乗鞍岳におけるミューオンの精密測定

宗像、加藤、安江、小財、宮崎、中嶋、丹羽、中村（信州大理）、
青木（ICRR）、小島（愛工大）

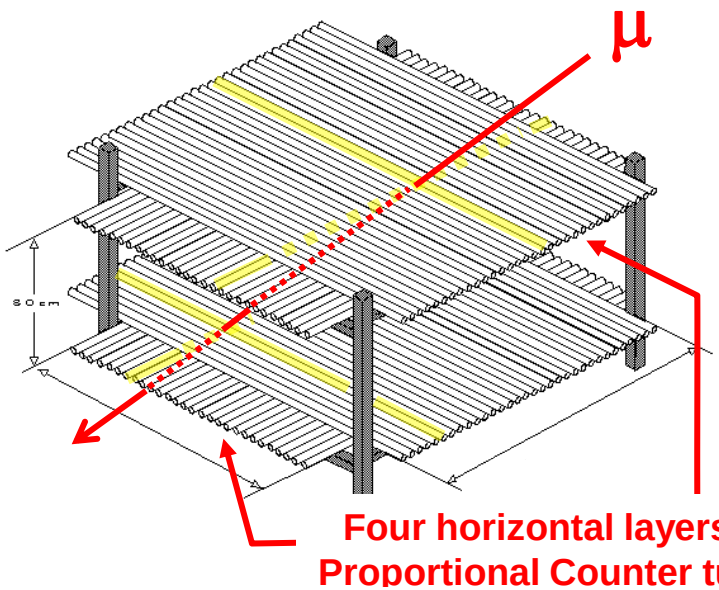
校費：389千円　（太陽電池パネル架台改修）
旅費：198千円　（松本～乗鞍、松本～柏）

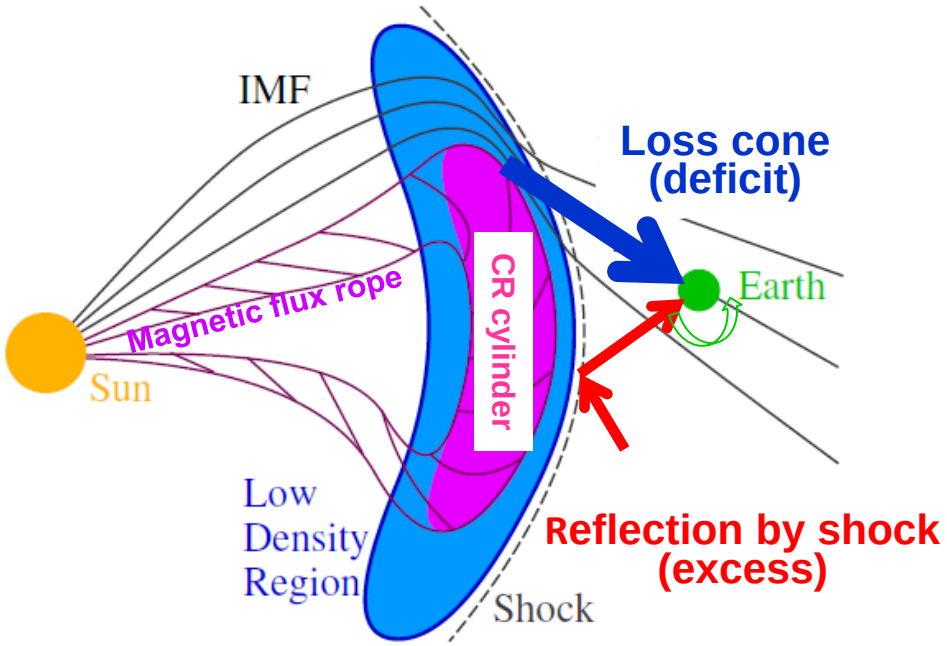
SK/Tibet空気シャワーアレイによる 10 TeV宇宙線強度の恒星時日周変動の観測

宗像、加藤、安江、小財、宮崎、中嶋、丹羽、中村（信州大理）、瀧田（ICRR）

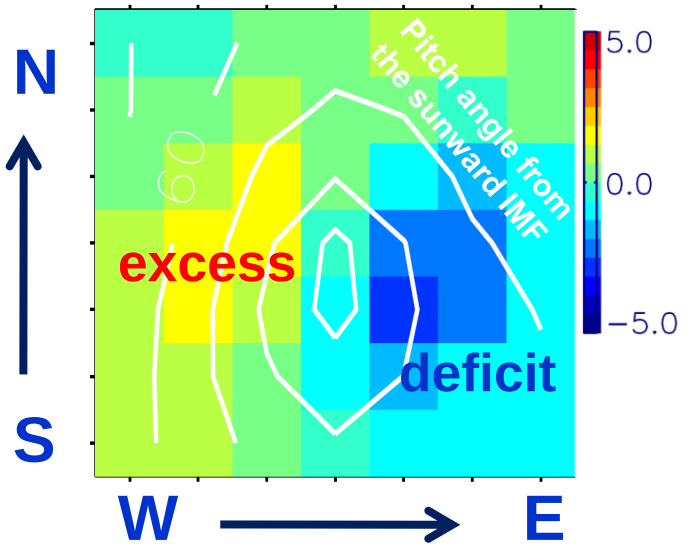
旅費（松本⇔柏）：50千円（SK）/ 150千円（Tibet）

乗鞍ミューオン計



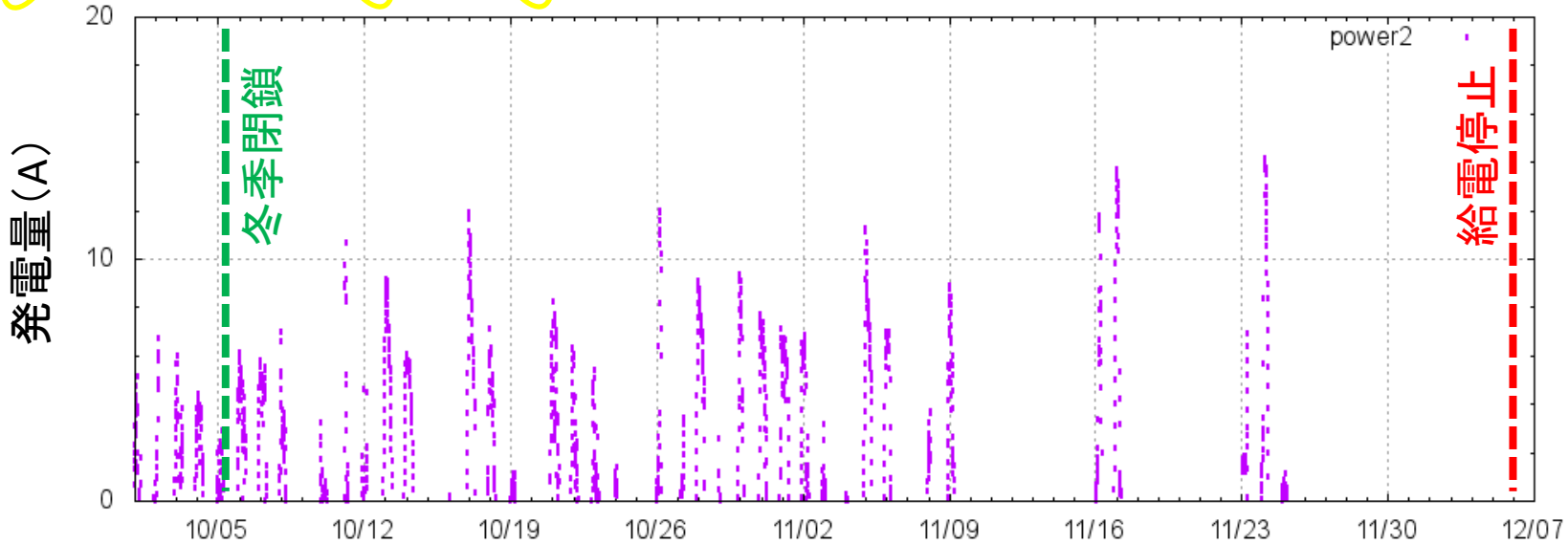


2D map of 1 hour data (2006 12/14 08:30UT)

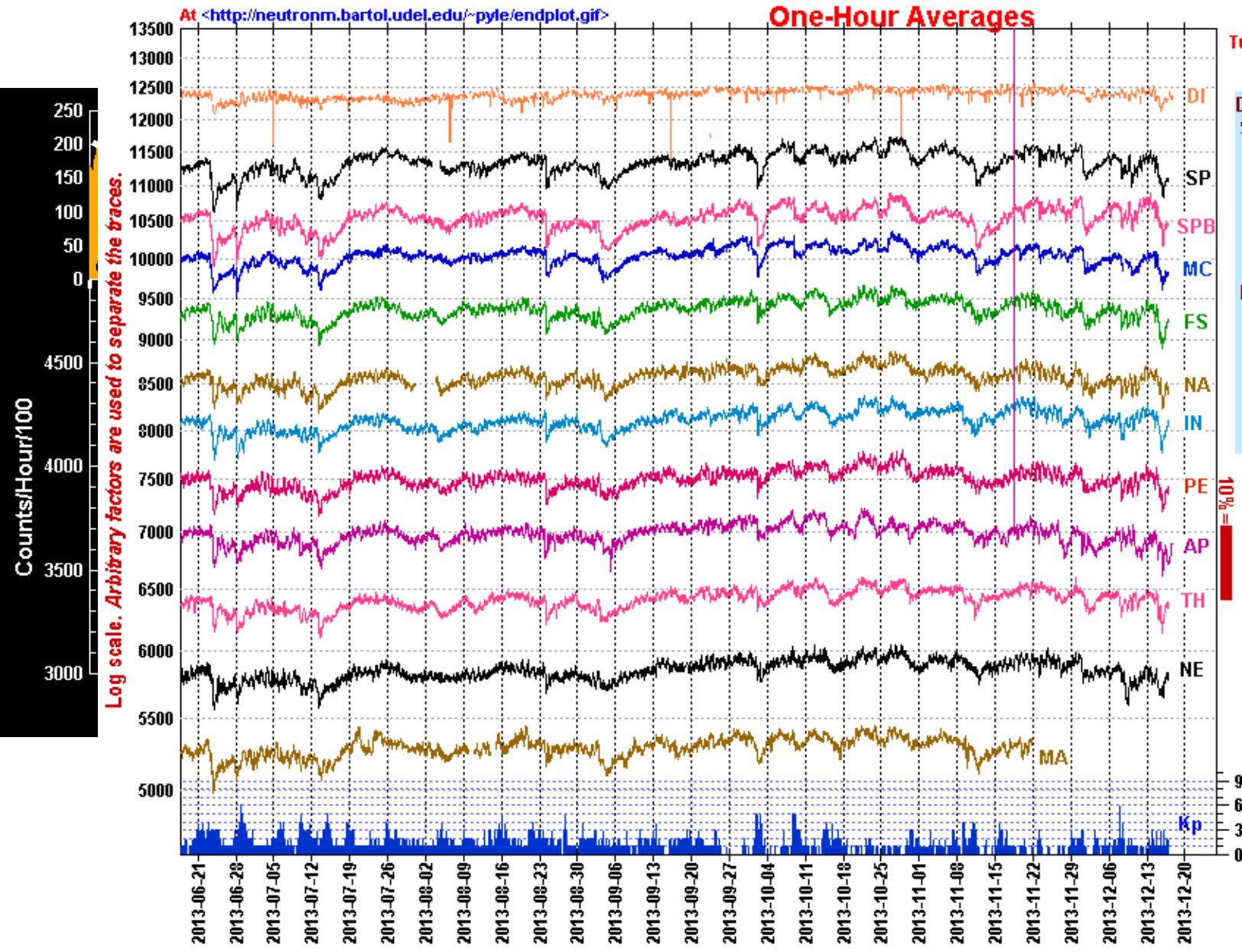


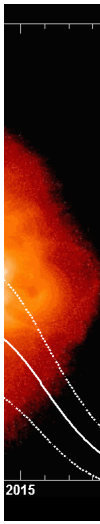
2013年度作業内容

- 太陽電池パネル架台の改修（パネルはH25年度調達済）



最近の太陽活動


At <http://neutronm.bartol.udel.edu/~pyle/endplot.gif>
One-Hour Averages
Prepared
Tue, Dec 17, 2013
Doi Inthanon
South Pole
(Bares)
South Pole
McMurdo
Fort Smith
Nain
Inuvik
Peawanuck
Apatity
Thule
Tixie Bay
Newark
Mawson
Kp
DI
SP
SPB
MC
FS
NA
IN
PE
AP
TH
NE
MA
Kp
10% =
Log scale. Arbitrary factors are used to separate the traces.
Counts/Hour/100
250
200
150
100
50
0
4500
4000
3500
3000
13500
13000
12500
12000
11500
11000
10500
10000
9500
9000
8500
8000
7500
7000
6500
6000
5500
5000
9
6
3
0
2013-06-21
2013-06-28
2013-07-05
2013-07-12
2013-07-19
2013-07-26
2013-08-02
2013-08-09
2013-08-16
2013-08-23
2013-08-30
2013-09-06
2013-09-13
2013-09-20
2013-09-27
2013-10-04
2013-10-11
2013-10-18
2013-10-25
2013-11-01
2013-11-08
2013-11-15
2013-11-22
2013-11-29
2013-12-06
2013-12-13
2013-12-20

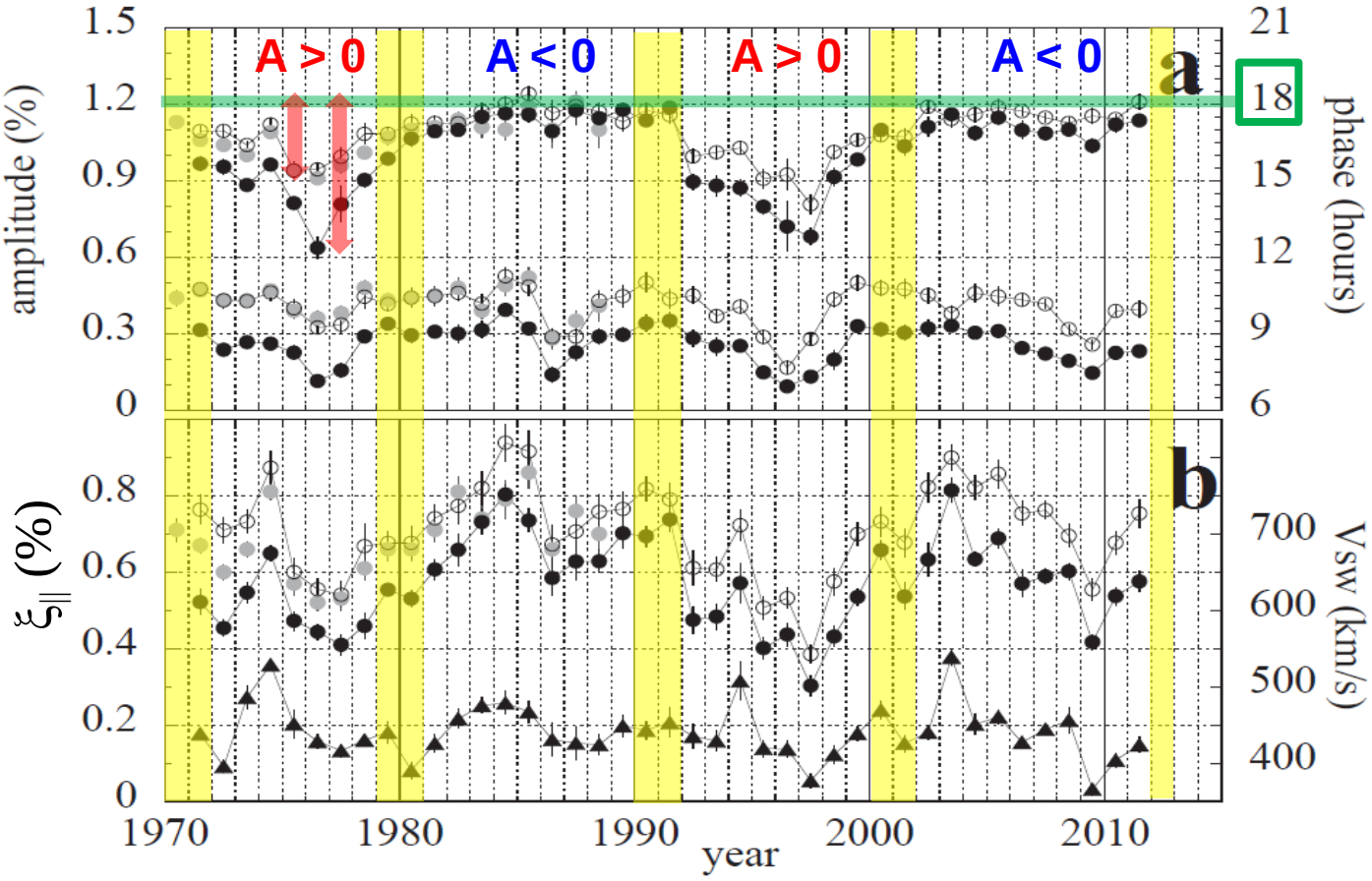

2015

Space harmonics & $\xi_{||}$

(corrected for the SW convection + CG-effect)

● : Nagoya muon detector (this work)

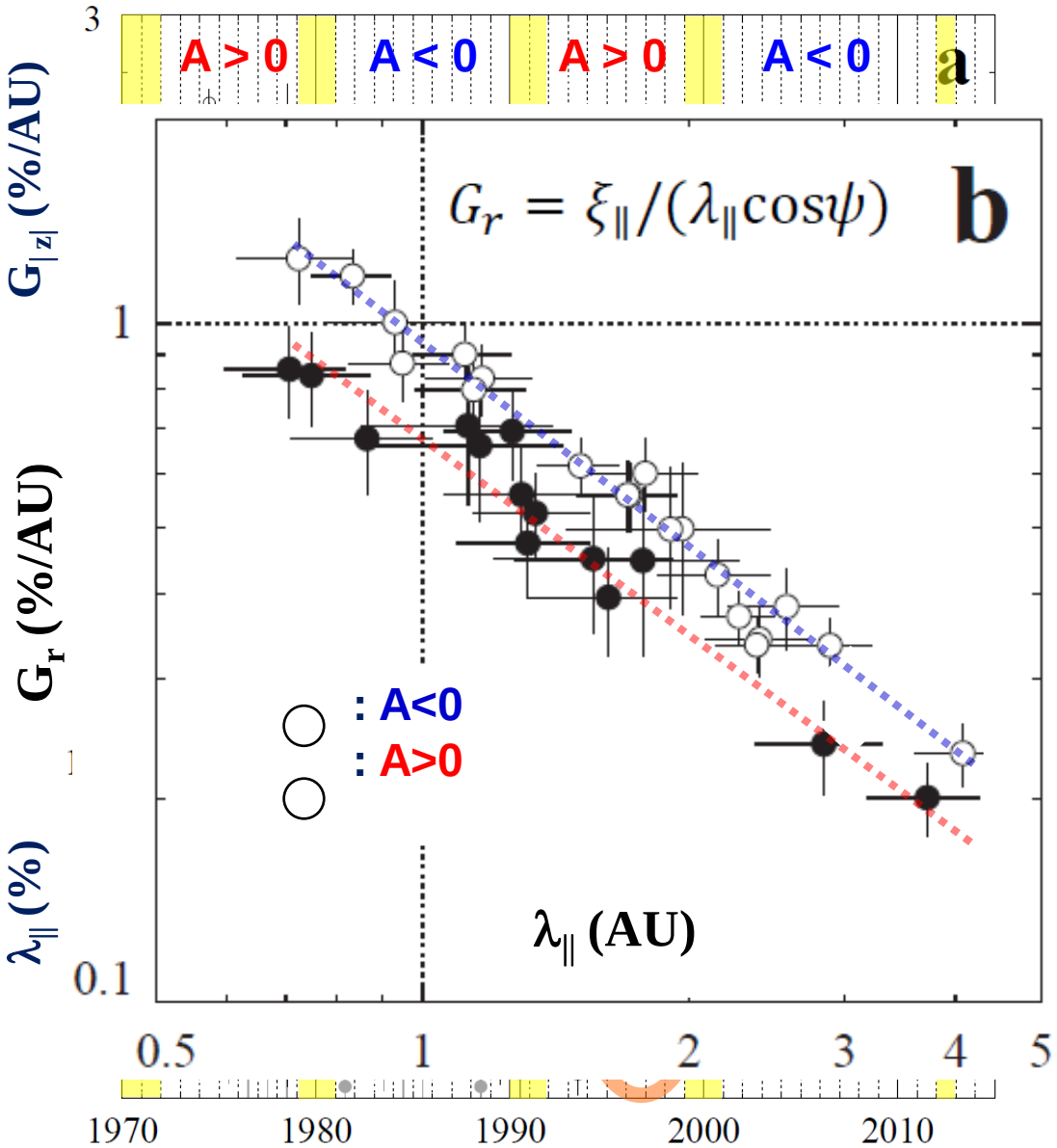
○ : Newark NM (this work) ● : Deep River NM (Chen & Bieber, 1993)



- This phase shift is much larger in muon than that in NM, suggesting the rigidity dependence of the anisotropy.
- A clear 22y variation seen in $\xi_{||}$ indicates that $\xi_{||}$ is responsible for the phase variation.
- $\xi_{||}$ by muon and NM are very consistent with each other.
- There is a notable positive correlation seen between $\xi_{||}$ & Vsw.

Modulation parameters

(proc. ICRC in Rio, 2013)



● : Nagoya muon detector (this work)
○ : Newark NM (this work)
● : Chen & Bieber (1993)

- $G_{|Z|}$ is positive (negative) in A>0 (A<0) epoch in accordance with the drift model prediction.
- G_r is positive & larger (smaller) in solar maximum (minimum) period, changing with 11y solar activity cycle.
- **G_r is larger (smaller) in A<0 (A>0) epoch as the drift model predicts.**
- The amplitude of this 22y variation, however, is only a factor of ~1.5 and can be easily masked by 11y variation with ~10 times larger amplitude.

チベット実験による恒星時異方性

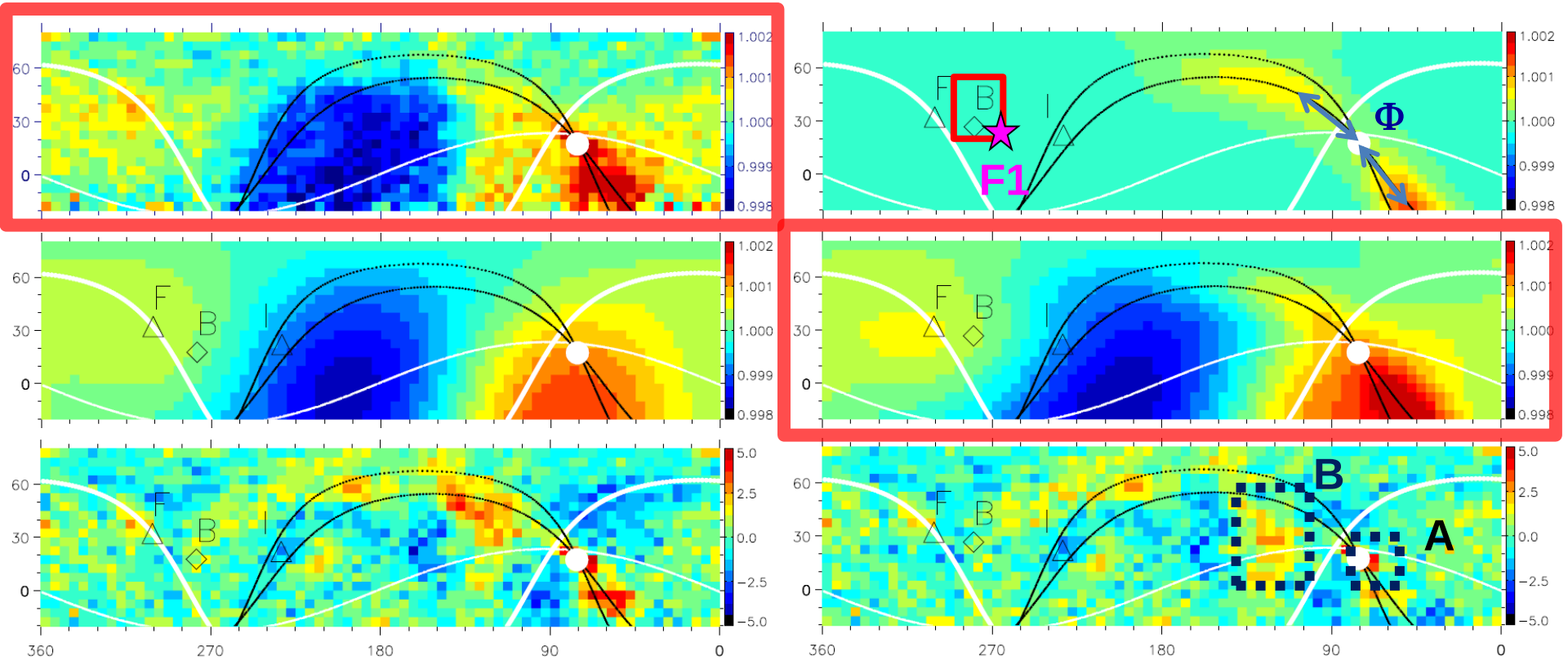
Predicted/observed ISMF (B) orientations

Global + Midscale anisotropy model: **B** (Amenomori et al., Astrophys. Space Sci. Trans, **6**, 49, 2010)

Faraday rotation measure: **F** (Frisch, Space Sci. Rev., **78**, 213, 1996)

ENA ribbon by IBEX: **I** (Frisch, Space Sci. Rev., **78**, 213, 1996)

Starlight polarization by magnetized dust: **F1** (Astrophys. J., **760**, 106, 2012)



Miraglo “hot” regions (Abdo et al., PRL, 101, 2008)

New detector (SciCRT) in Mexico

Collaboration between Mexico & Japan
PI: Y. Matsubara of STEL, Nagoya Univ.

19.0°N, 97.3 °W
4,600 m a.s.l. (590 hPa)
Geomag. Cut-off (V) = 7.9 GV

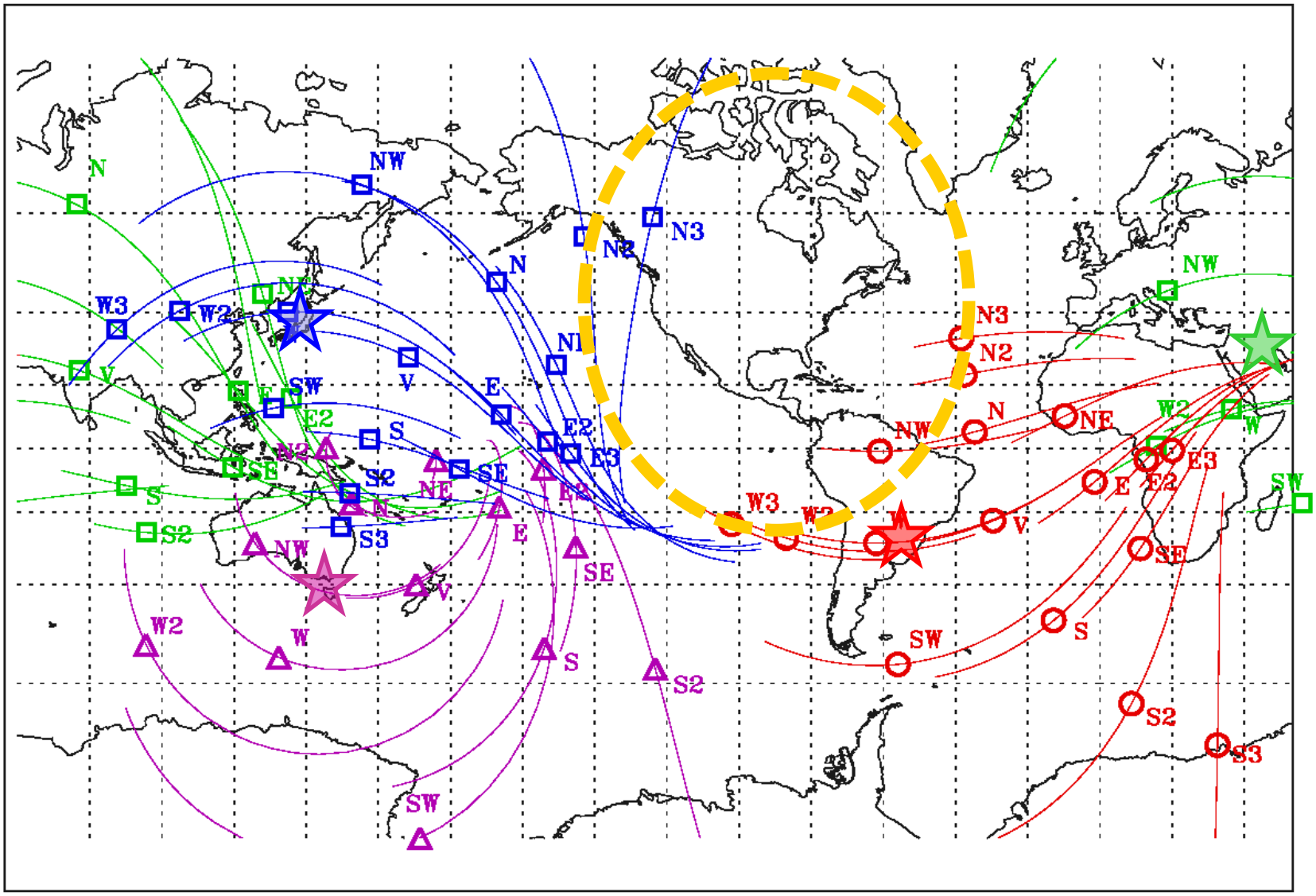
Expected muon count rate:
2.7×10^6 cph (750 Hz)

Now in test operation.

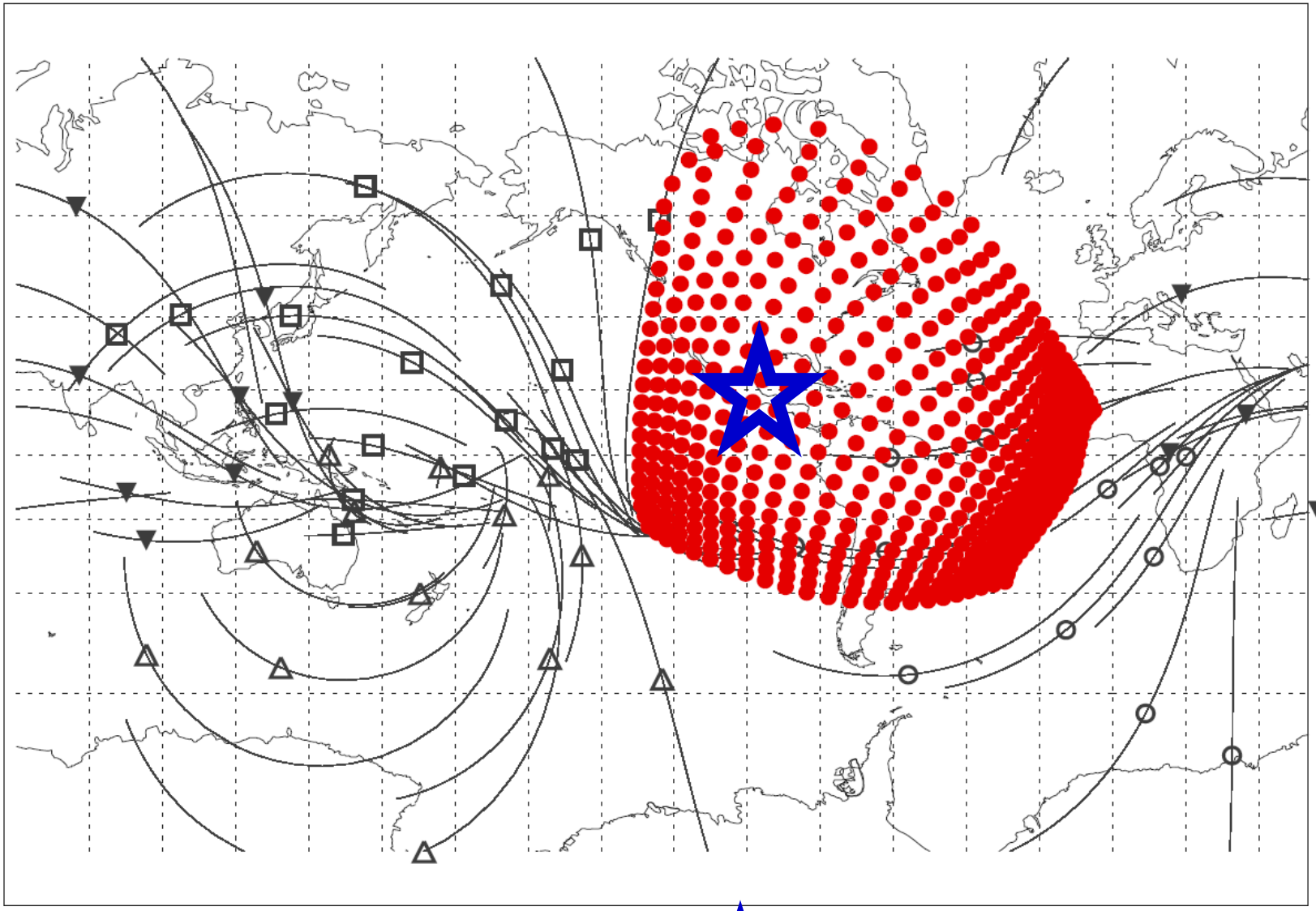
Installed in April, 2013

Observation hut

Before (filling a gap in GMDN)



After



Mt. Sierra Negra