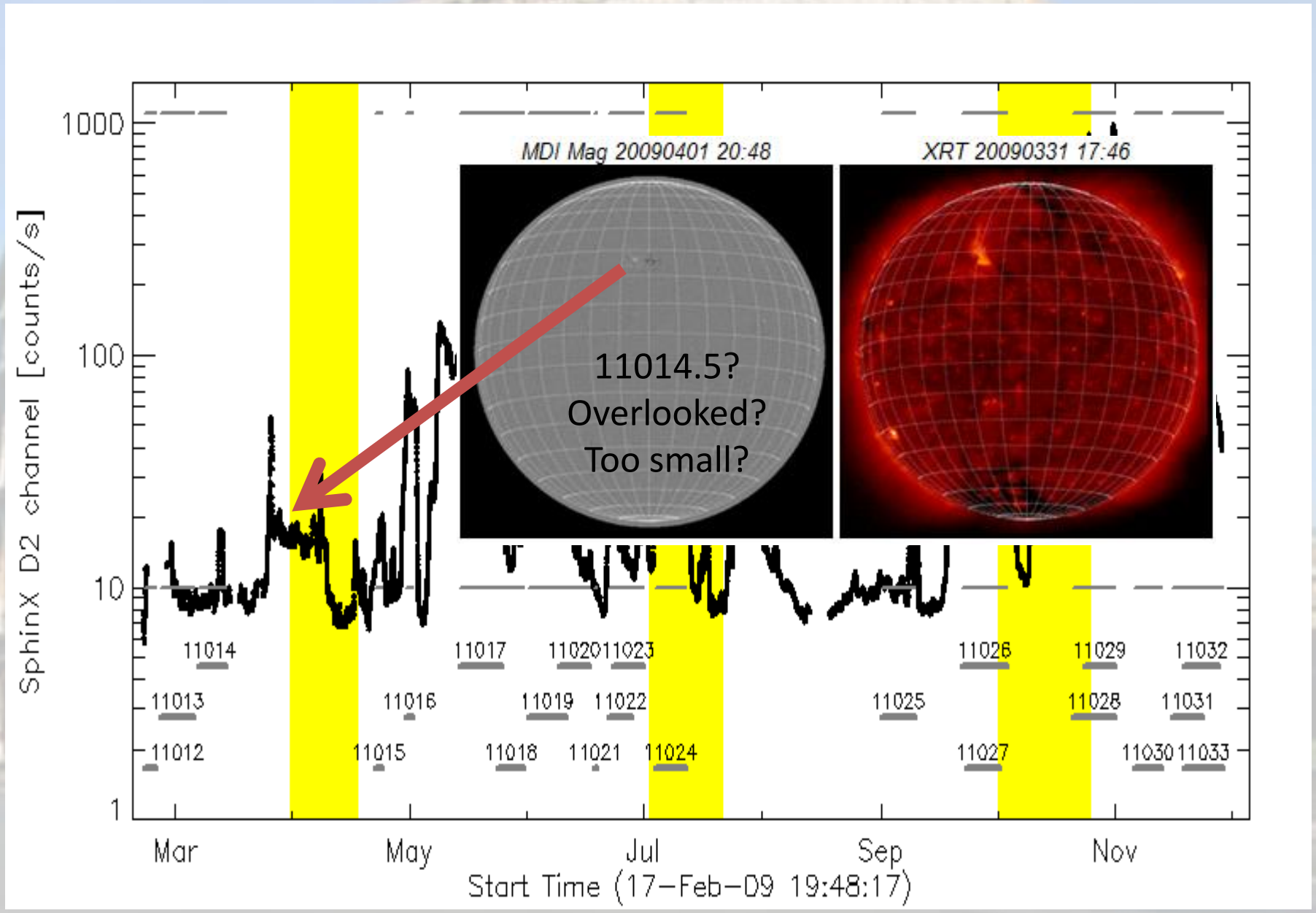
- **SphinX AR/small events database – spatial temporal distributions of nanoflares and bright points (minimum of activity)**
- **Flares and CMEs relationship**
- **SphinX observed AR flare productivity**
- **Dissemination (in cooperation with WP6)**

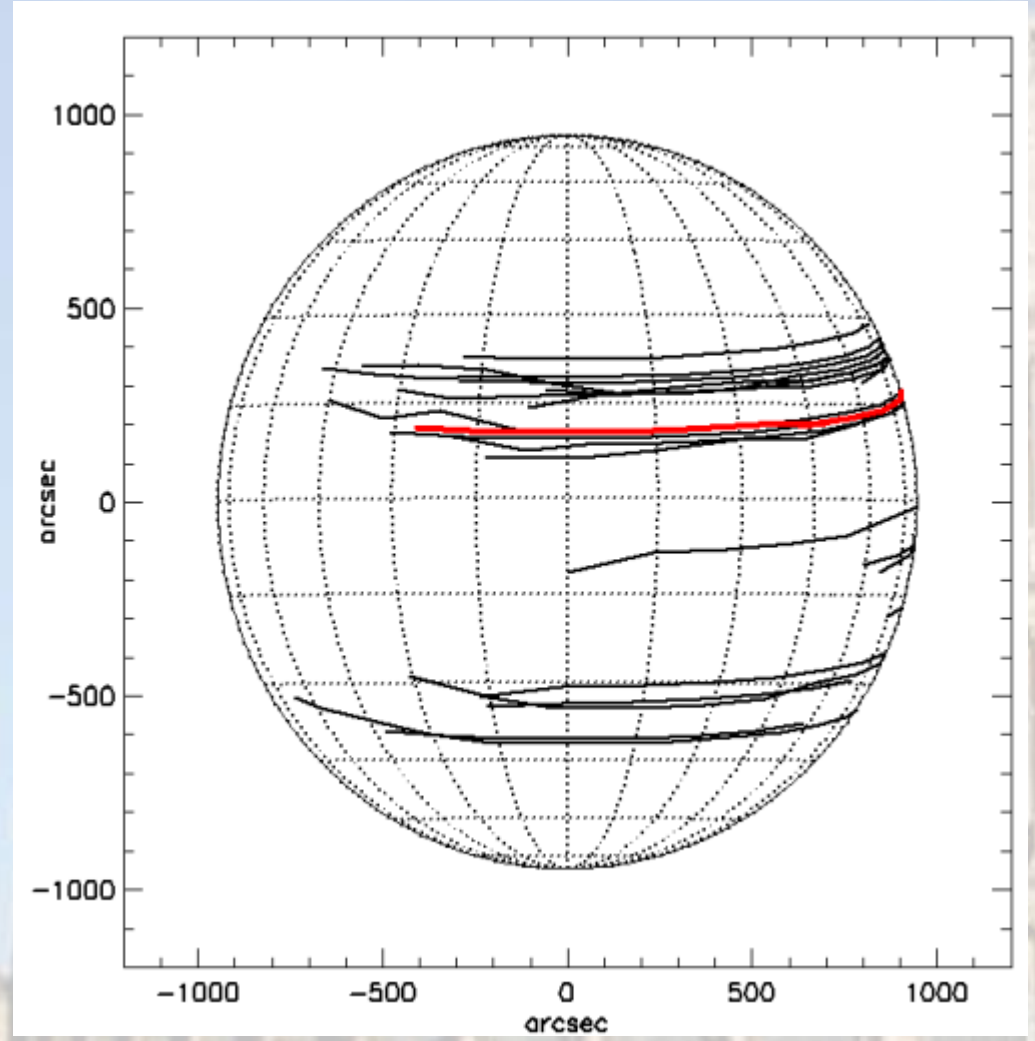
Context data for positions necessary
XRT, WL ground based, magnetograms

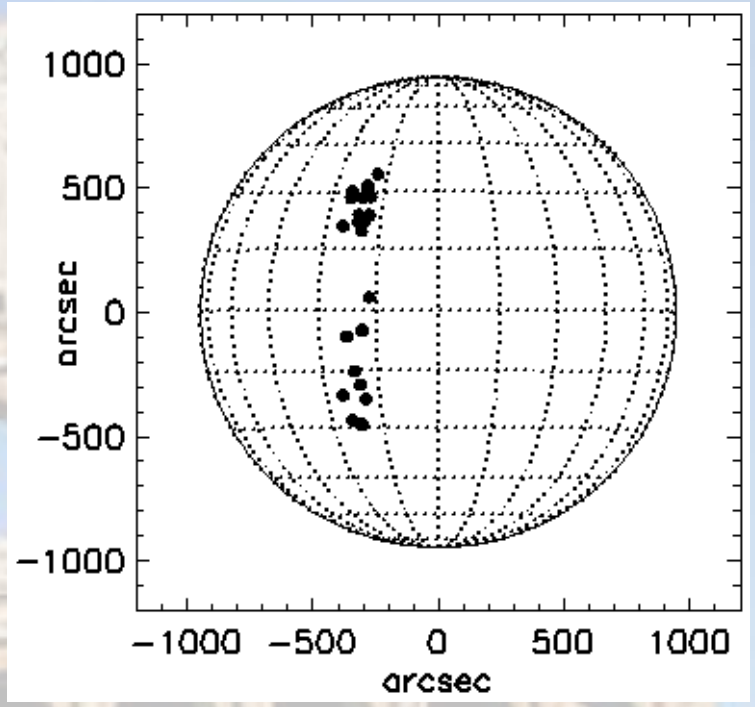


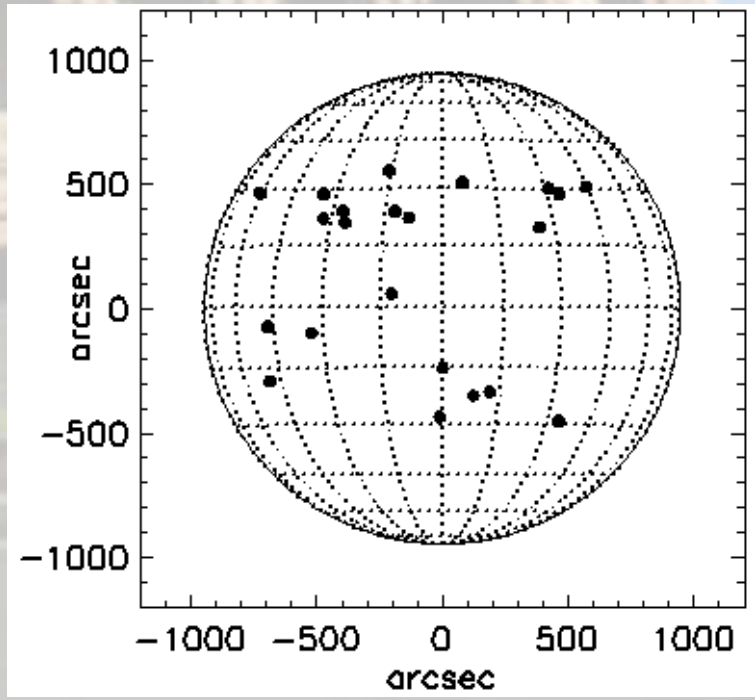
October 18, 2009
A1.2 flare in AR

Active Region observations ~60% of mission









22 SphinX observed ARs good diff. rot. model for photosphere and corona

Why minimum

- Reference point
- Easy modeling
- Most safe seasons for space exploration

WP5: Environment (Imapct on) for Space Exploration. Lead LPI

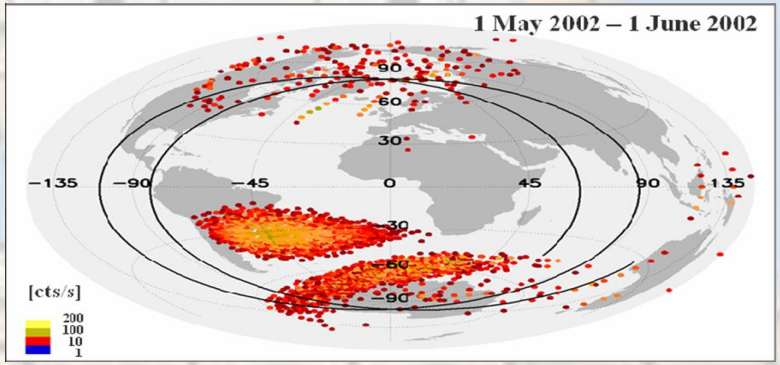
Task 5.5:. Particle environmental impacts on space-based instruments on LEO high-latitude orbits. Lead – SRC PAS, participants - LPI, ROB

D5.5) Online database and analysis of the variability of particle environment.

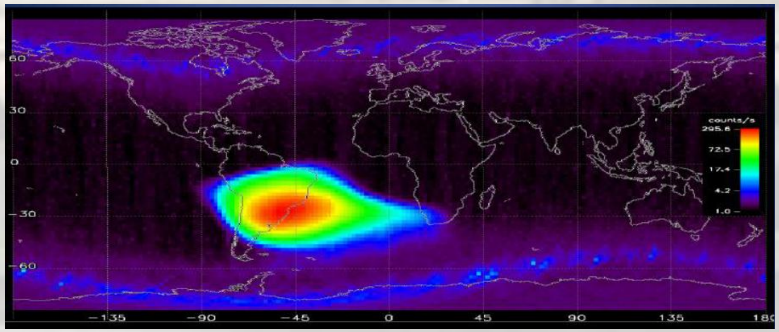
Instruments

RESIK, SphinX

- **Particle environment maps for RESIK and SphinX**
- **Influence of particles on instrument electronics and detectors**
- **Particle background in measurements**
- **Dissemination (in cooperation with WP6)**



Particle environment as seen by RESIK detectors in May 2002 – near **maximum** activity.



Particle environment as seen by SphinX detectors in May 2009 – near **minimum** activity.


Thank you