Upgrading the Dourbes cosmic ray observatory for research and development of improved space weather monitoring services

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This presentation will outline the recent and future activities at the Royal Meteorological Institute (RMI) regarding space weather research, monitoring, and developing of related services, with focus on the modernisation and use of the cosmic ray observatory.

At the RMI Geophysical Centre in Dourbes (50.1°N, 4.6°E), various space weather observations -- cosmic ray, ionospheric, geomagnetic -- have been carried out for a long time. During the years, a large database has been accumulated and used for space weather research and development of services.

Currently, the Dourbes cosmic ray observatory consists of a standard NM64 neutron monitor (with 9 counters) which is in operation since 1965 (http://www.nmdb.eu/?q=node/469). Considering that the ground-based neutron monitors are still state-of-the-art and most popular instrumentation for monitoring the cosmic rays, we have invested in 9 new counter tubes which will allow us to build an extended 18-counter neutron monitor. A larger neutron monitor will provide a much better time resolution and lower uncertainty thanks to the greater counting rate. The statistical fluctuations of the measurements will be decreased and allow detection of smaller variations in the cosmic ray intensity and therefore smaller events in the solar activity. The improved geometry and volume with the additional sections of the monitor will increase three to four times the counting rate and allow investigation of a lower intensity solar events.

The Dourbes neutron monitor is a member of the international family of neutron monitors, providing data to the International Neutron Monitor Database (NMDB). Earlier this year, new computer hardware and software was installed at the site, allowing for the real-time data provision to NMDB. It is well understood that advanced space weather services are possible only when high time resolution and real time data from multiple sources are readily available and our institute is doing its best to provide such data to the international community of scientists and other users.

Investment plans are put in place to complement the neutron monitor observations with measurements of the muon component of the atmospheric cascade. Muon detectors use the good penetration capability of muons in matter to easily distinguish muons from other cosmic ray components (except for neutrinos). Thus, the installation of an underground muon detector in Dourbes will allow the monitoring of the high-energy part of the muon component.