

Energetic particle activity in magnetospheric polar regions and the SAA as seen by X-rays detectors of RESIK spectrophotometer aboard Coronas-F.



M. Kowaliński, J. Sylwester, S. Gburek, P. Podgórski

Solar Physics Division of Space Research Centre

Polish Academy of Sciences,

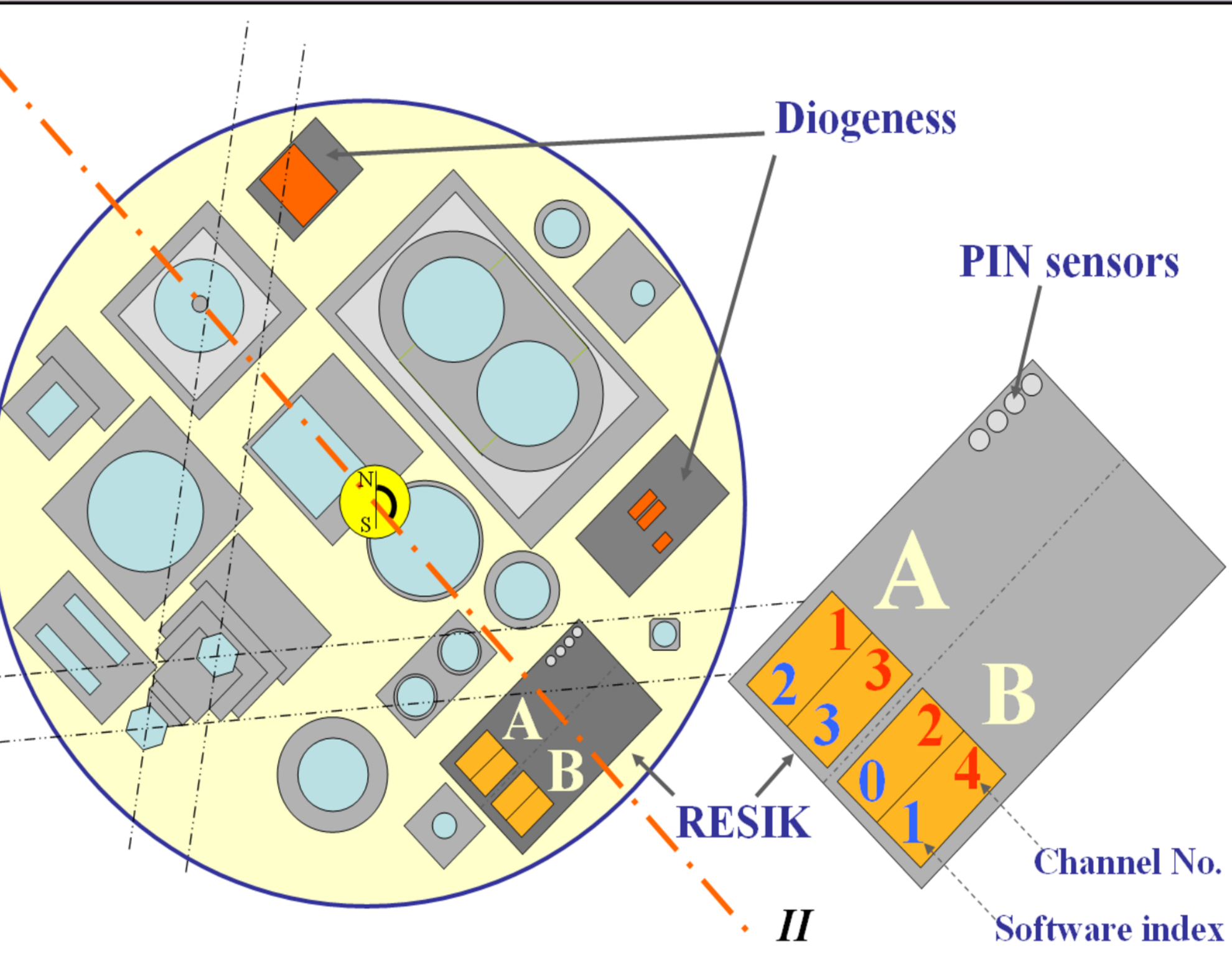
Wroclaw, Poland

D. Lisin

IZMIRAN

Russian Academy of Sciences

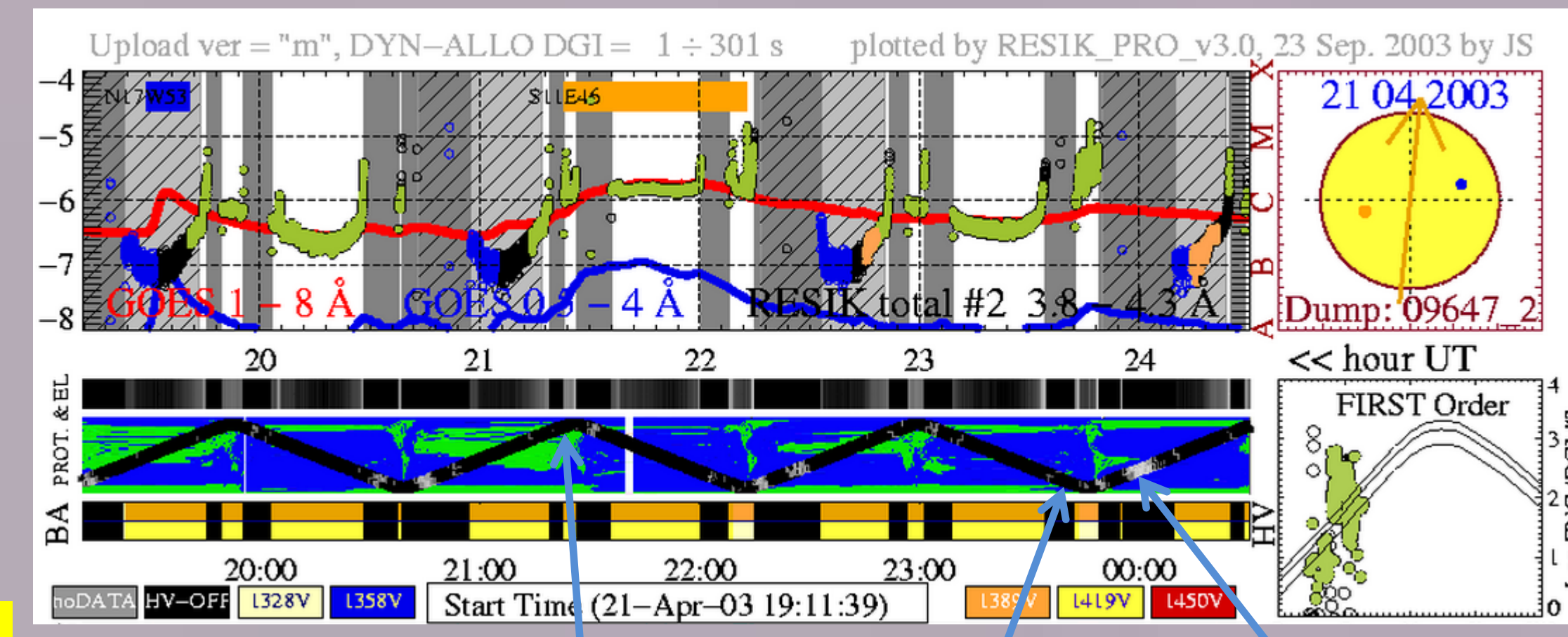
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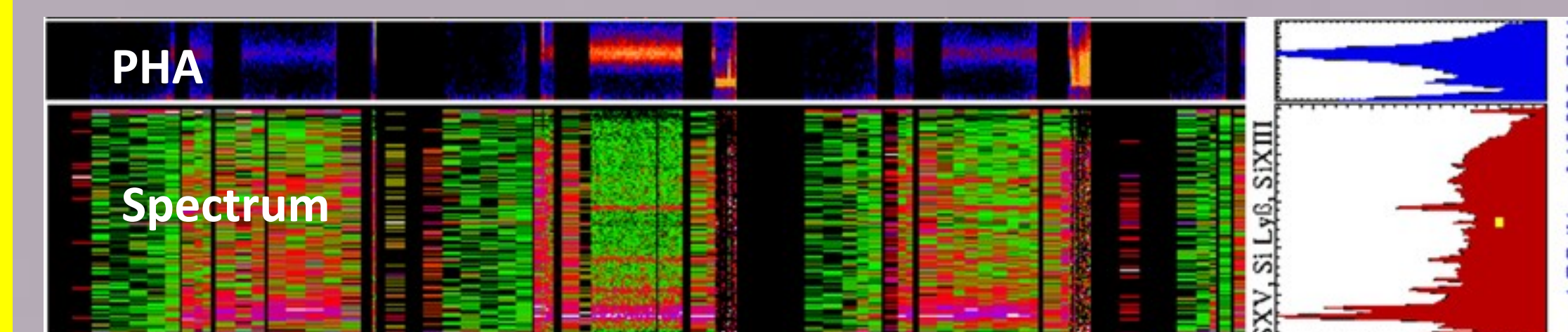
The view from the top of CORONAS-F instrument platform. RESIK channels are indicated

RESIK was a Bragg crystal spectrometer designed to observe solar active region and flare plasmas. Its spectral channels span ten different spectral bands in 1.1 Å - 6.1 Å range in the first, second and third order reflection. Two pairs of crystals illuminate two large position-sensitive double proportional gas detectors. These detectors are also sensitive to charged particle hits and secondary X-rays. Records of science and housekeeping data observed by RESIK are shown on:

http://www.cbk.pan.wroc.pl/experiments/resik/resik_catalogue.htm

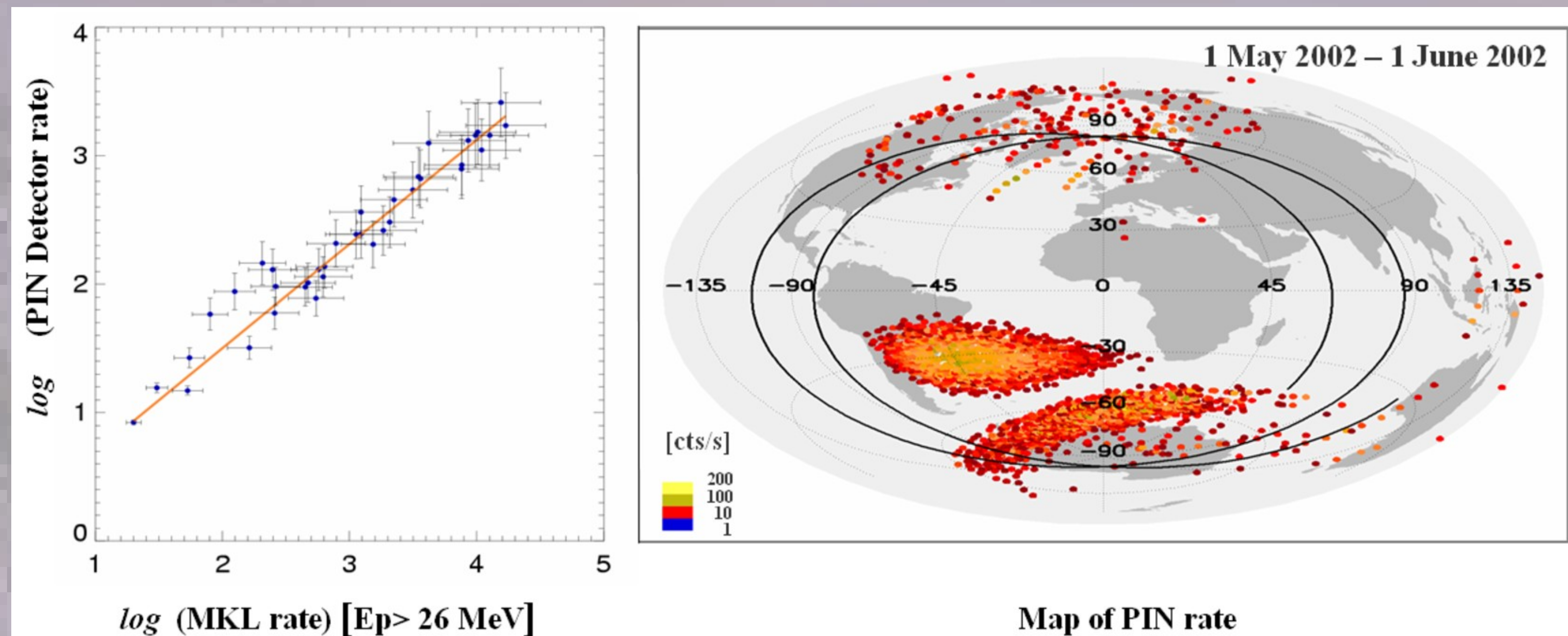


PIN counts in: North polar region South polar region SAA

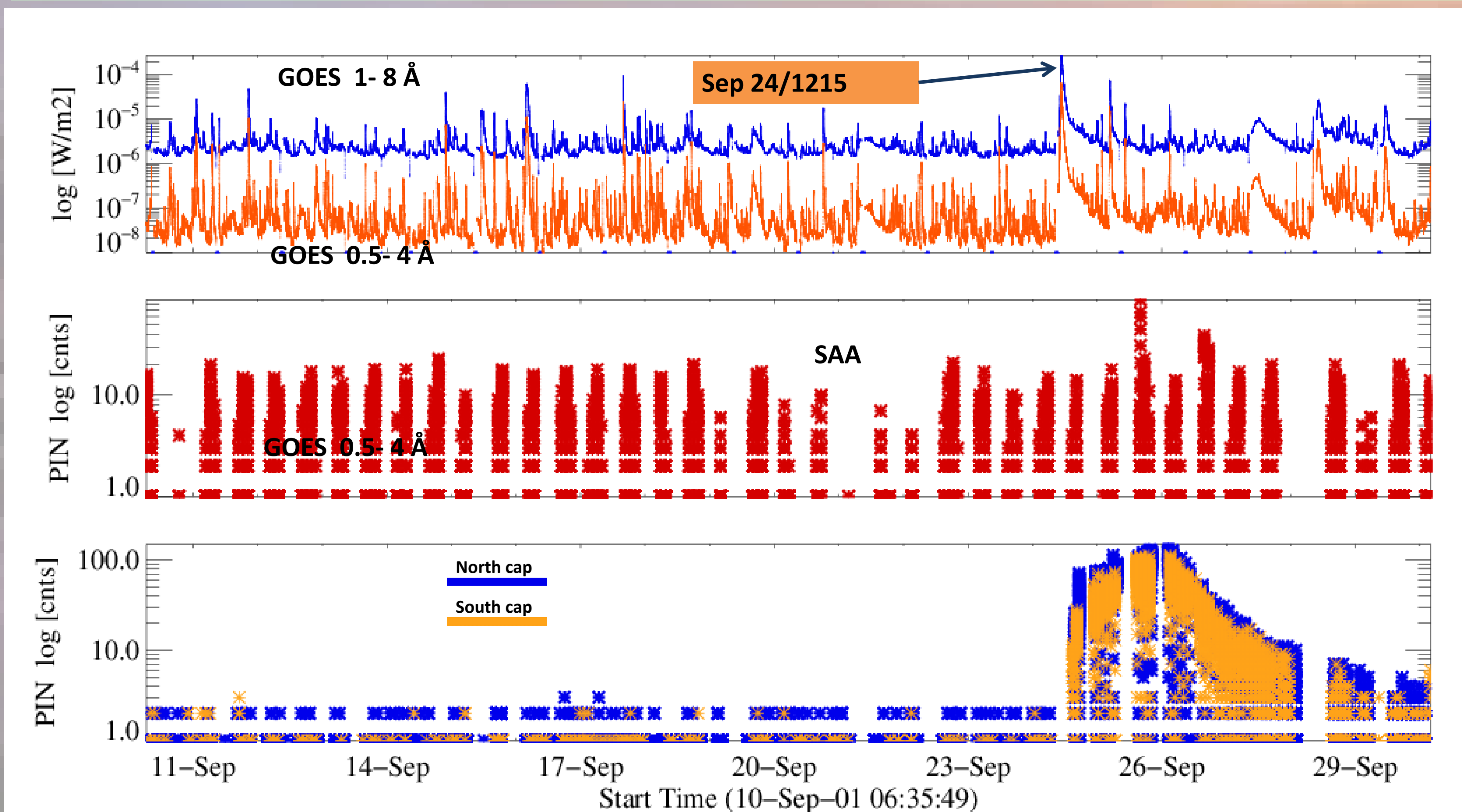


Fragments of example page of RESIK online catalogue. More than 1000 pages are available for inspection

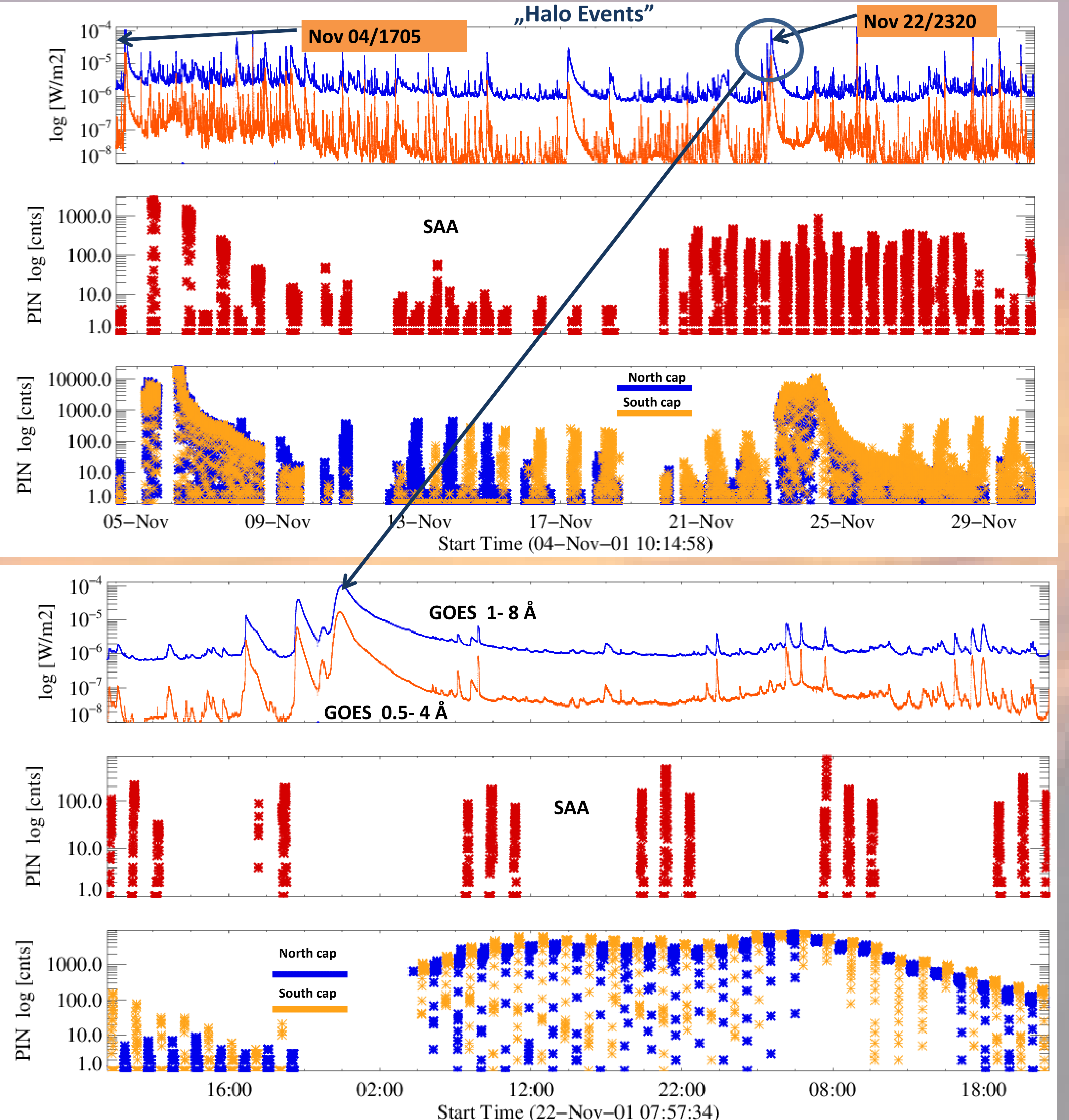
RESIK (**R**entgenovsky **S**pectrometer s **I**zognutymi **K**ristalami) was the bent crystal spectrometer placed aboard the CORONAS-F Russian satellite. CORONAS-F was observing solar activity from July 31, 2001 to December 6, 2005. The satellite was orbiting the Earth at a height of about 500 km; the orbit inclination was 82.5 degrees. RESIK was equipped with four shielded PIN diode detectors. These detectors were used in order to detect background counts due to energetic particle penetration occurring mostly during passages through polar regions and SAA area. The characteristics of RESIK PIN diode detectors allow to sense particles with the energies above ~1 MeV. We present diagrams illustrating the coupling of the particle environment penetrated by CORONAS-F with selected proxies of solar activity.



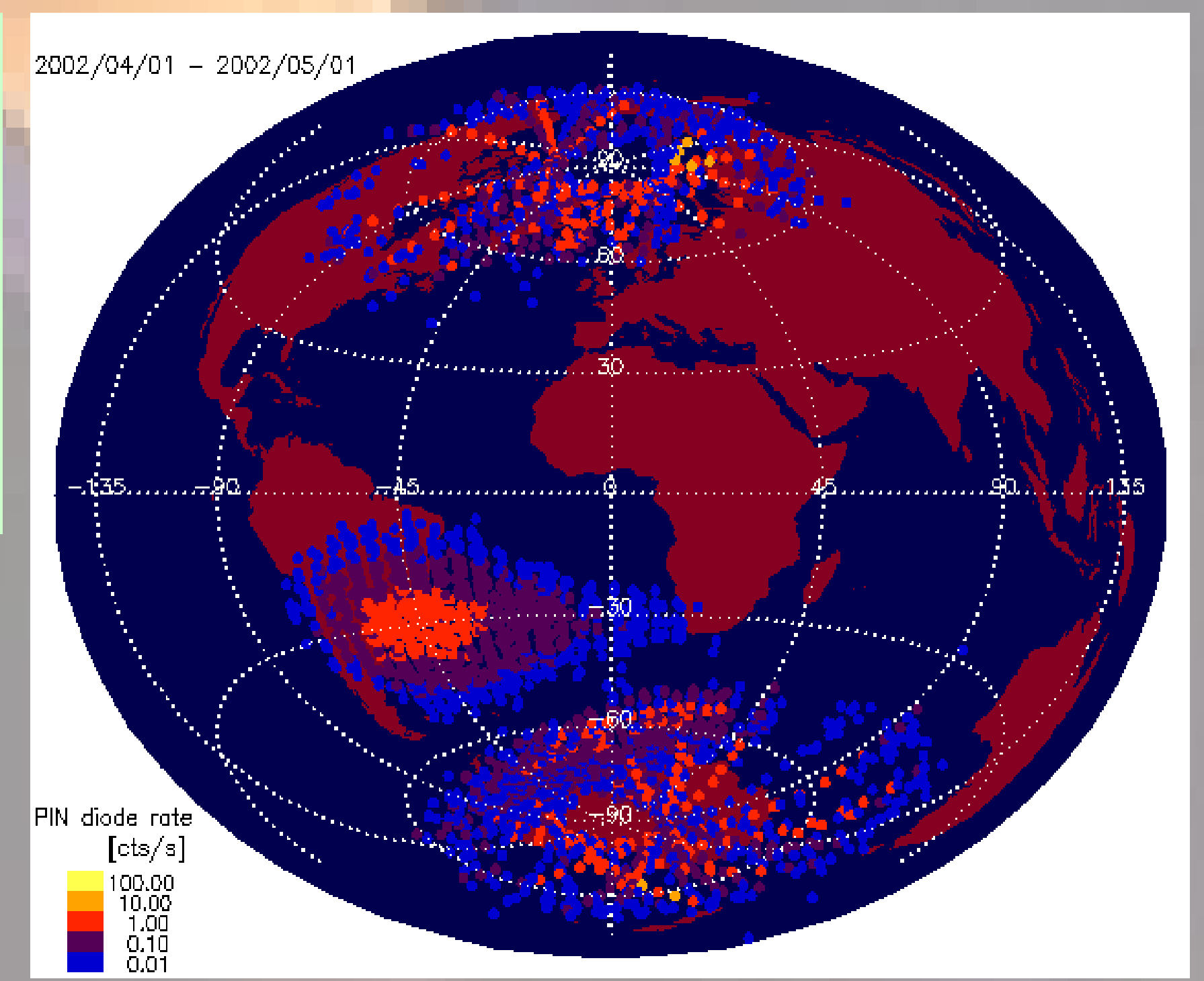
In addition to the large gas detectors, inside RESIK were placed 4 PIN sensors sensitive only to the charge particles from the spacecraft environment. In the left panel the correlation diagram shows a direct correspondence between the rates seen by these PIN sensors and the rate measured by the Russian MKL instrument (<http://coronas.izmiran.ru/F/MKL/>). The MKL - cosmic ray monitor, was used to record fluxes and spectra of the 1 - 200 MeV protons and 0.5 - 12 MeV electrons. In the right panel a map is presented showing the location of regions with increased rates of the PIN sensors as determined from data collected over May 2002.



The disturbances in the state of Earth magnetosphere are caused by the solar activity phenomena such as: solar wind, solar energetic particle clouds and Coronal Mass Ejections. CMEs effects are especially noticeable in polar regions and to much lesser extent in the South Atlantic Anomaly (SAA). In both polar regions, increased PIN rates are distinctly observed to follow some, but not all flares seen on the GOES soft X-ray plot. The SAA region shows up also some activity-associated variability, however with a much smaller amplitude. RESIK PIN sensors have been collecting data from September 2001 to September 2003 and these data are open for common analysis.



Right: The monthly map showing the location of regions with increased rates of the PIN sensors, after flares M2 and X1, as determined from data collected over April 2002.



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