

STCE research and services support of PECASUS: Dourbes Neutron Monitors

**Danislav Sapundjiev, Olivier Hendrickx, Guy Crabbe, Tobias
Verhulst, Jean-Claude Jodogne, Stanimir Stankov**

*STCE annual meeting, 6 June
2019 Uccle*

Evaluate the local radiation conditions in real-time during quiet and active space weather (i.e. GLE)

Cosmic Rays(CR) and radiation exposure

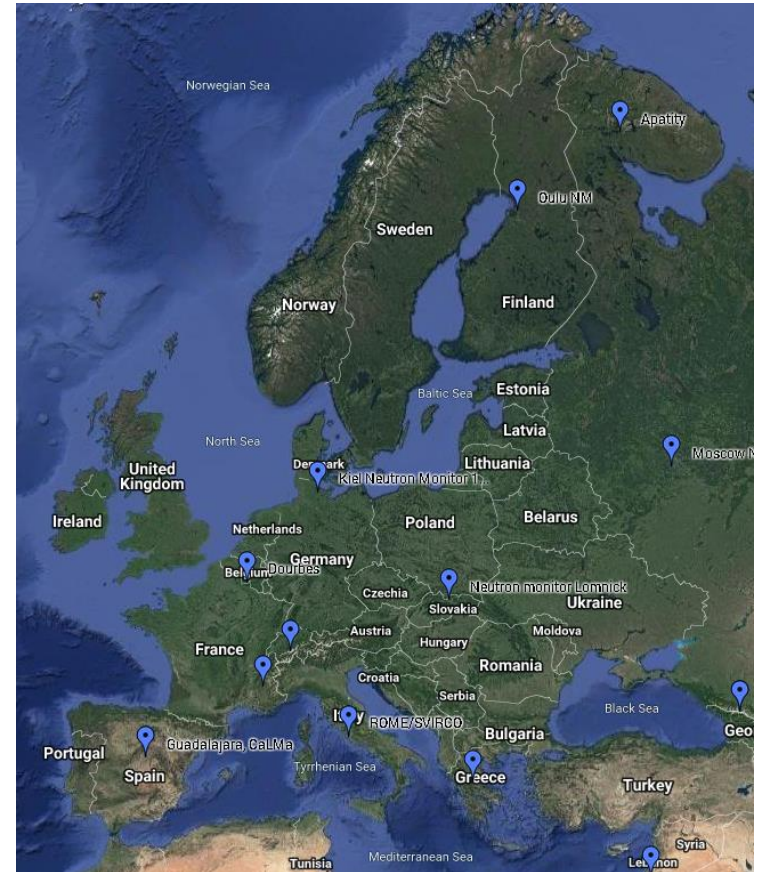
- CR are the main source of ionization in the lower and middle atmosphere
- CR account for about 13 % of the *Total Annual Effective* dose received by the population[1]
- **The CR have highest intensity at ~15 km**

Local

Only 4 stations available in the Western Europe, only 3 provide data in real time

GLE

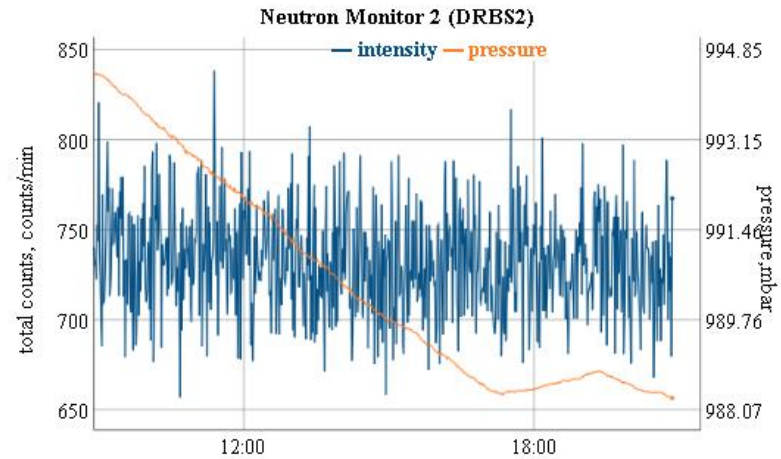
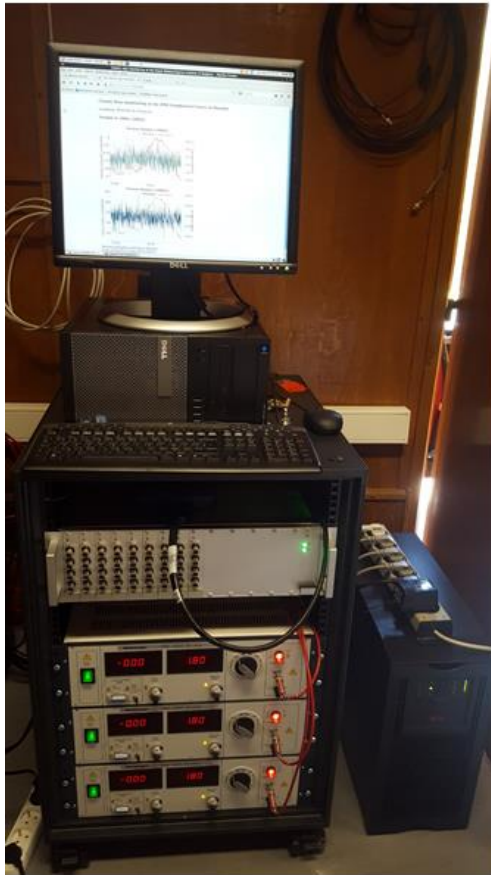
Dourbes NM's are the only devices measuring the GCR radiation (energies 0.5 – 15 GeV) in real time in this region



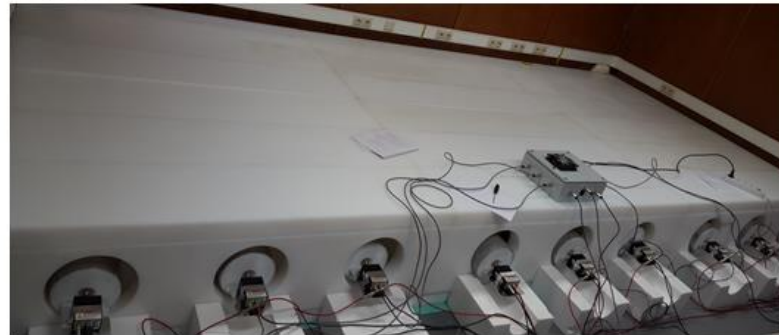
[1] Cinelli et al. JOURNAL OF MAPS, 2017, VOL. 13, NO. 2, 812–821)

<http://www01.nmdb.eu/station/>

- Since 17 January 2019, a modern Neutron Monitor entered continuous operation:



Section: Ionosphere and Space Weather
 Solar-Terrestrial Centre of Excellence
 Copyright © 1952-2019, RMI - All rights reserved

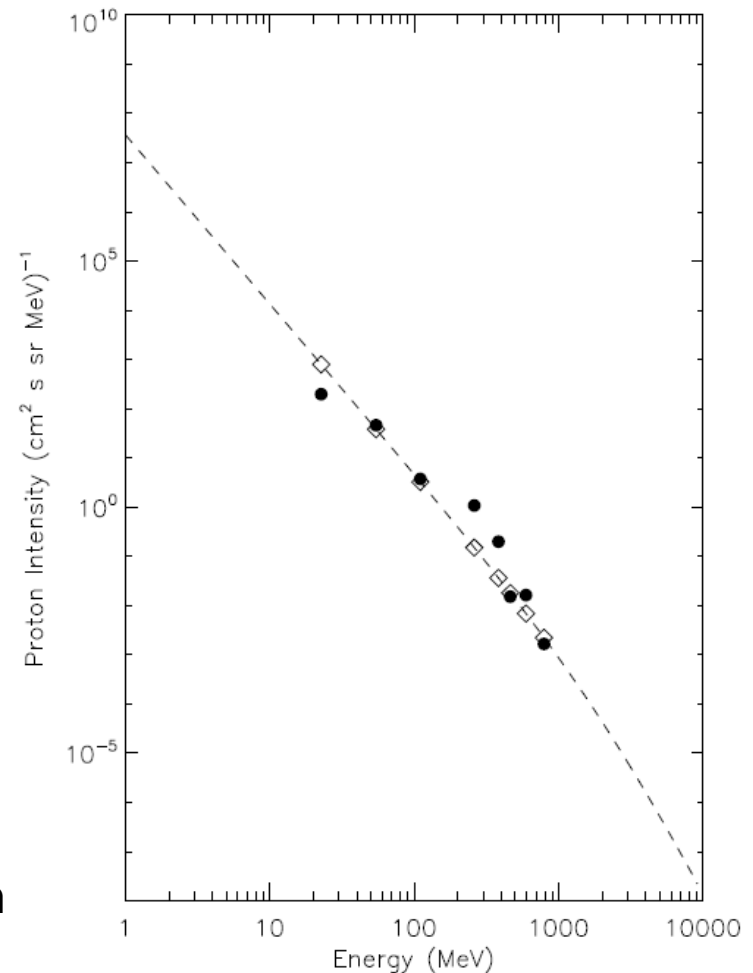


Note: the old 9-NM64 neutron monitor is in a process of modernization – the electronics & data registration - to allow better data analysis

Information about the interplanetary conditions:

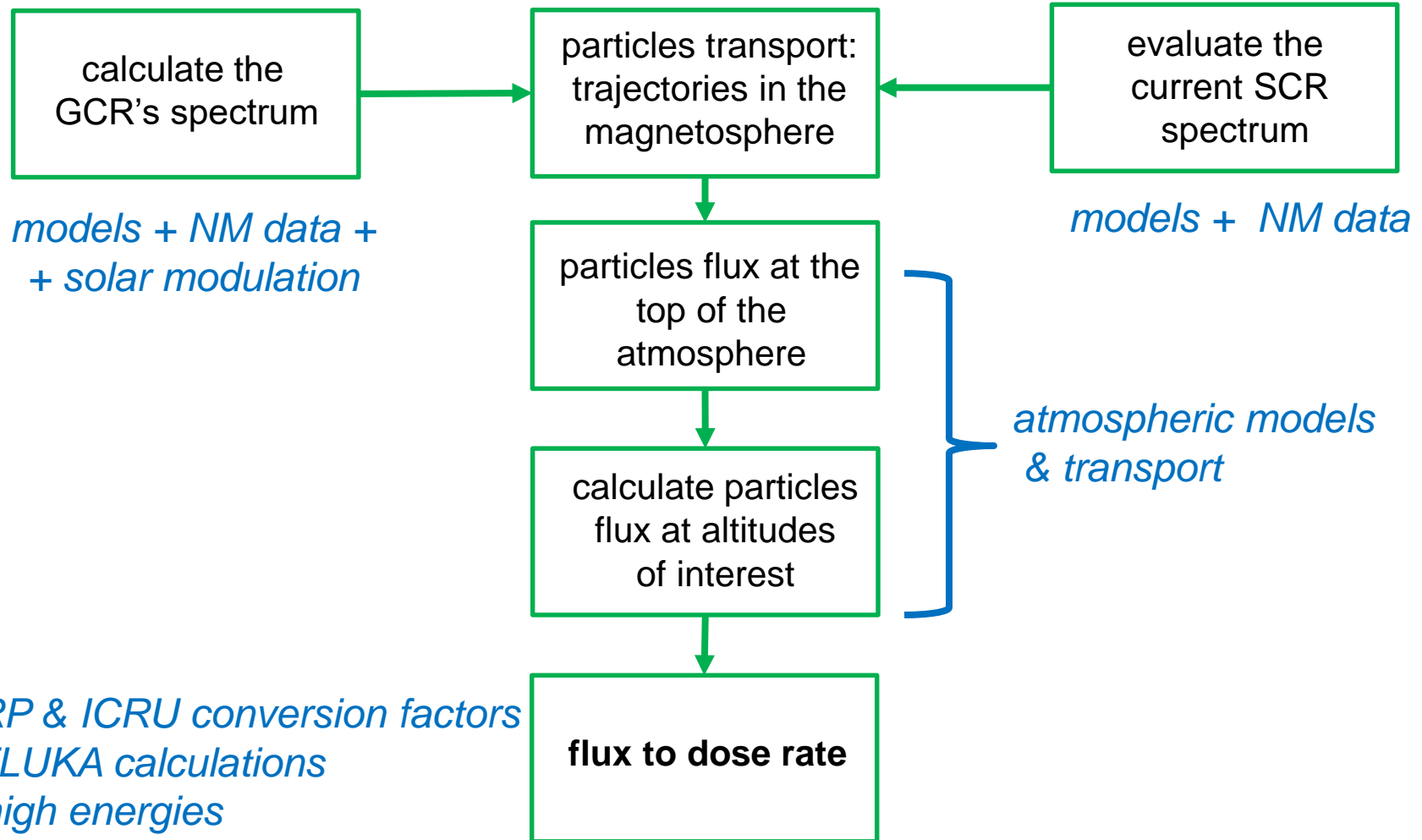
- Solar Modulation of the Galactic Cosmic Rays (GCR)
- Spectrum of the Solar Cosmic Rays
- Forecast of GLE events

Example: energy spectrum from the Bastille event (14 July 2000): solid circles proton intensities from 8 GOES energy channels, the diamond-denoted values are calculated from the NM-network for the same event [1]



[1] Su Yeon Oh et al., PROCEEDINGS OF THE 31st ICRC, 2009

models + Kp + transport codes (GEANT4)



See e.g. Bütikofer et al. PROCEEDINGS OF THE 31st ICRC, 2009

- The Local radiation conditions in the vicinity of a NM station can be evaluated from the station's output.
- Detection energy threshold is set by the stations geomagnetic cutoff rigidity and the properties of the particular Neutron Monitor

The differences in the DRBS NM design make possible to discriminate the intensities of the incoming particles.

This gives the possibility to evaluate the spectrum of the SCR and use it for rapid determination of the local radiation environment.

