Potential use of NMDB for the real-time Observation and Specification of the near-Earth Radiation environment

http://nmdb.eu mail@nmdb.eu

EU FP7 project Contract No RI-213007

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CAPACITIES

e-infrastructure

C A U

Christian-Albrechts-Universität zu Kiel

UNIVERSITY of OULU
OULUN YLIOPISTO

IEP SAS
SPACE PHYSICS

u b

b
UNIVERSITÄT
BERN

IZMIRAN

l'Observatoire de Paris | LESIA

National & Kapodistrian University of Athens
Athens Neutron Monitor Station

COSMIC RAY DIVISION
Yerevan Physics Institute

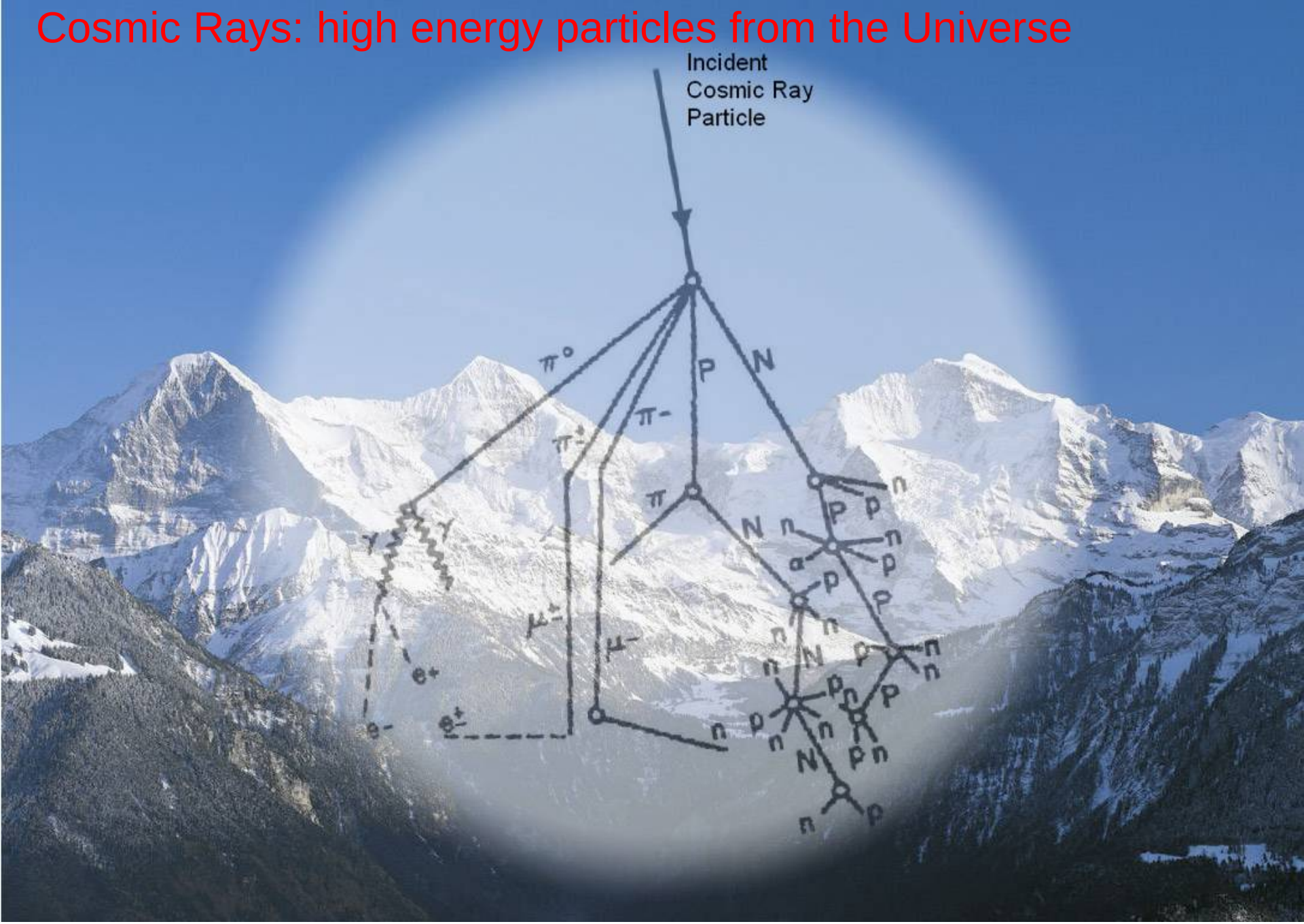
INAF - UNIRomaTre
S.V.I.R.CO.

Institute of Ionosphere
Republic of Kazakhstan

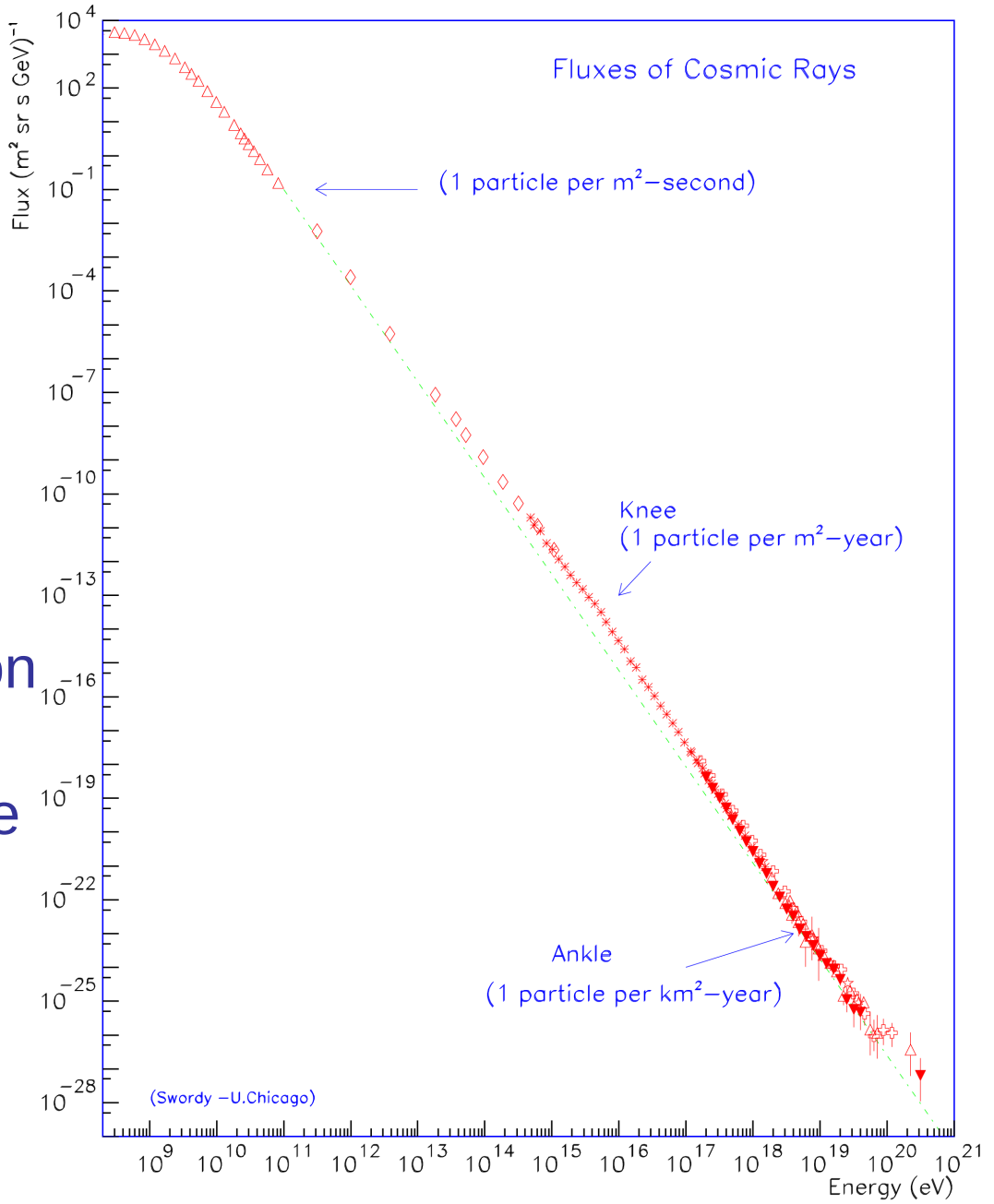
TEL AVIV UNIVERSITY אוניברסיטת תל-אביב
TAU -ICRC

SRG

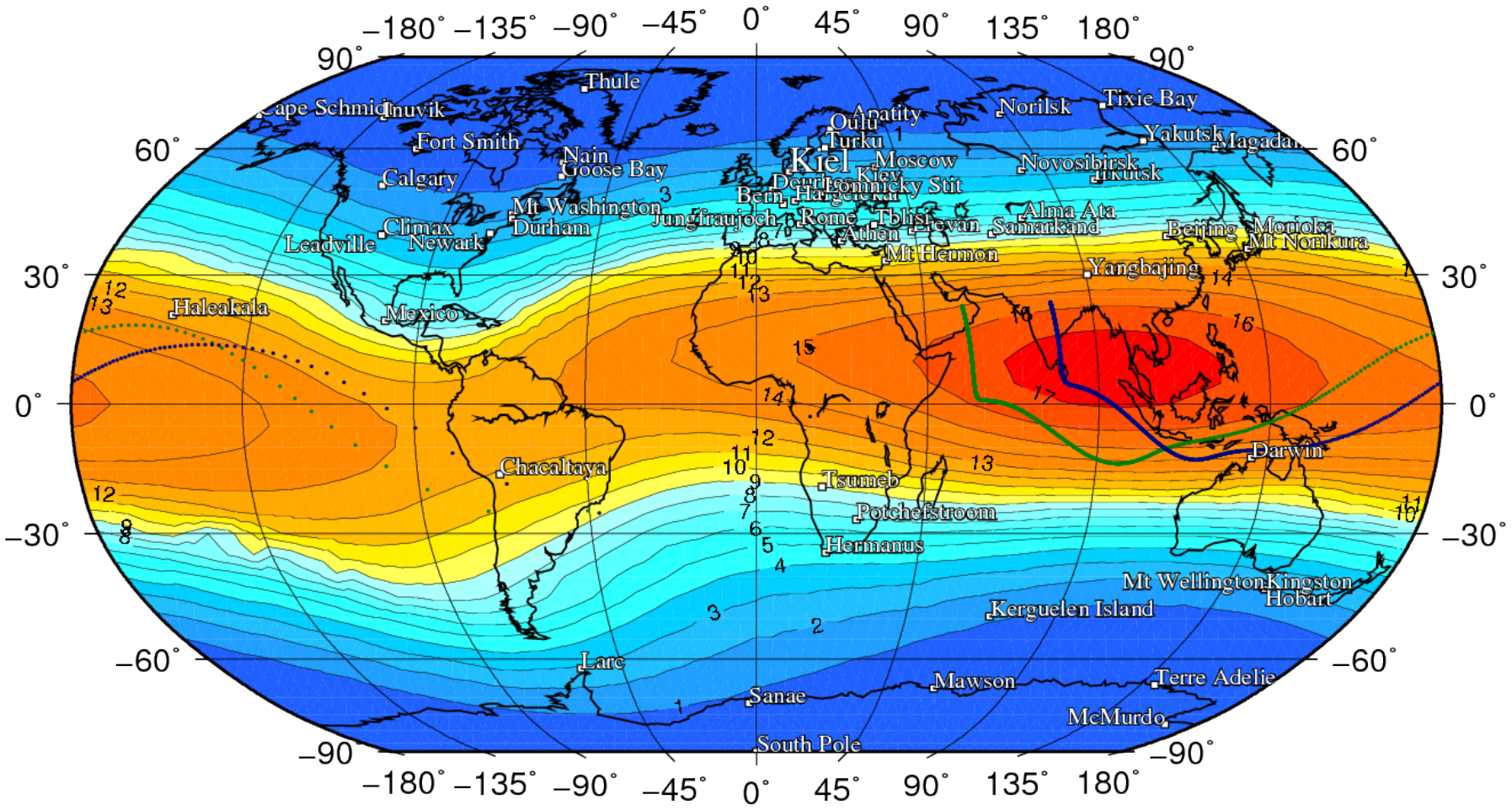
Cosmic Rays: high energy particles from the Universe



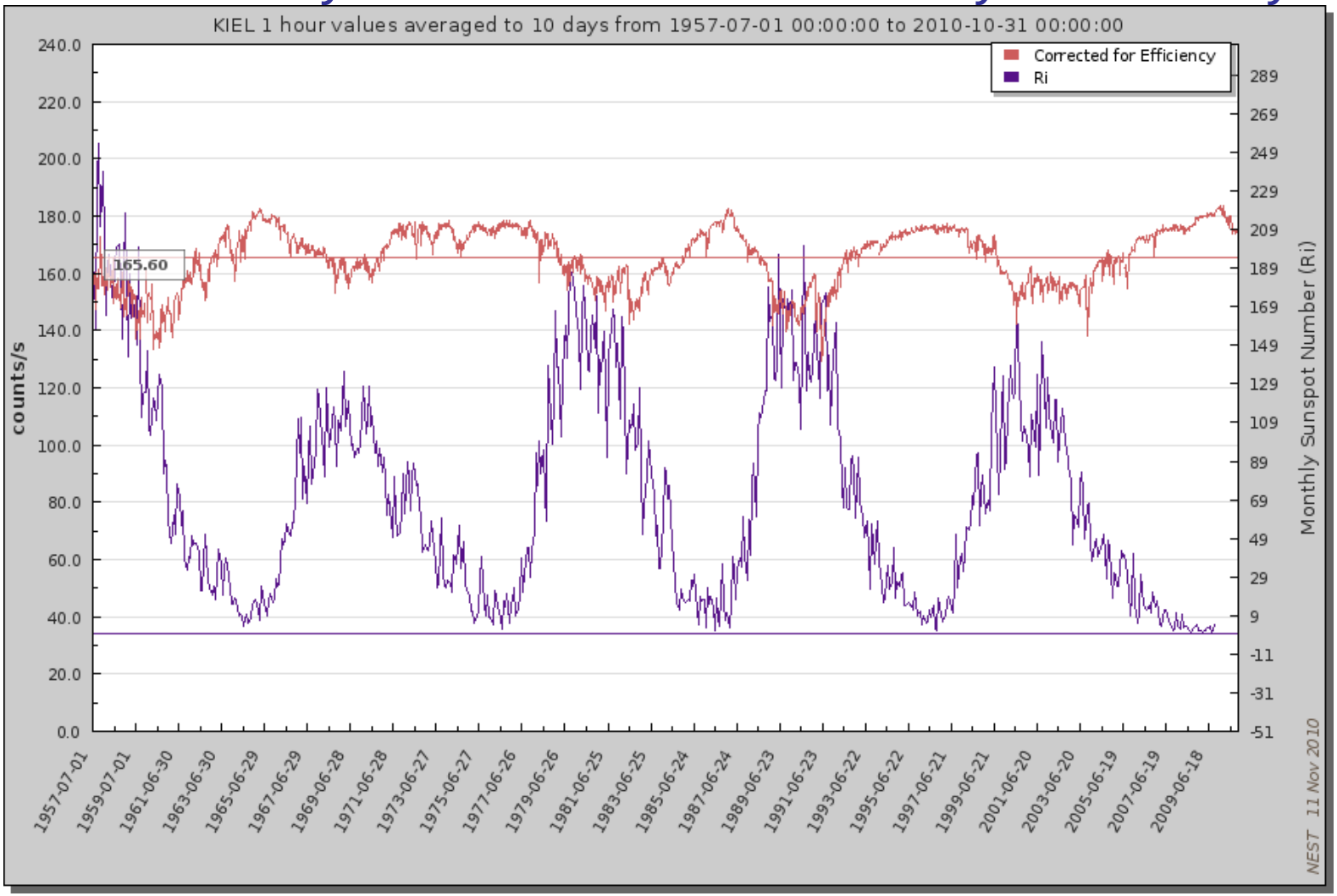
- Cosmic Ray energies and intentities cover many orders of magnitude
- Higher energies require larger detectors
- Detection range for Neutron Monitors: 0.5-20GeV
- Energies above 10GeV are not affected by the solar magnetic field



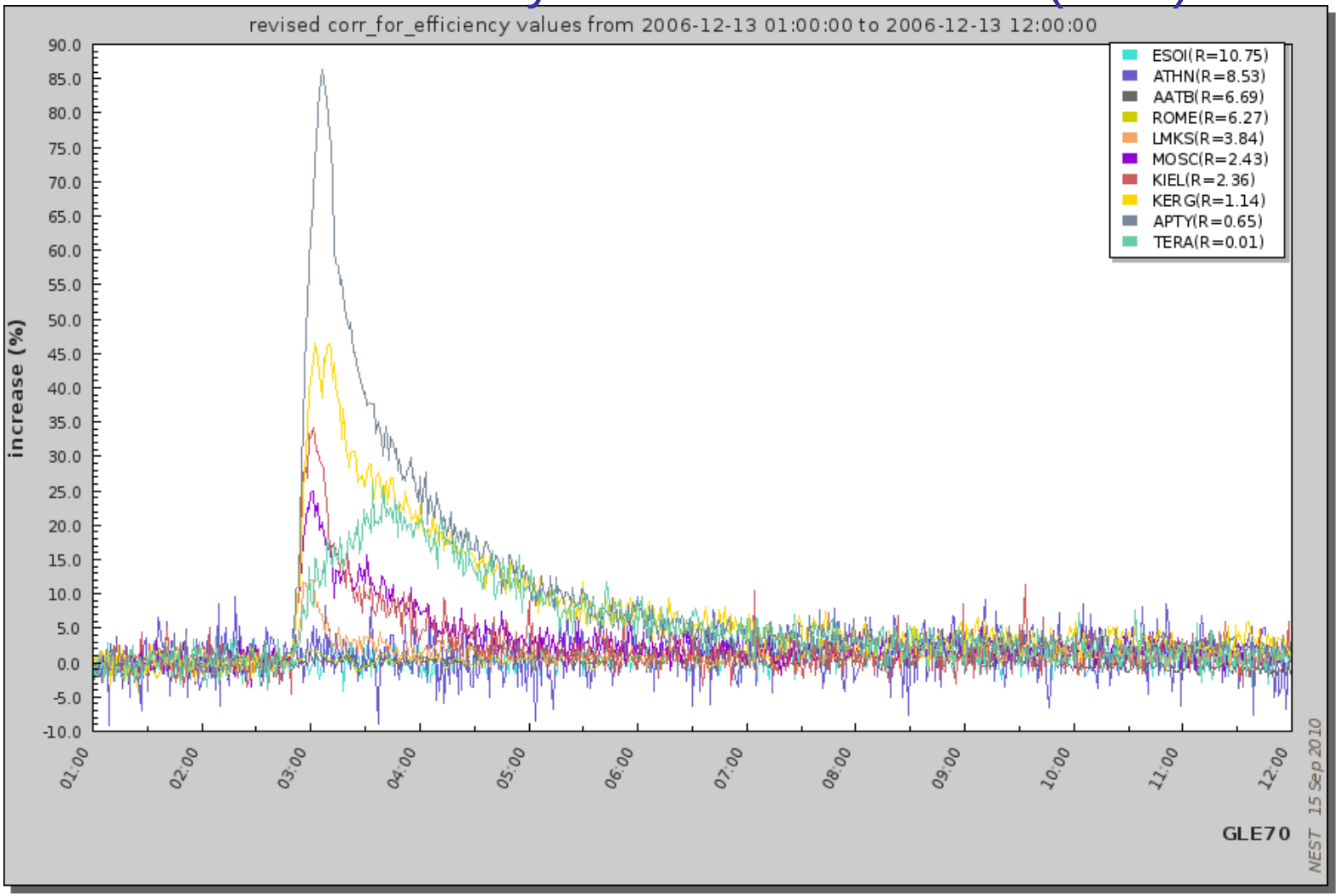
Worldwide Neutron Monitor network



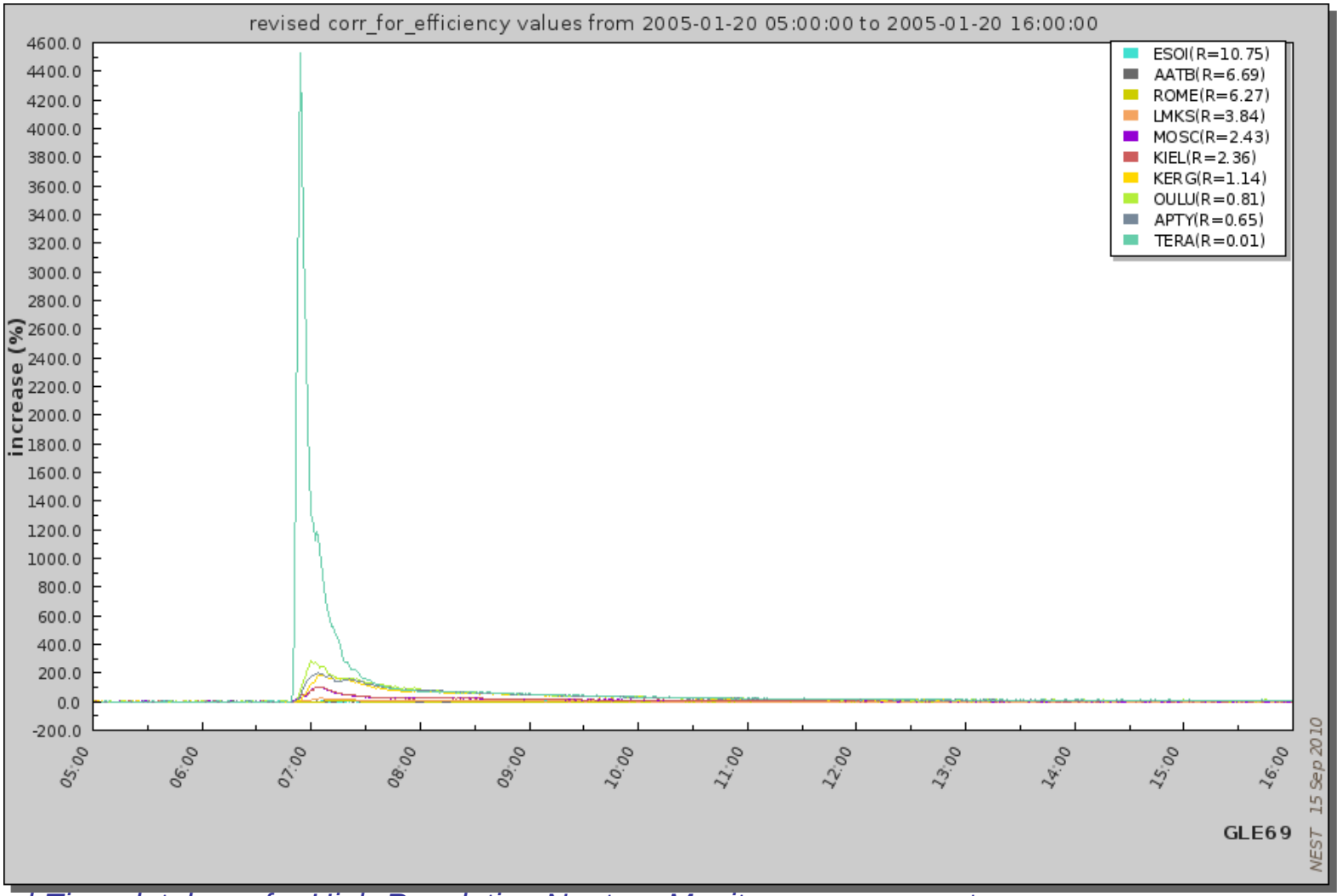
More than 50 years of data: modulation by the solar cycle



Solar Cosmic Rays: short term events (GLE)



Increase is strongly dependent on location and altitude



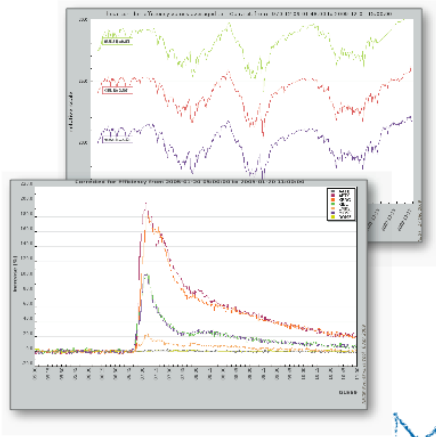
Status in 2007

- Data in 1h resolution and common format available at World Data Center (WDC)
- No real-time data
- No high-resolution data
- Not suitable for Space Weather applications

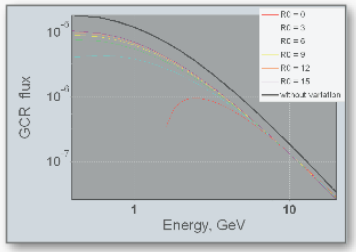
NMDB goals

- Provide data in standard format
- Provide high resolution data
- Provide real-time data (< 5 min delay)
- Make data easily accessible
- Provide designs for modern registration systems
- Applications

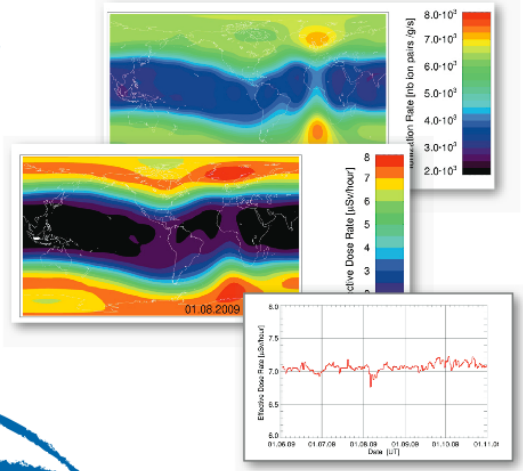
NEST TOOL TO PLOT AND RETRIEVE DATA



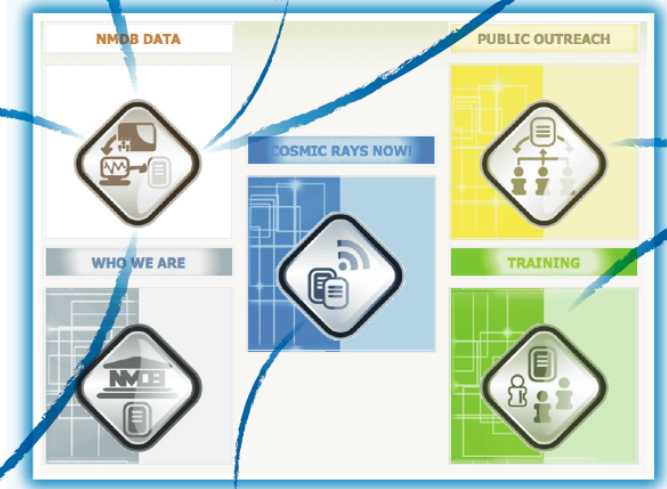
SPECTRUM OF GCR



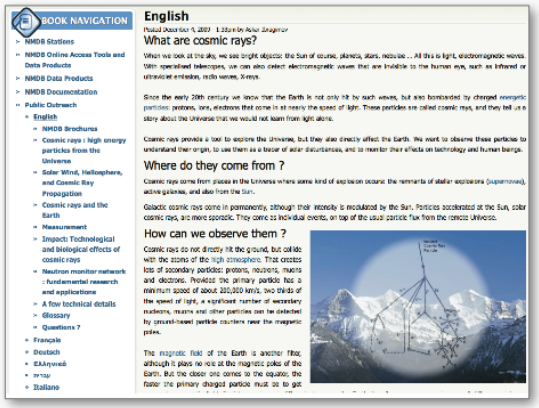
IONISATION RATES AND DOSE RATES IN THE ATMOSPHERE (every 6 hrs)



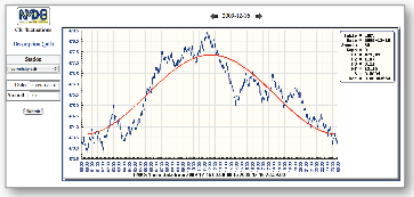
GLE ALERT IN REAL TIME



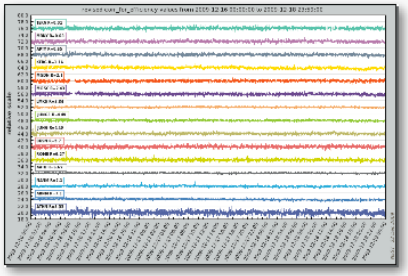
TRAINING AND PUBLIC OUTREACH



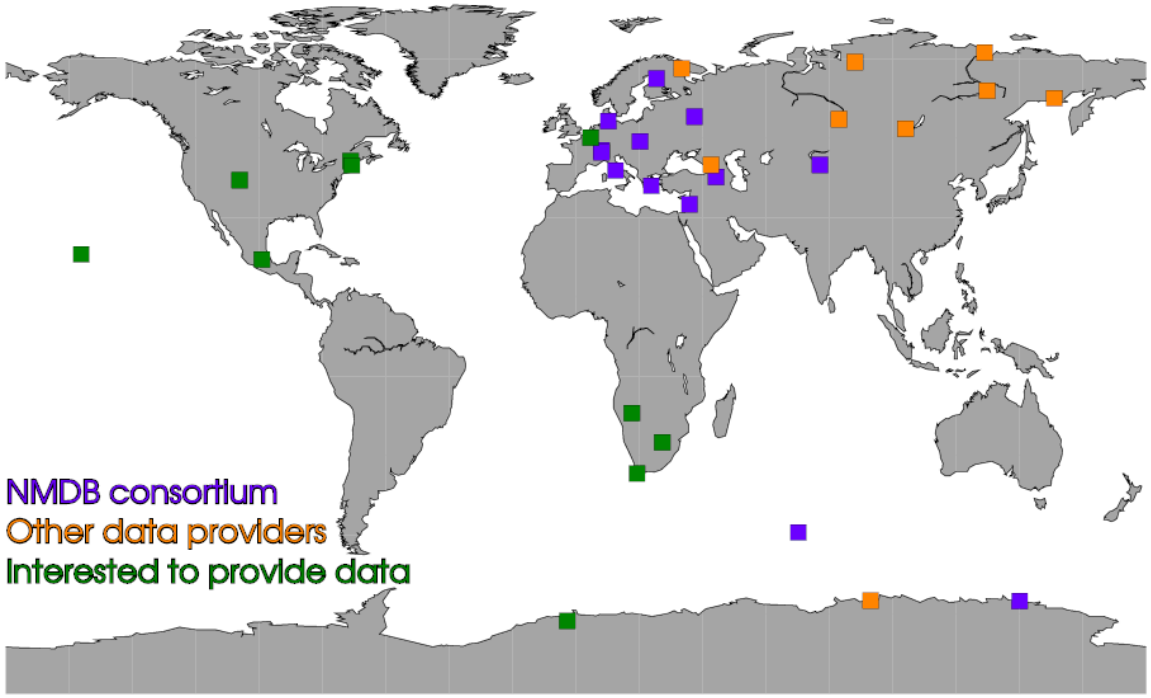
DAILY CR VARIATION



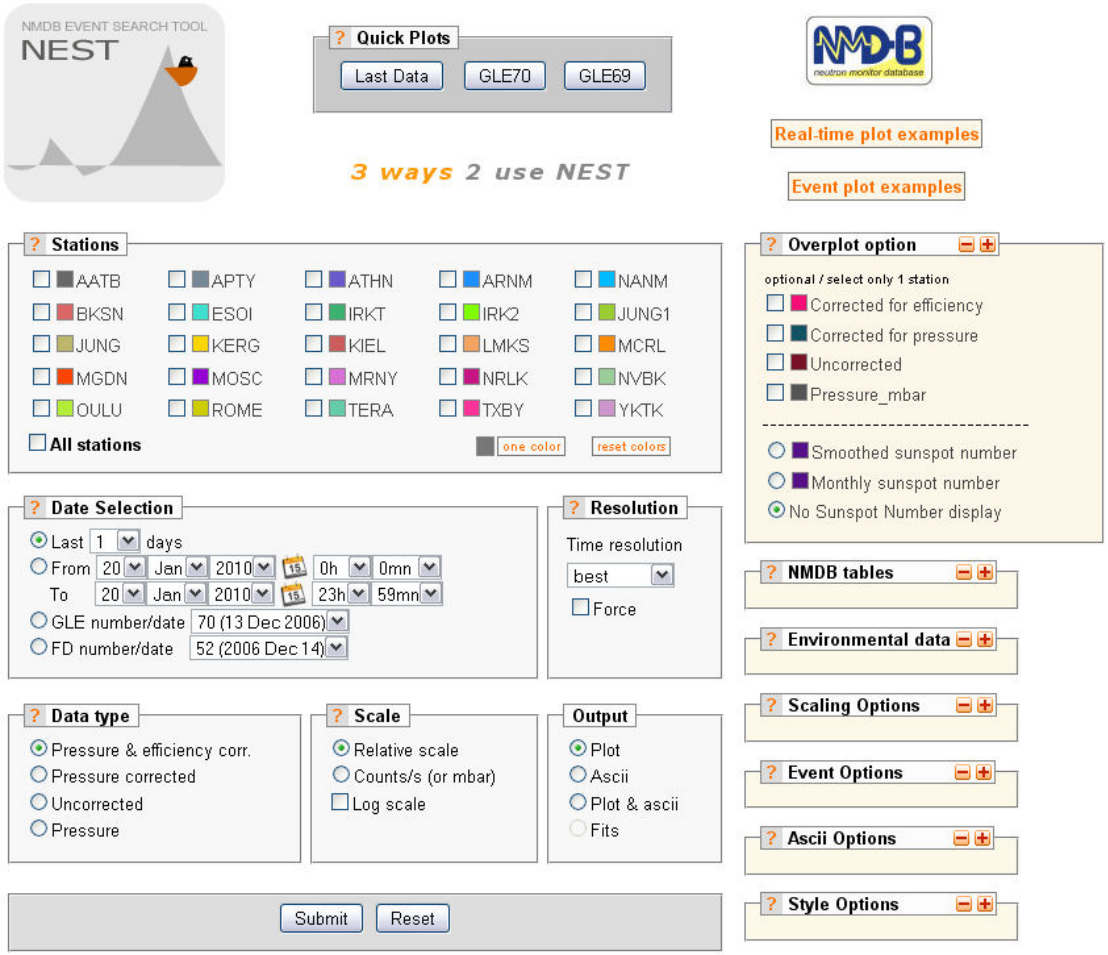
COSMIC RAYS NOW !



NMDB data providers



- 26 stations
- 19 real-time
- Future stations:
  - New Hampshire
  - Delaware
  - Mexico
  - South Africa
  - Austria
  - Belgium
  - Spain
  - Thailand
  - ...

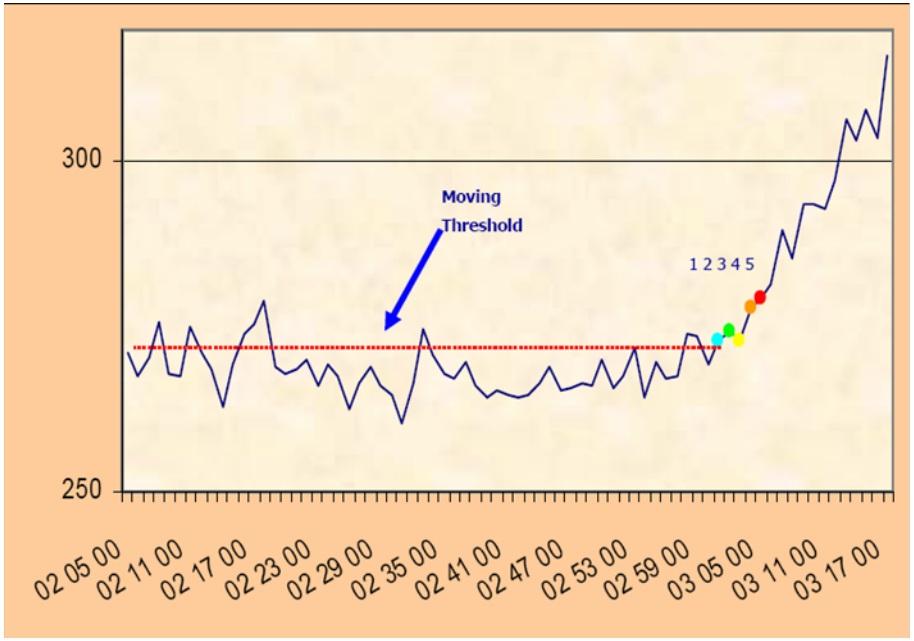


OBSParis: NEST

- Main interface to NMDB data
- Plots countrate, pressure, sunspot index, ...
- Performs averaging and merging (ori+rev) in MySQL
- Generates plots and ascii
- Customize plots
- Can be used in scripts (wget)
- “Very easy to get to the data” (comment by NOAA user)

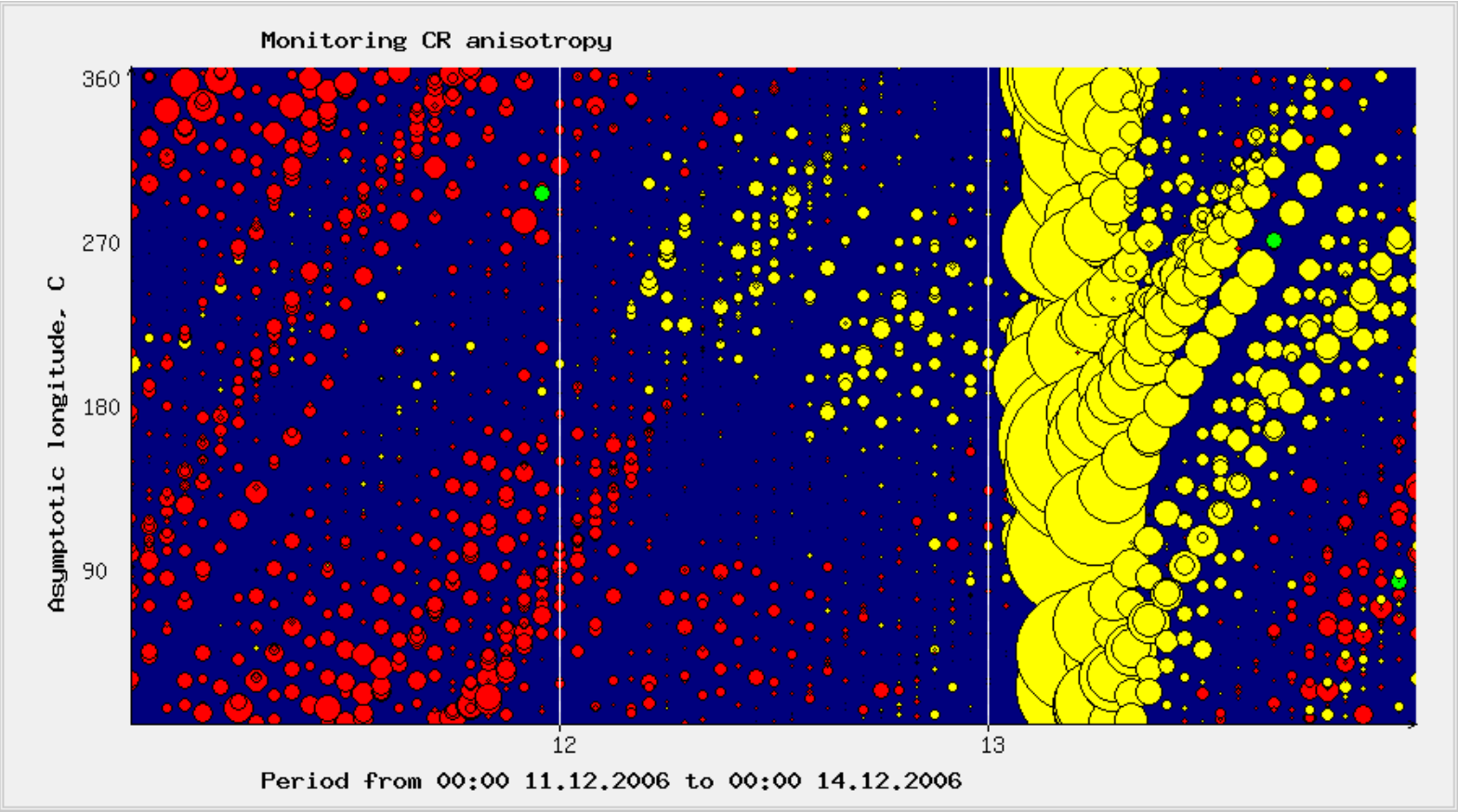
`http://nest.nmdb.eu`

NKUA: GLE ALERT

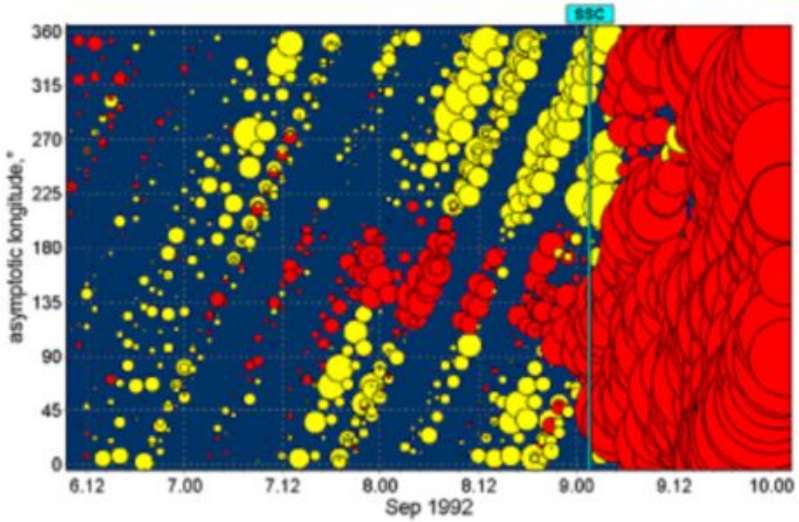


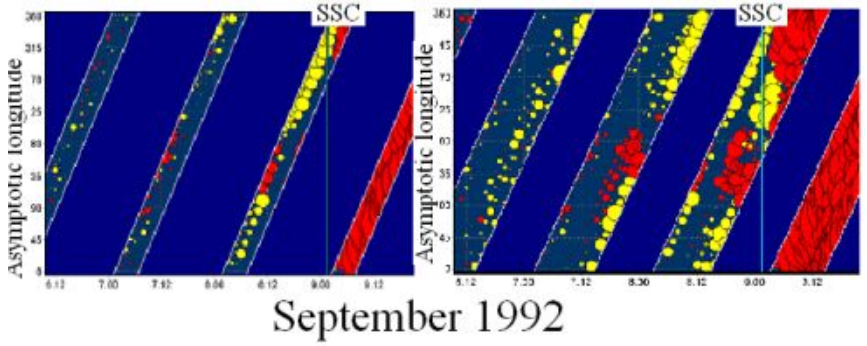
- Determine moving threshold M (last 60 minutes) and standard deviation σ
- Pre-alert if countrate > M + N*σ
- 5 pre-alerts → Station Alert
- 3 Stations in Station Alert → General Alert

IZMIRAN: Monitoring of CR anisotropy



Anisotropy monitoring requires whole Earth coverage



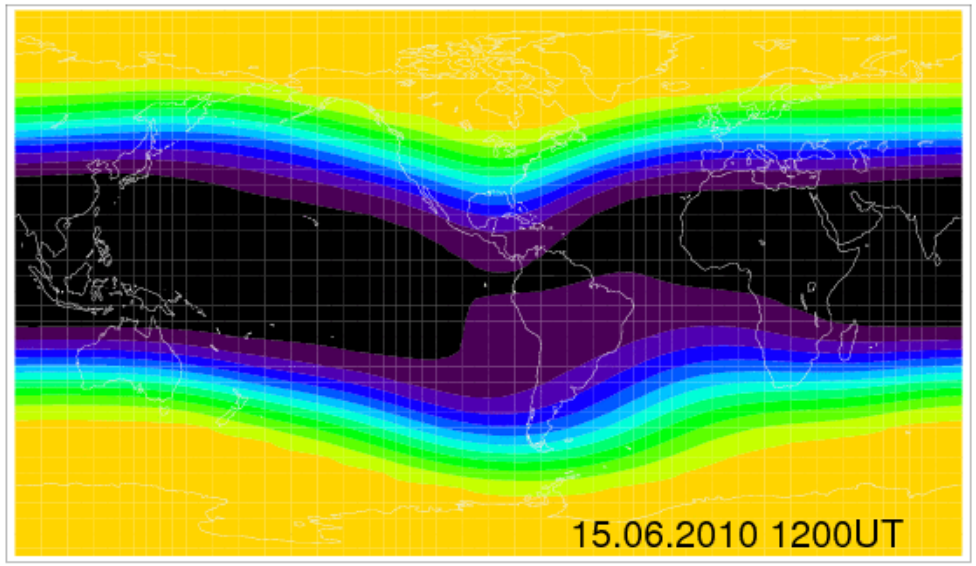


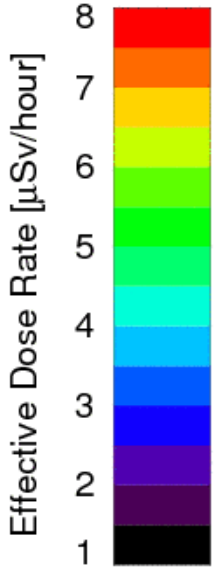
Calculation using only:
European stations / +Russian stations

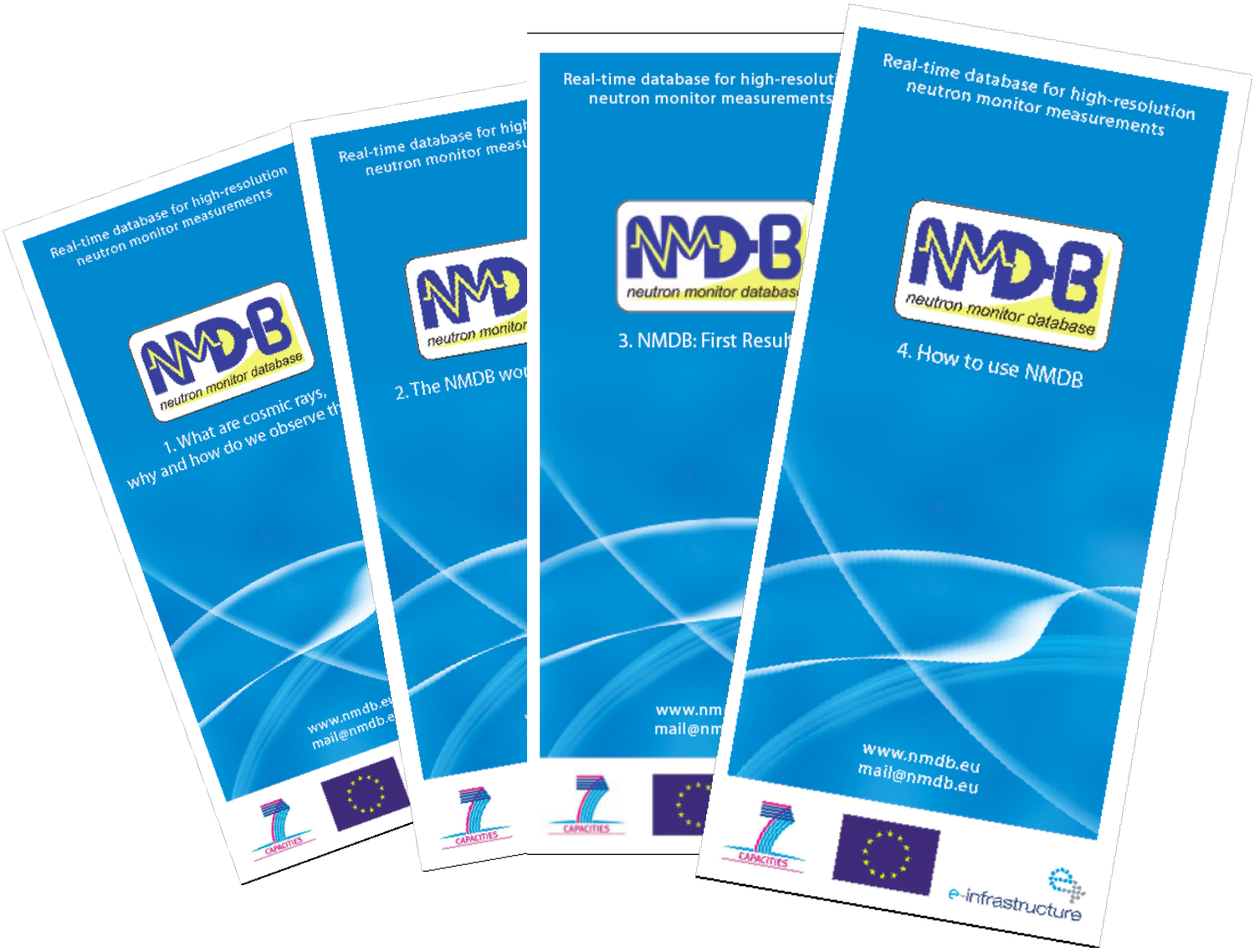
Calculation using all available stations

UBern: Ionization and Radiation Dose Rates

Effective Dose Rate vs. Position
Altitude: ~10.5 km asl
At time: 2010-06-15 12:00 UT






Real-time database for high-resolution neutron monitor measurements
1. What are cosmic rays, why and how do we observe th
2. The NMDB wo
3. NMDB: First Result
4. How to use NMDB
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CAPACITIES
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NMDB: one stop shop for...

- real-time cosmic ray data
- historical cosmic ray data
- GLE alerts, CR and GLE spectra
- background information on cosmic rays
- training for cosmic ray science
- information on registration systems and components

questions@nmdb.eu
http://nmdb.eu

Acknowledgements

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