

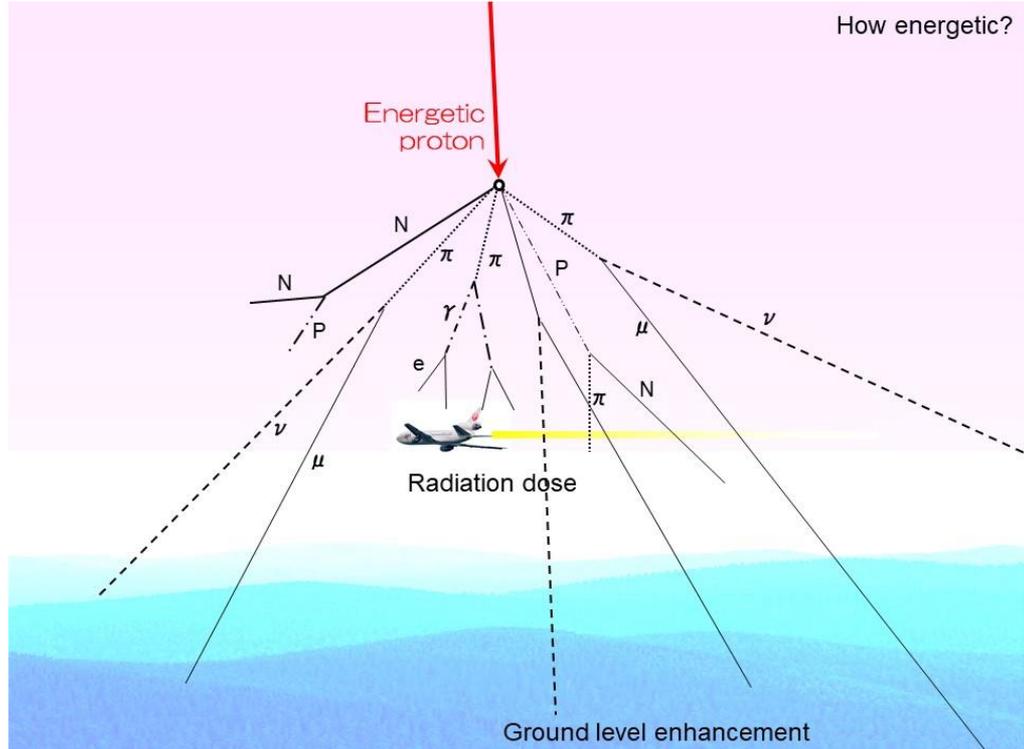
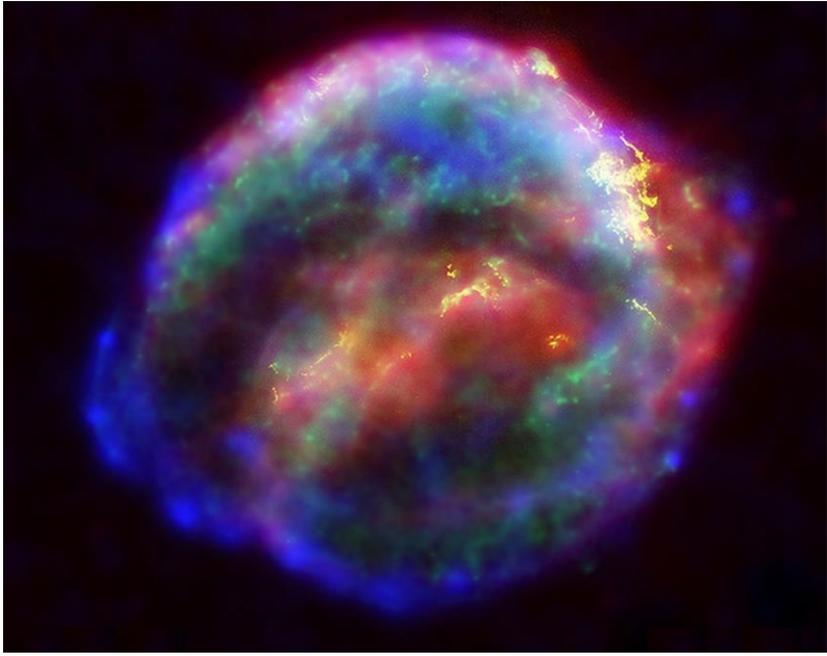
昭和基地宇宙線観測データ、リアルタイム・アーカイブシステムの構築

加藤千尋 (信州大学)
片岡龍峰 (国立極地研究所)

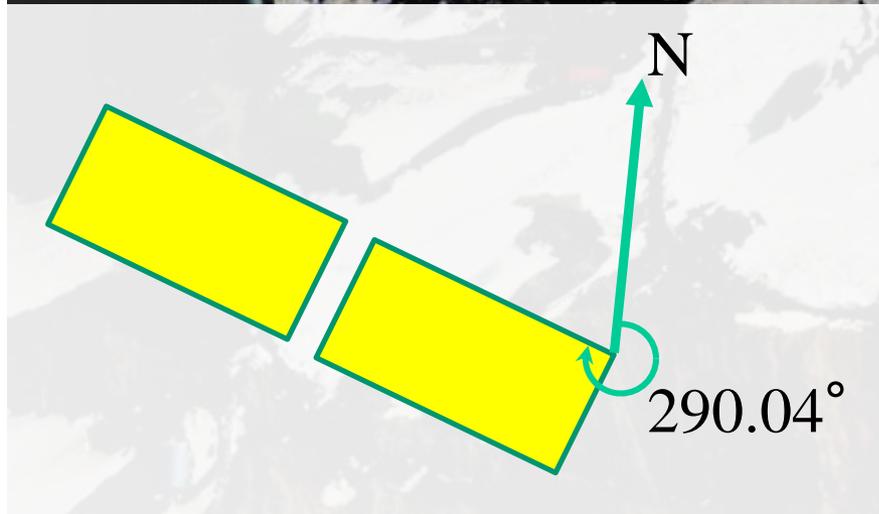


片岡：追加0

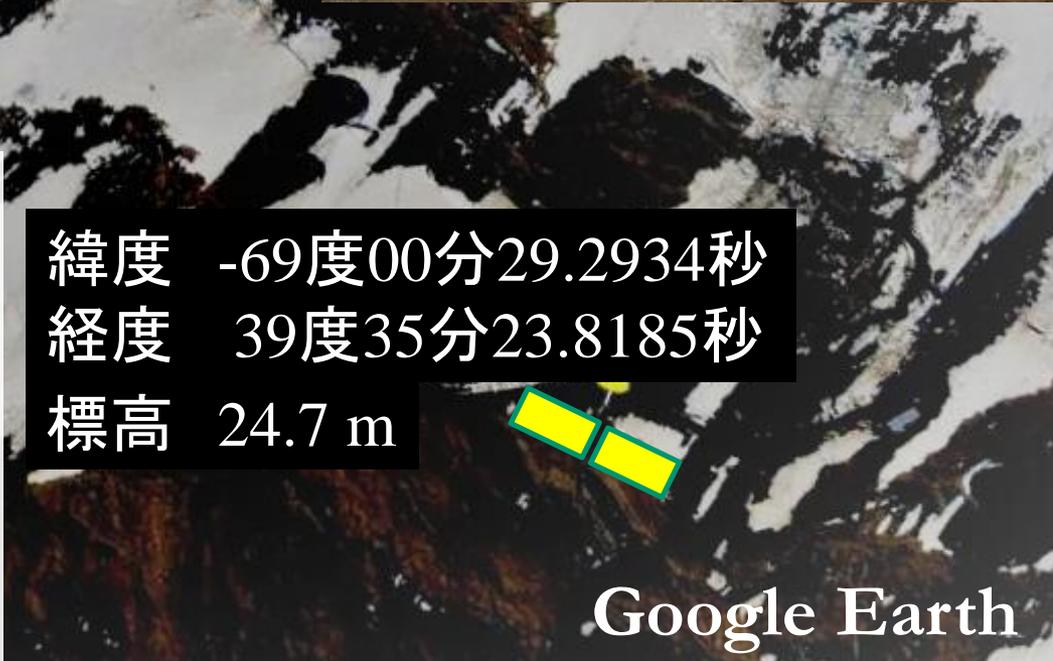
銀河宇宙線：galactic cosmic rays



Location of the Syowa CR observatory



緯度 -69度00分29.2934秒
経度 39度35分23.8185秒
標高 24.7 m



Google Earth

南極昭和基地での宇宙線観測計画

NM & MD

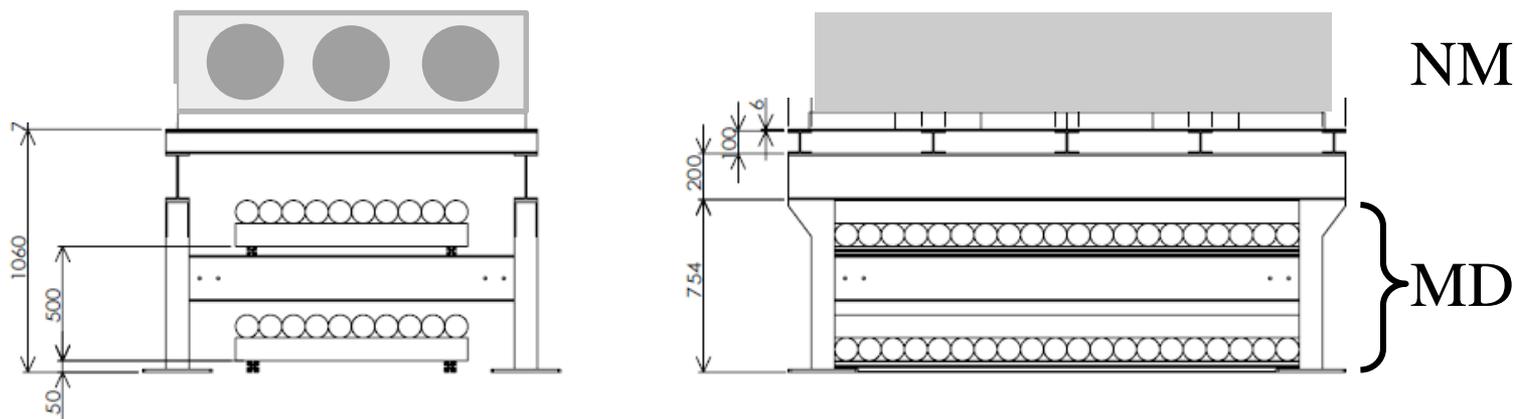
コンテナ2基内に設置

NM: 3 Tubes/Container, Total 6 tubes

MD: 4 layers

x: $10\text{cm}\Phi \times 100\text{cm}$ 20 tubes/layer

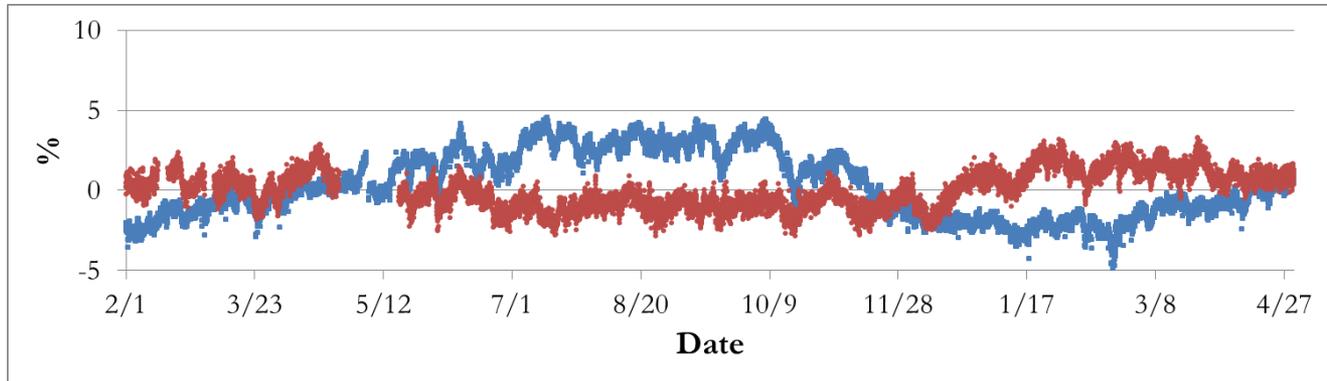
y: $10\text{cm}\Phi \times 200\text{cm}$ 10 tubes/layer



Mount

Operation rate : 2018.2.1 ~ 2019.4.30

= [MD: 99.7 % NM: 93.2 %]



NM, MD共に高い稼働率を維持
気温効果が見える

自動データ転送も滞りなく行われている。

モニタ用DB:QL for GMDN (SyowaMD)

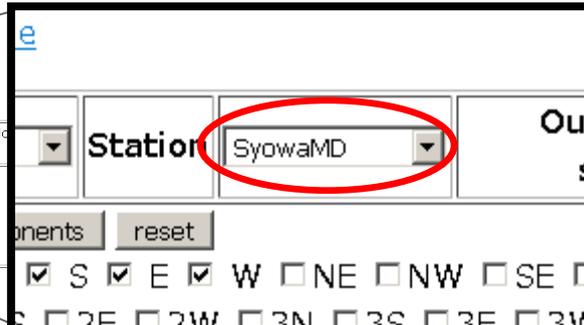
Simple Monitor of Cosmic Ray muon data

Description of supplied data is found [here](#).

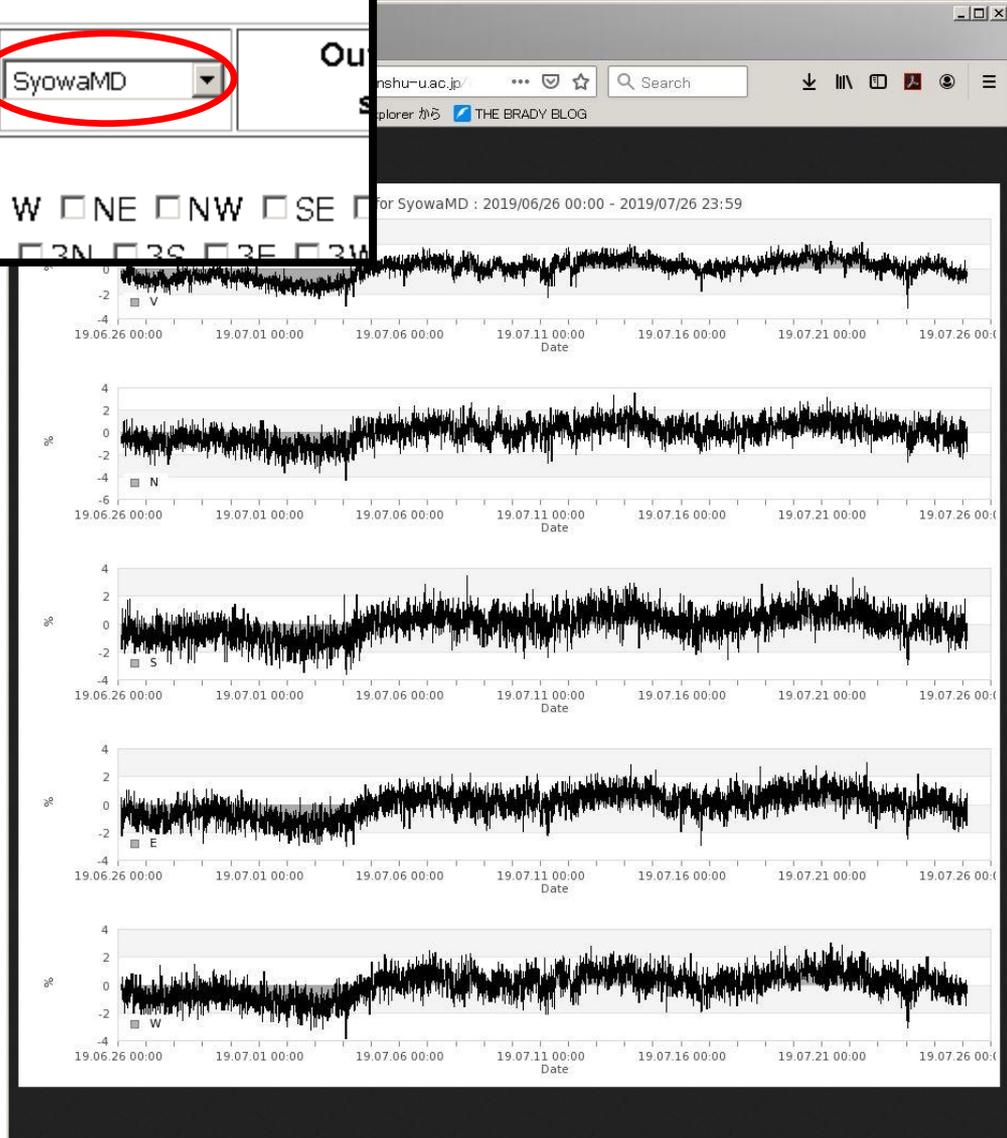
[Test page of access interface to CR Anisotropy Database](#)

[SyowaNM monitoring page](#)

select data	LevelID	Station	SyowaMD	Output style	Text data MHzCalib	
Components	<input type="checkbox"/> all CR components <input type="button" value="reset"/>					
	<input checked="" type="checkbox"/> V <input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> S <input checked="" type="checkbox"/> E <input checked="" type="checkbox"/> W <input type="checkbox"/> NE <input type="checkbox"/> NW <input type="checkbox"/> SE <input type="checkbox"/> SW					
	<input type="checkbox"/> 2N <input type="checkbox"/> 2S <input type="checkbox"/> 2E <input type="checkbox"/> 2W <input type="checkbox"/> 3N <input type="checkbox"/> 3S <input type="checkbox"/> 3E <input type="checkbox"/> 3W					
	<input type="checkbox"/> WT <input type="checkbox"/> US <input type="checkbox"/> LS (for Kuwait: <input type="checkbox"/> XUall <input type="checkbox"/> YUall <input type="checkbox"/> XLall <input type="checkbox"/> YLall)					
	<input type="checkbox"/> Pres <input type="checkbox"/> Temp <input type="checkbox"/> HV <input type="checkbox"/> PPS <input type="checkbox"/> GMHz <input type="checkbox"/> MHz <input type="checkbox"/> Max dev.					
	<input type="button" value="components"/> <input type="button" value="reset"/>					
Single	<input checked="" type="checkbox"/> S <input checked="" type="checkbox"/> E <input checked="" type="checkbox"/> W <input type="checkbox"/> NE <input type="checkbox"/> NW <input type="checkbox"/> SE <input type="checkbox"/> SW					
	<input type="checkbox"/> 2E <input type="checkbox"/> 2W <input type="checkbox"/> 3N <input type="checkbox"/> 3S <input type="checkbox"/> 3E <input type="checkbox"/> 3W					
	<input type="button" value="ZohzanFPGA"/>					
	<input type="button" value="Upper Layer"/>					
	<input type="button" value="U all"/> <input type="button" value="reset"/>					
	U01 U02 U03 U04 U05 U06 U07 U08 U09 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19 U20 U21 U22 U23 U24 U25 U26 U27 U28 U29 U30 U31 U32 U33 U34 U35 U36					
	for Kuwait(50 x 50)					
	<input type="button" value="XU all"/> <input type="button" value="reset"/>					
	XU01 XU02 XU03 XU04 XU05 XU06 XU07 XU08 XU09 XU10 XU11 XU12 XU13 XU14 XU15 XU16 XU17 XU18 XU19 XU20 XU21 XU22 XU23 XU24 XU25 XU26 XU27 XU28 XU29 XU30 XU31 XU32 XU33 XU34 XU35 XU36 XU37 XU38 XU39 XU40 XU41 XU42 XU43 XU44 XU45 XU46 XU47 XU48 XU49 XU50					
	<input type="button" value="YU all"/> <input type="button" value="reset"/>					
	YU01 YU02 YU03 YU04 YU05 YU06 YU07 YU08 YU09 YU10 YU11 YU12 YU13 YU14 YU15 YU16 YU17 YU18 YU19 YU20 YU21 YU22 YU23 YU24 YU25 YU26 YU27 YU28 YU29 YU30 YU31 YU32 YU33 YU34 YU35 YU36 YU37 YU38 YU39 YU40 YU41 YU42 YU43 YU44 YU45 YU46 YU47 YU48 YU49 YU50					
	<input type="button" value="Lower Layer"/>					
	<input type="button" value="L all"/> <input type="button" value="reset"/>					
	L01 L02 L03 L04 L05 L06 L07 L08 L09 L10 L11 L12 L13 L14 L15 L16 L17 L18 L19 L20 L21 L22 L23 L24 L25 L26 L27 L28 L29 L30 L31 L32 L33 L34 L35 L36					
	for Kuwait(50 x 50)					
	<input type="button" value="XL all"/> <input type="button" value="reset"/>					
	XL01 XL02 XL03 XL04 XL05 XL06 XL07 XL08 XL09 XL10 XL11 XL12 XL13 XL14 XL15 XL16 XL17 XL18 XL19 XL20 XL21 XL22 XL23 XL24 XL25 XL26 XL27 XL28 XL29 XL30 XL31 XL32 XL33 XL34 XL35 XL36 XL37 XL38 XL39 XL40 XL41 XL42 XL43 XL44 XL45 XL46 XL47 XL48 XL49 XL50					
	<input type="button" value="YL all"/> <input type="button" value="reset"/>					
	YL01 YL02 YL03 YL04 YL05 YL06 YL07 YL08 YL09 YL10 YL11 YL12 YL13 YL14 YL15 YL16 YL17 YL18 YL19 YL20 YL21 YL22 YL23 YL24 YL25 YL26 YL27 YL28 YL29 YL30 YL31 YL32 YL33 YL34 YL35 YL36 YL37 YL38 YL39 YL40 YL41 YL42 YL43 YL44 YL45 YL46 YL47 YL48 YL49 YL50					
Time	from:	Year 2019	Month 06	Day 26	Hour 03	Min 00
	bill:	Year 2019	Month 07	Day 26	Hour 03	Min 59
style of time	<input checked="" type="radio"/> Regular Date <input type="radio"/> DoY (only for text.style.data)					
	<input type="button" value="send query"/> <input type="button" value="reset"/>					

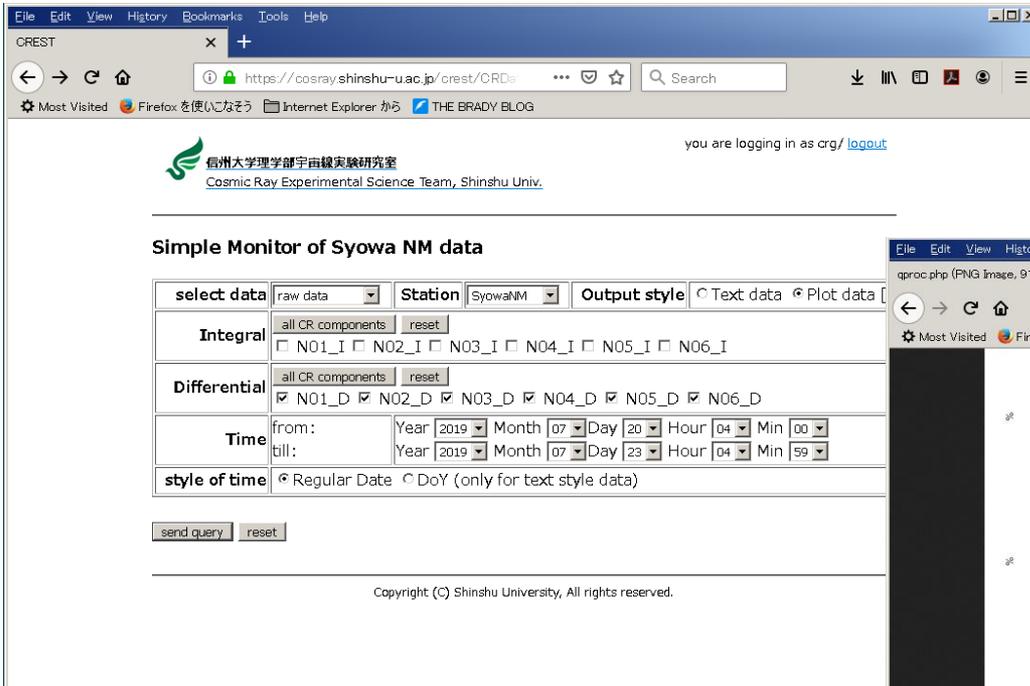


プロット例(気圧補正済)

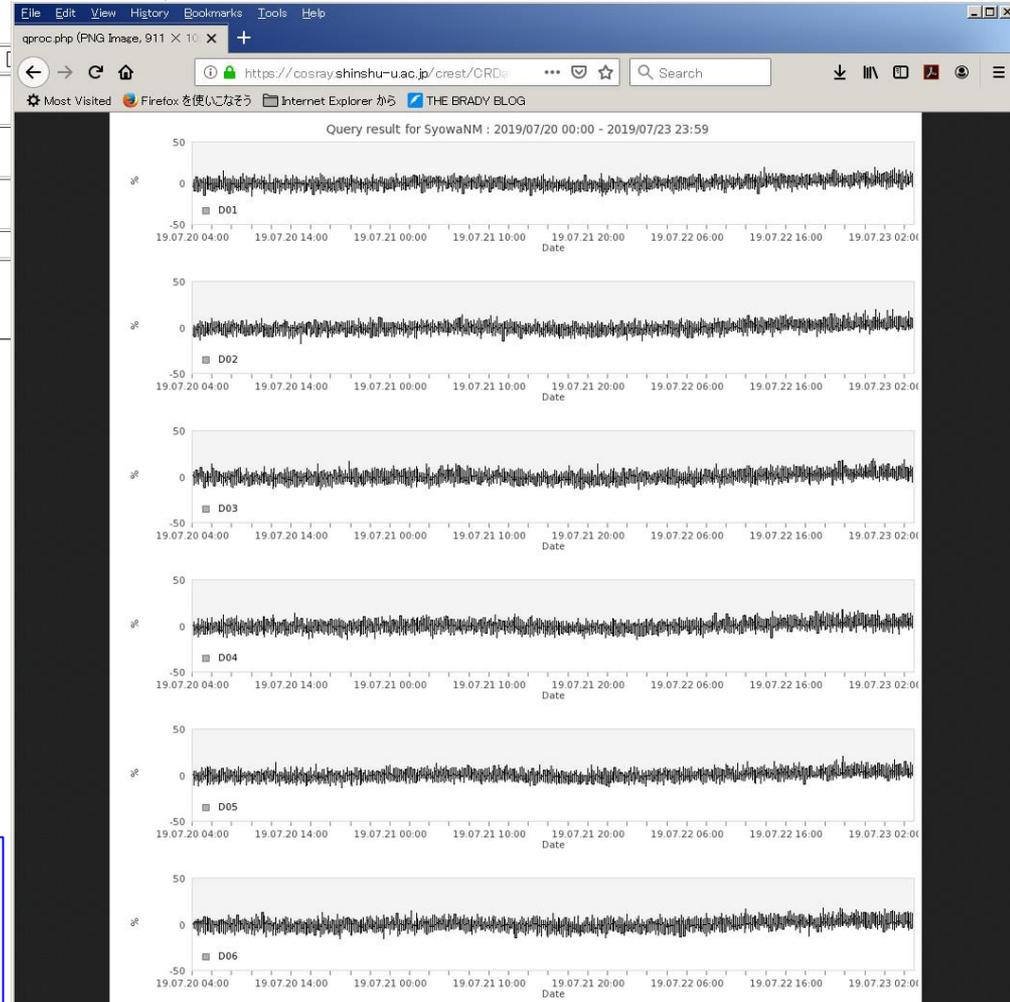


モニタ用DB:QL for SyowaNM

プロット例(気圧補正無)



The screenshot shows a web browser window with the URL <https://cosray.shinshu-u.ac.jp/crest/CRDs>. The page header includes the logo of Shinshu University and the text "you are logging in as crg/logout". The main content is titled "Simple Monitor of Syowa NM data". It features a form with several sections: "select data" (raw data), "Station" (SyowaNM), and "Output style" (Text data, Plot data). The "Integral" section has checkboxes for N01_I, N02_I, N03_I, N04_I, N05_I, and N06_I. The "Differential" section has checkboxes for N01_D, N02_D, N03_D, N04_D, N05_D, and N06_D. The "Time" section has dropdown menus for "from:" and "till:" with fields for Year, Month, Day, Hour, and Min. The "style of time" section has radio buttons for "Regular Date" and "DoY (only for text style data)". There are "send query" and "reset" buttons at the bottom of the form. The footer of the page reads "Copyright (C) Shinshu University, All rights reserved."



NM+MD:

DBへの書込み自動化 済

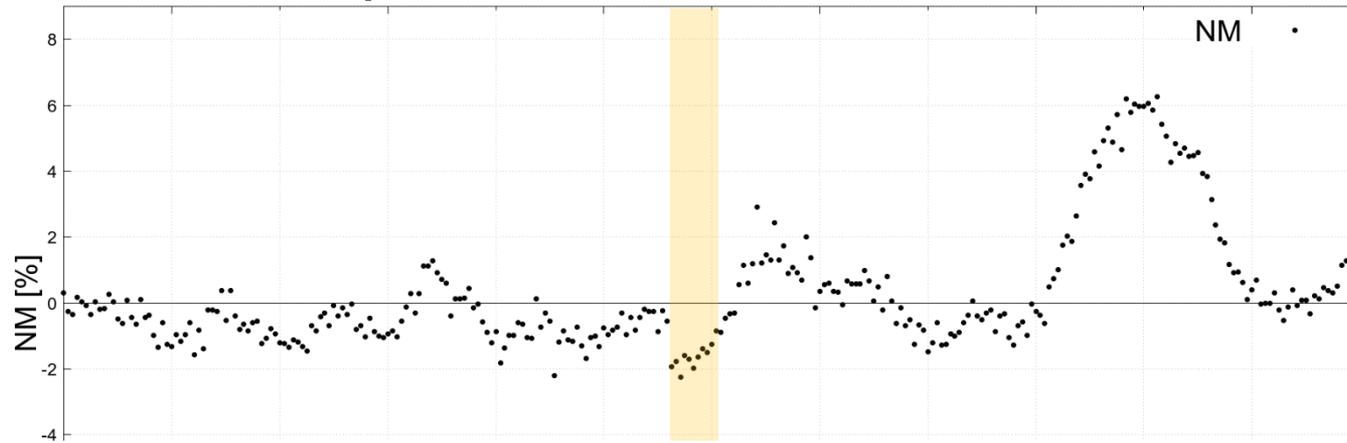
MD:

気圧補正自動化 済

NM+MD:

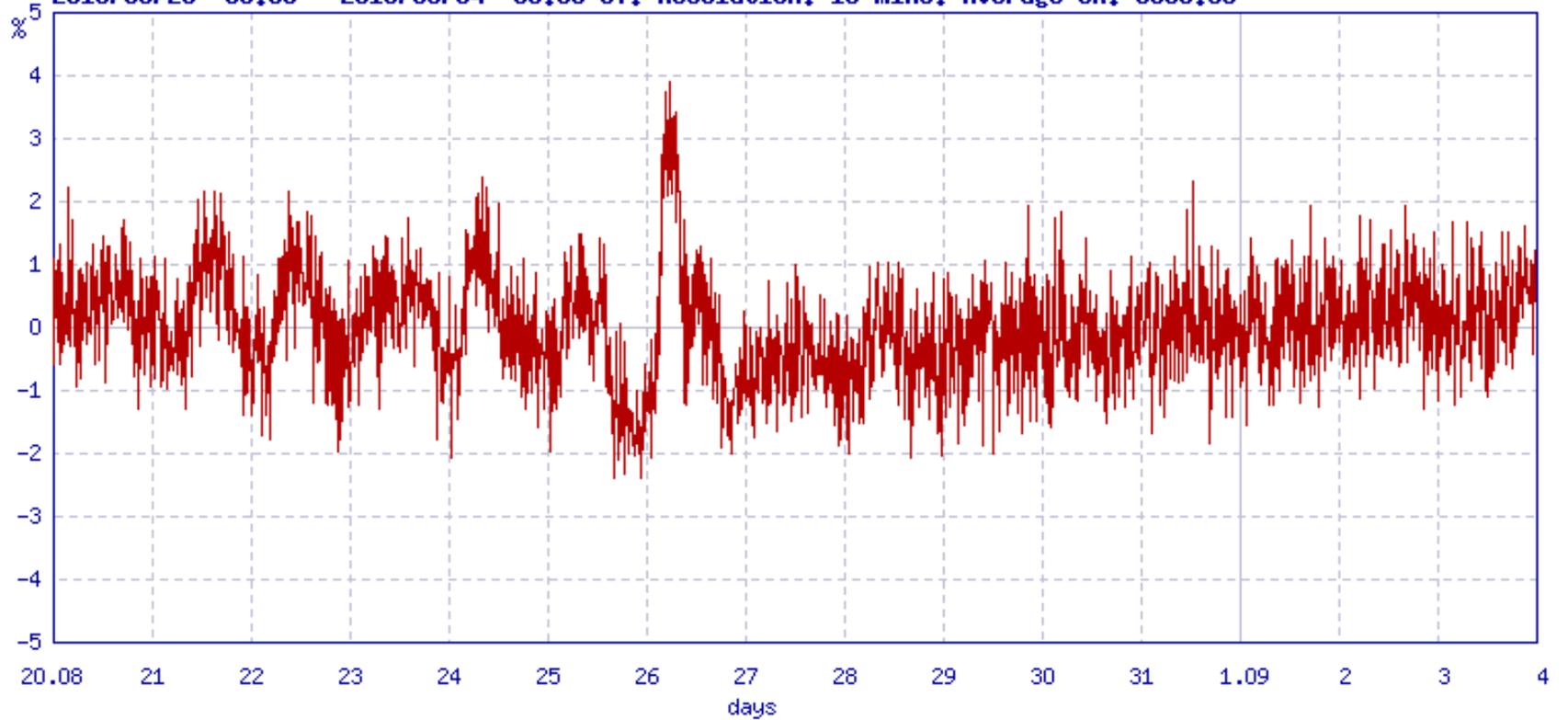
公開データ作成の自動化

2018.8.のイベント



Oulu Neutron Monitor

2018/08/20 00:00 - 2018/09/04 00:00 UT. Resolution: 10 mins. Average CR: 6688.35



2018.8.のイベント

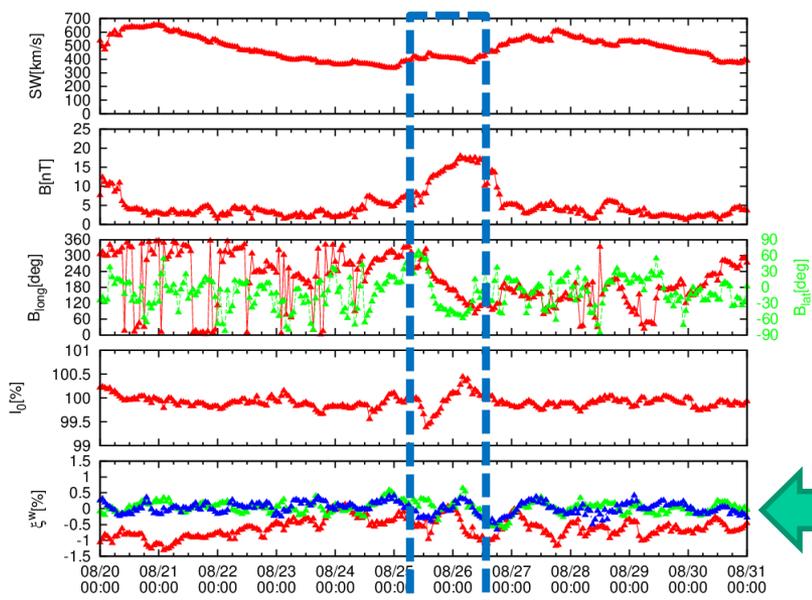
SW

|B|

B_{long}

B_{lat}

I_0

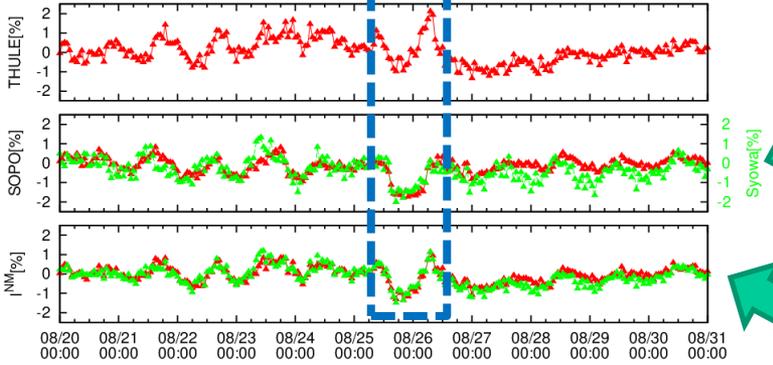


GMDN(+SyowaMD) と SyowaNM, Thule, 及びSouthPoleのNMデータを使った解析。

Flux Ropeの通過を示している。

Red: ξ_x
Grn: ξ_y
Blu: ξ_z

Thule

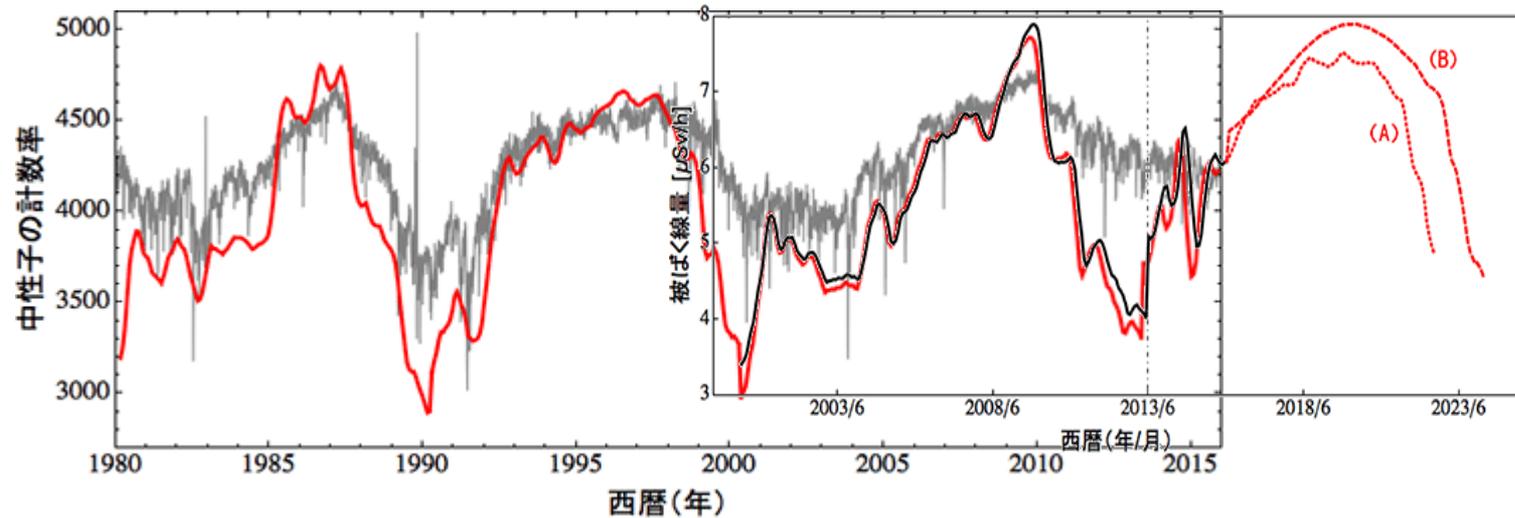


NM(South Pole)
NM(Syowa)

$$I_{NM} = \frac{Thule + SthPl}{2}$$

$$I_{NM} = \frac{Thule + Sywa}{2}$$

太陽圏の宇宙線輸送シミュレーションによる数年先の予測値(赤)
Miyake, Kataoka, and Sato (2017, Space Weather)



リアルタイム化への課題

- 現地の観測データは、 μ が10分値（気圧・室温）、中性子が1分値
- 1日の観測終了時に日本へ送信する、という観測モードが安定に動作中
 - リアルタイムにメール送信する機能が導入時に使えなかった、という事情のため
- メール送信機能の目途がついた
 - 1時間は出来そう、10分、1分はわからない
 - 気温効果の件も含めて開発者に問合せ中