

乗鞍岳における ミューオンの精密測定

宗像、加藤、安江、稲葉、小財、正川、山際、菊地、石崎(信州大理)
青木(ICRR)、小島(名女大)

校費:400千円

太陽電池パネル5枚(破損パネル交換用)、CRポッティング材料

旅費:150千円

松本～乗鞍、松本～柏

- Global Muon Detector Network (GMDN)の一部として、高統計で方向分解能の高い宇宙天気観測を行う。
 - Geomagnetic Storm's Precursors Observed from 2001 to 2007 with the Global Muon Detector Network – GMDN
⇒ Rockenbach et al., Geophys. Res. Lett. 38, L16108, 2011.
 - The average spatial density gradient of galactic cosmic rays and its temporal variation observed with the Global Muon Detector Network(GMDN)
⇒ Kozai et al., Proc. 32nd ICRC, paper ID 0376, 2011.

これまでの経過:



2009年度:

- バッテリー増設(計14台)
- **連続観測開始**(通年稼働率 82.9 %を達成)

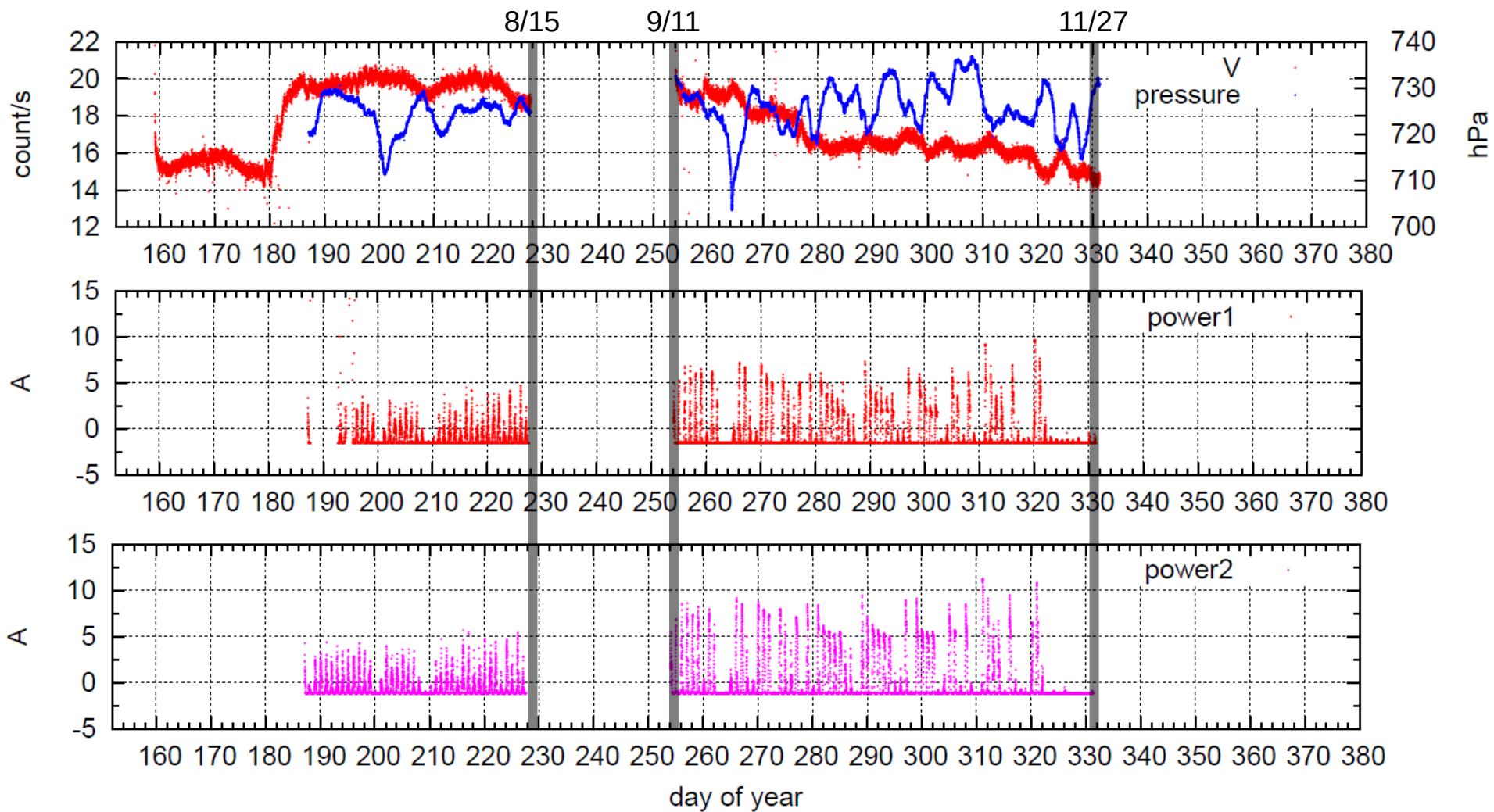
2010年度:

- 冬季の雪圧により**太陽電池パネル架台が変形**
- ネットワーク障害

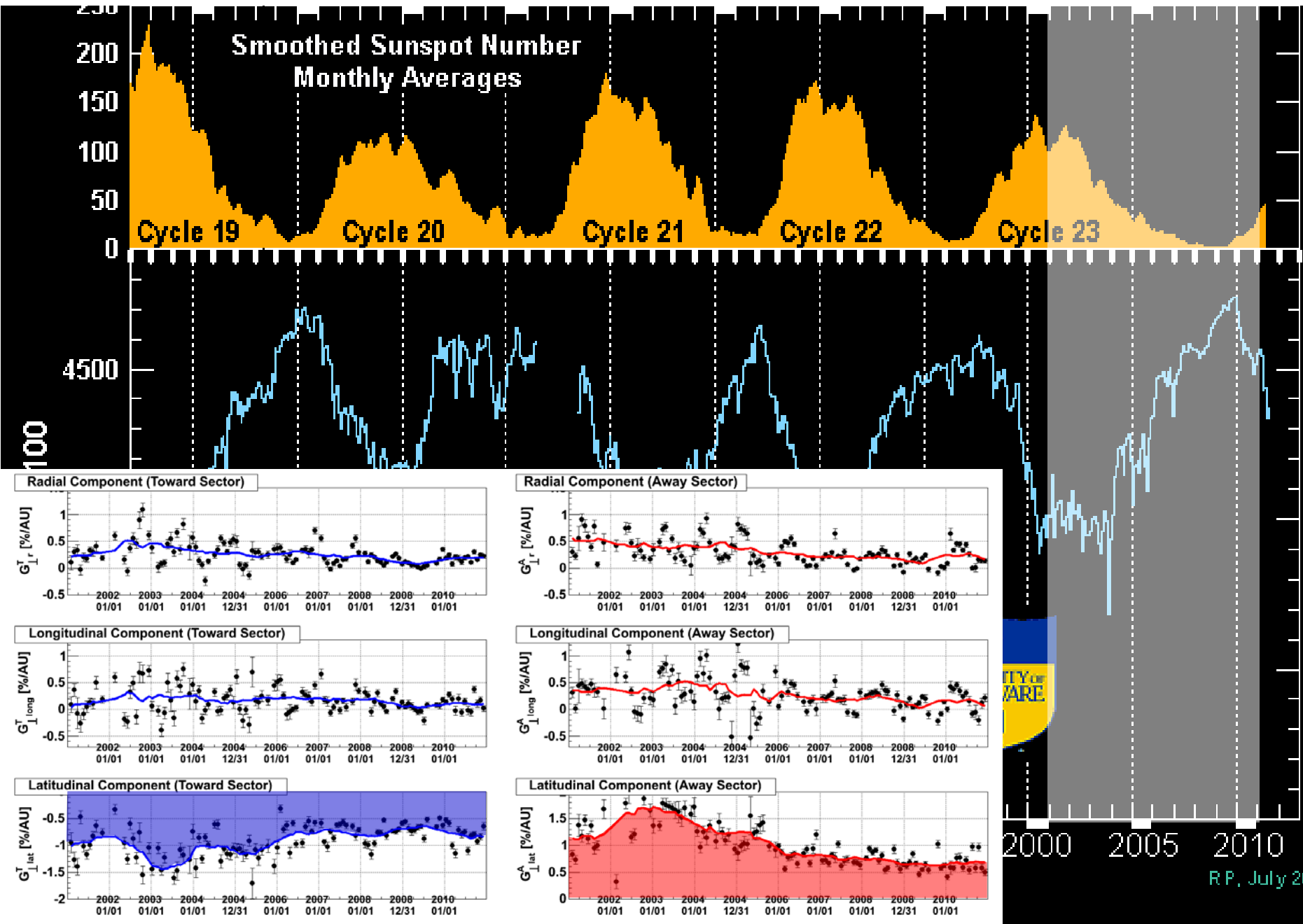
2011年度:

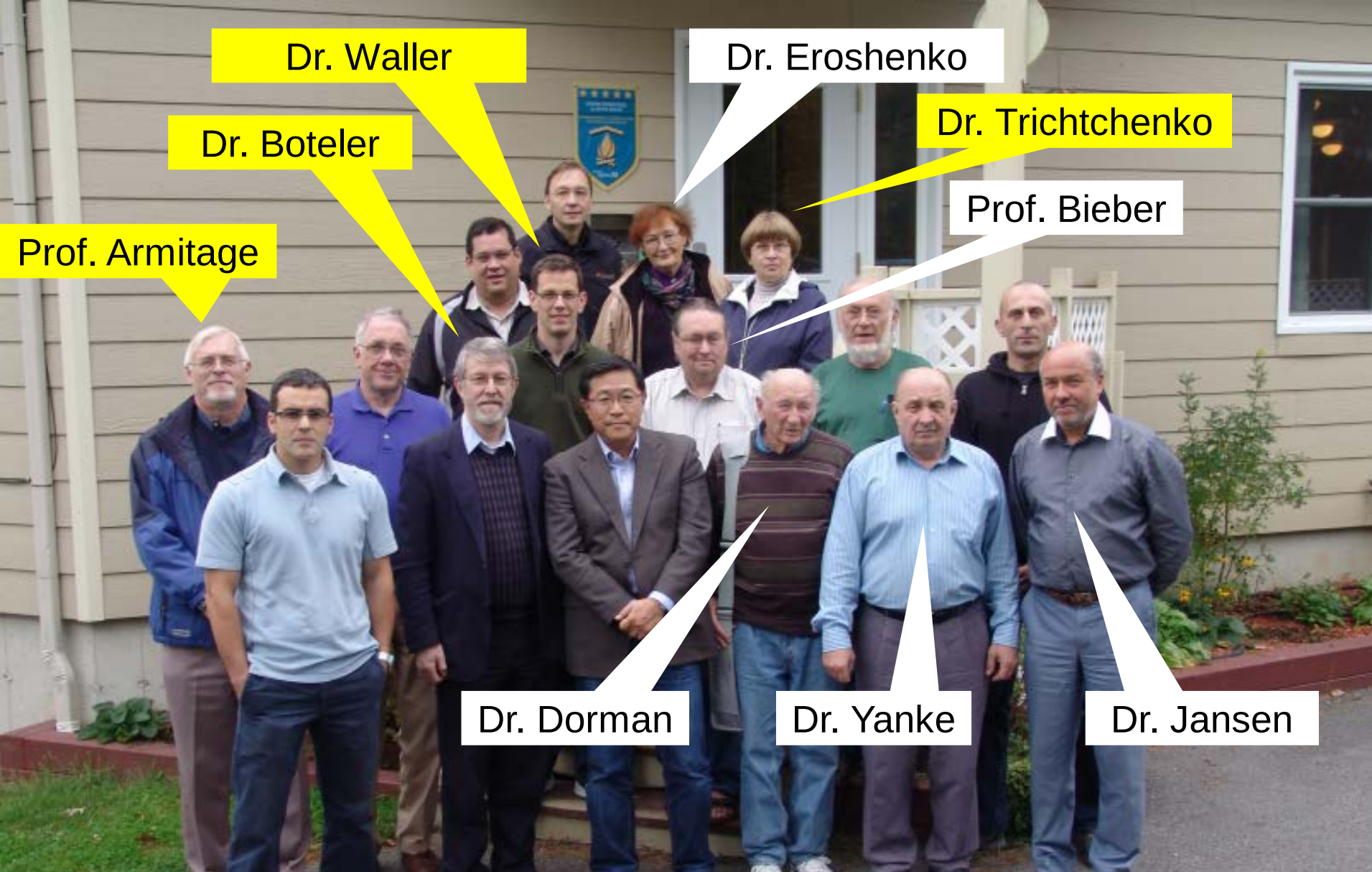
- 夏季の開所を待って観測を再開。
- 発電不足のため**11月27日に観測停止。現在復旧待ち。**





What does GMDN tell us?

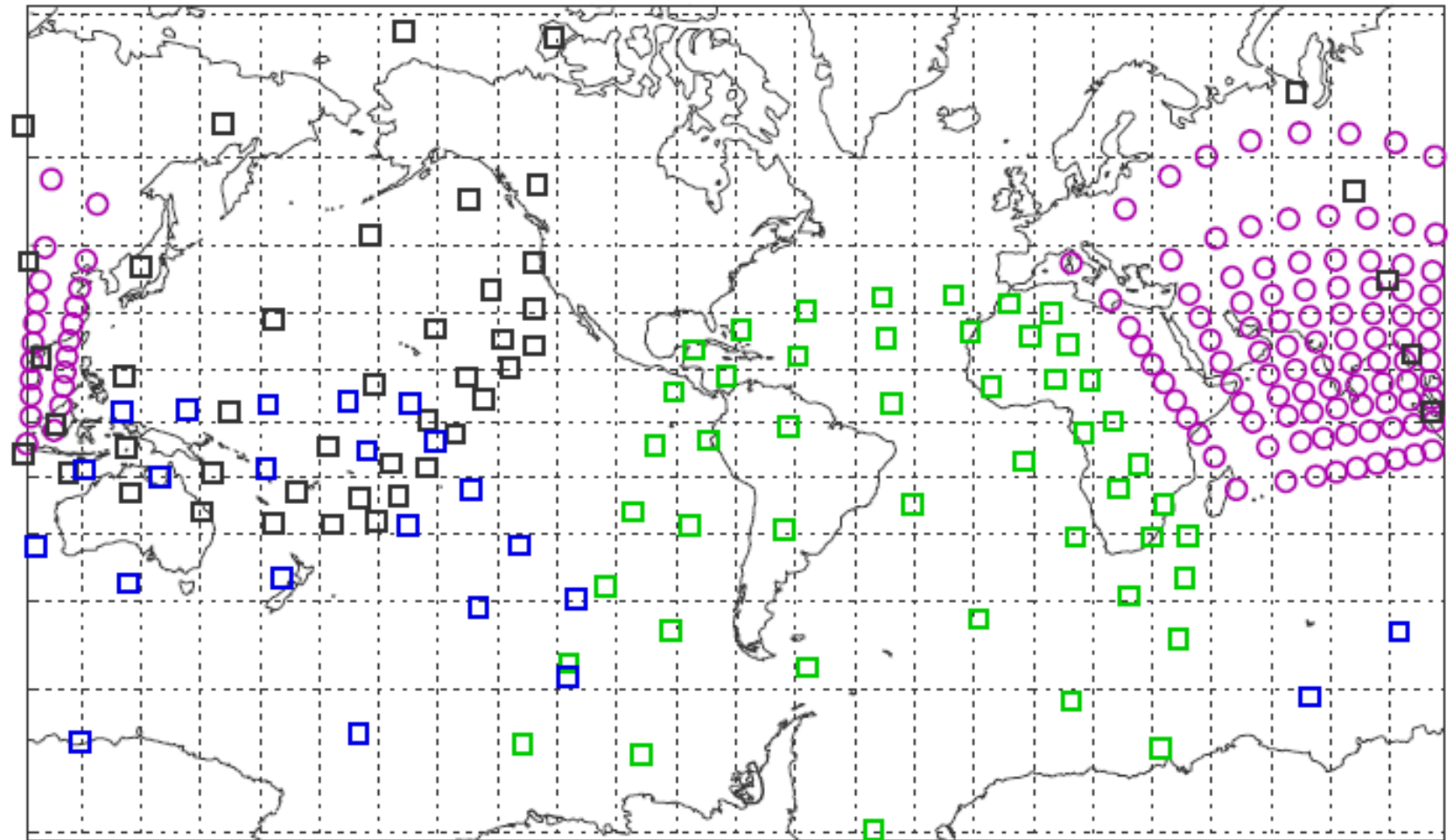




Canadian Muon Detector Workshop
17-19 October, 2011 in St Emile de Suffolk, Quebec, Canada

current GMDN

Muon Detector Network



■ Nagoya

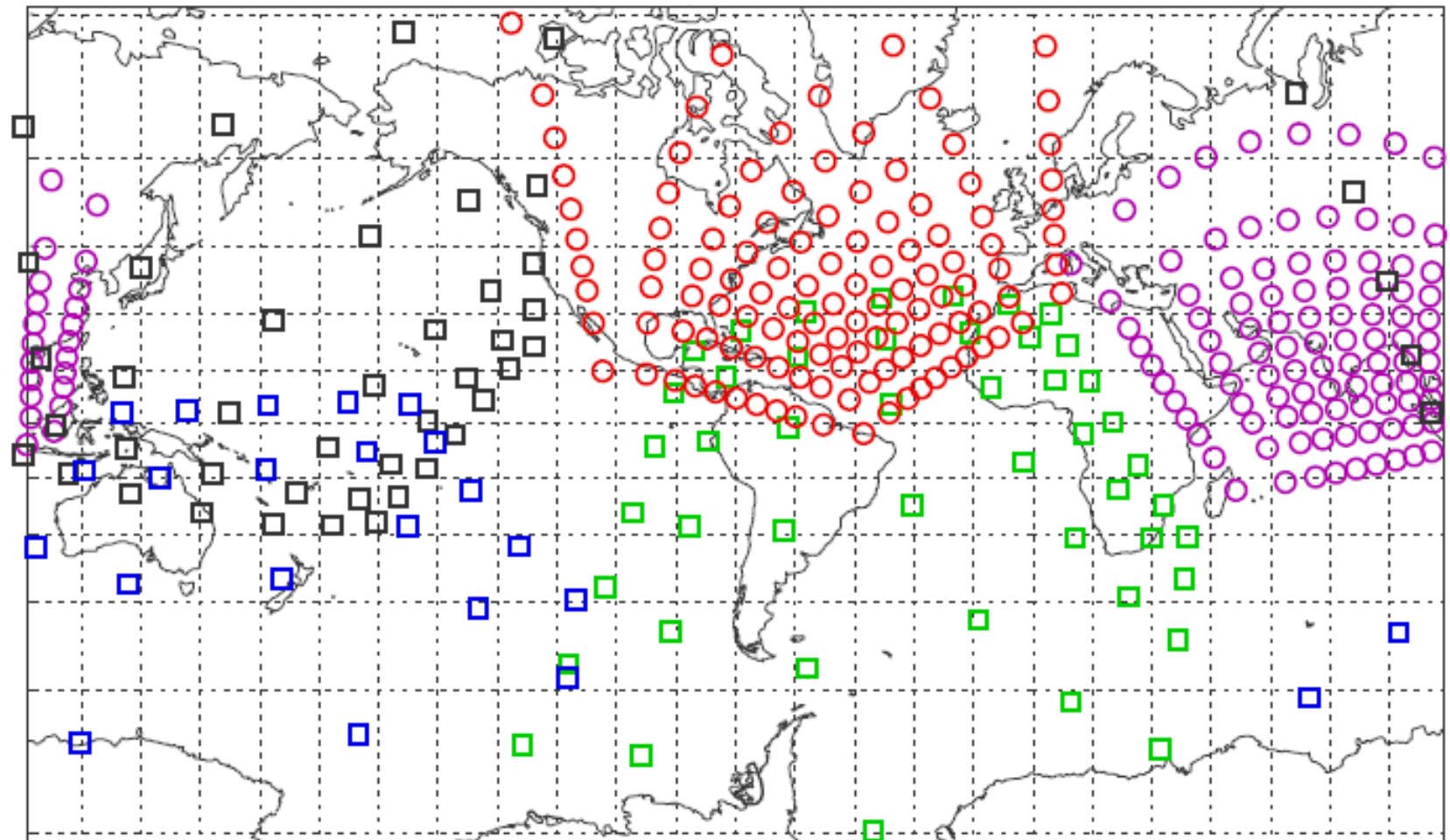
○ Kuwait

■ Hobart

■ SaoMartinho

current GMDN + Ottawa

Muon Detector Network



■ Nagoya

○ Kuwait

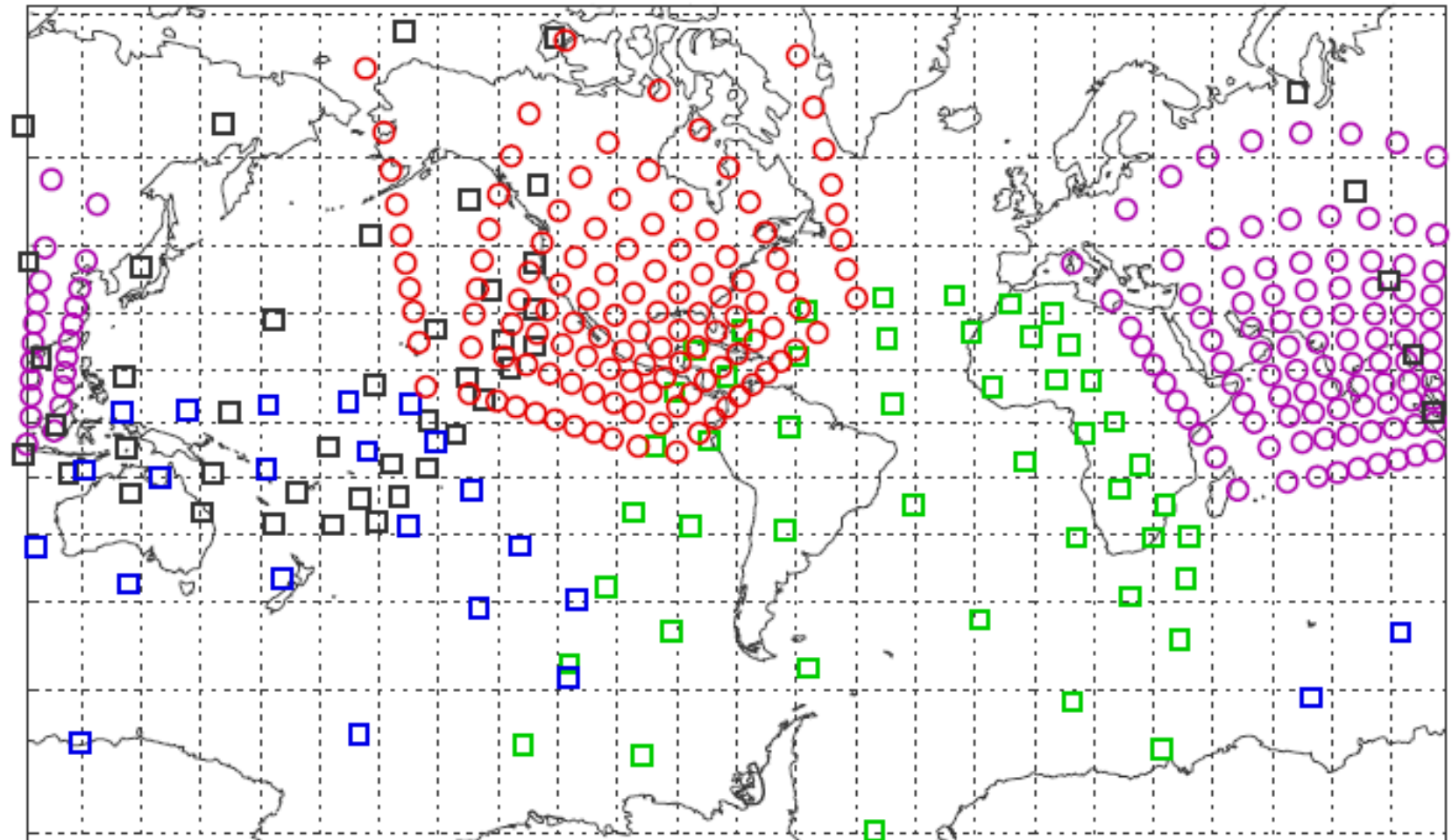
○ Ottawa

■ Hobart

■ SaoMartinho

current GMDN + Vancouver

Muon Detector Network



■ Nagoya

○ Kuwait

■ Hobart

■ SaoMartinho

○ Vancouver

SK/Tibet空気シャワーアレイによる 10 TeV宇宙線強度の恒星時日周変動の観測

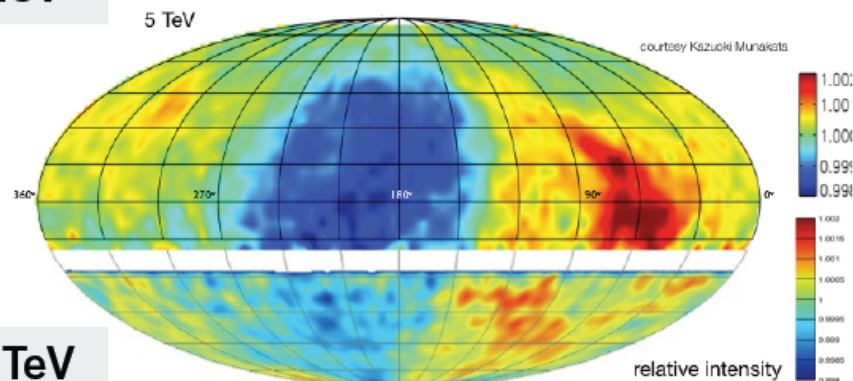
宗像、加藤、安江、稲葉、小財、正川、山際、菊地、石崎(信州大理)、
瀧田(ICRR)

旅費(松本⇔柏): 50千円(SK) / 150千円(Tibet)

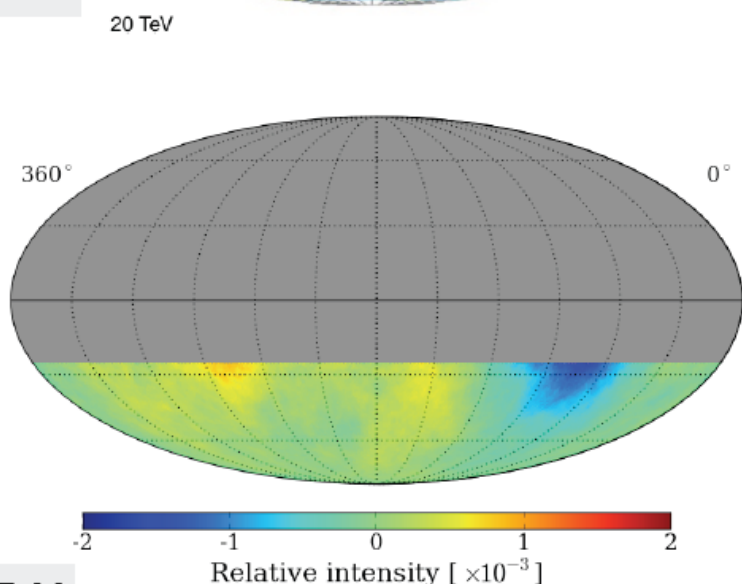
- **Heliospheric signatures** seen in the sidereal anisotropy of high-energy galactic cosmic ray intensity
⇒ Amenomori et al., AIP Conf. Proc., 1302, 285, 2010.
- **Solar cycle dependence** of the diurnal anisotropy observed with the **Matsushiro UG- μ** detector
⇒ Munakata et al., ApJ, 712, 1100, 2010.
- Two-hemisphere observations with the **Tibet (AS)**, **SK (UG μ)** & **Ice Cube (UG μ)**
⇒ private communications with Ice Cube (2010).
Cosmic Ray Anisotropy Workshop, Madison October 2011.

Comparison to low energies

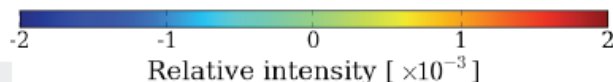
5 TeV



20 TeV



400 TeV



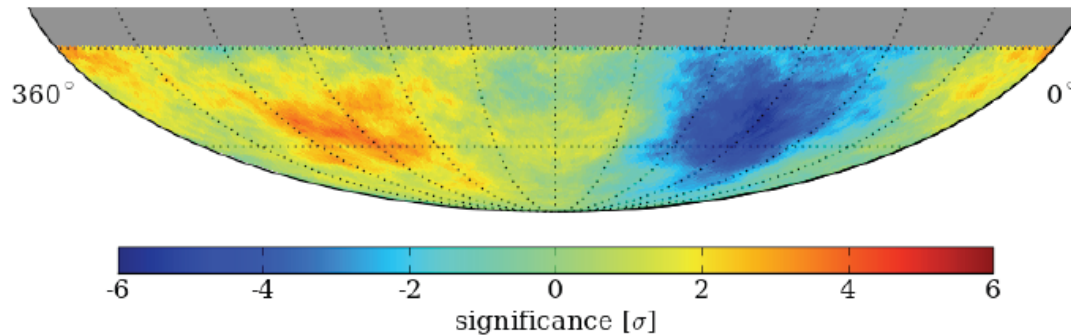
- The anisotropy changes phase
- Similar peak-to-peak strength
- Smaller characteristic size at high energies

<https://events.icecube.wisc.edu/indico/conferenceTimeTable.py?confId=39>

Significance maps for IT59

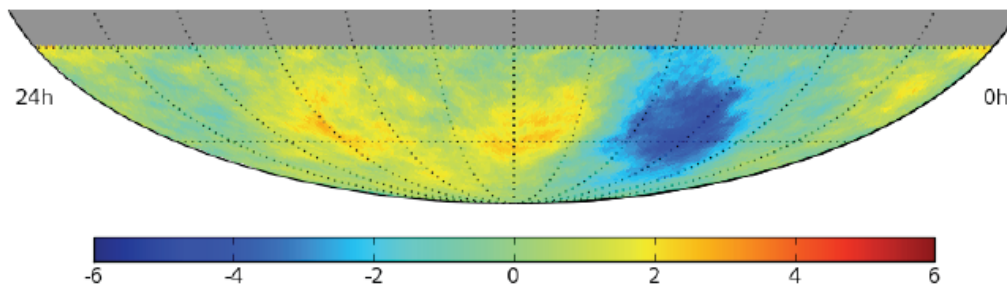
PRELIMINARY

All data



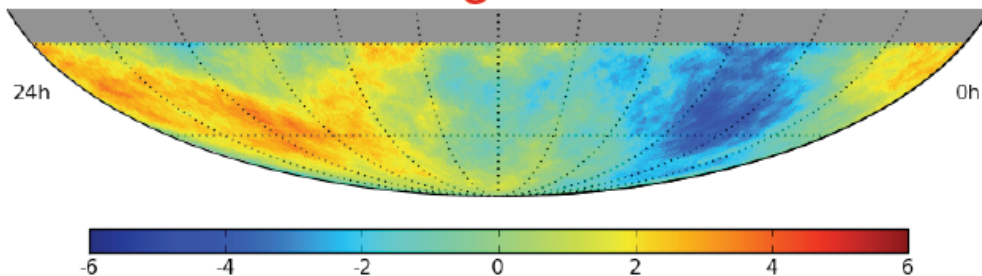
- 117×10^6 events
- **500 TeV** median energy
- Minimum significance: **-6.2 σ (pretrial)**

Low E



- 87×10^6 events
- **400 TeV** median energy
- Minimum significance: **-5.1 σ (pretrial)**

High E



- 30×10^6 events
- **2 PeV** median energy
- Minimum significance: **-4.9 σ (pretrial)**