National Institute of Information and Communications Technology
4-2-1 Nukui-kita, Koganei Tokyo 184-8795 Japan
TEL:042-327-7540

Report of Regional Warning Center Tokyo, 2013-2014
National Institute of Information and Communications Technology

I. Recent Accomplishments

A) New solar wind data receiver system was established

The solar wind data receiver from ACE and DISCOVR was replaced on March 2014 at the same place of previous one, Koganei. The old system was already more than twenty years old and often needs to repair. We operate this process under the cooperation with US, Germany, and Korea. We had MoU with NOAA in April 2014 relating with this project.

New solar wind data receiver

B) New solar radio telescope was established

We have been observing solar radio more than twenty years at Hiraiso, Japan with "HiRAS" system. However, the system is more than twenty years and often need repairs. In addition the recent radio condition around Hiraiso becomes worse. Under the situation we determined to build new system at Yamagawa observatory, Kagoshima. The new system was constructed on March 2014. The resolution of time and frequency is one of the top groups in the world. We will have simultaneous observation with HiRAS for comparing the results for system calibrations for one or two years.

Opening ceremony of new solar radio telescope in Yamagawa Obs.

C) Next generation ionosonde is now been installed

New ionosonde system "VIPIR2" is now installing in Koganei. It has an array receiver system which make possible to recognize X-mode and O-mode signal independently and the precision of automatic real-time scaling is expect to be higher than the present. It is very important progress for calculating real-time simulation with ionospheric code. In addition we can use direction finding of receiving signal in which we can deduce two dimensional distribution of ionospheric structure or finding source of artificial noise.

Install of VIPIR2 receivers

D) Data rescue in WDC for ionosphere and space weather

We have a long history of ionospheric observations since 1957, and operating the WDC for ionosphere and space

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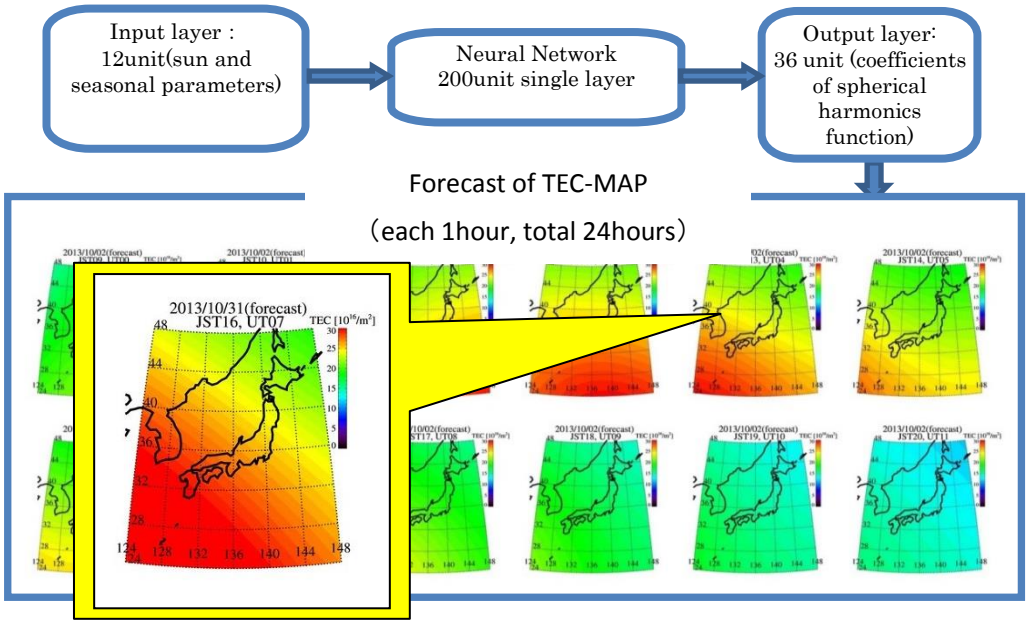
weather for exchanging and keeping the data. The old data are recorded on films which are easily spoiled in the long time. These data are precious and cannot be obtained again so it is important to keep the data with digitization. We already digitized whole of domestic data, and now we begin to do with the data obtained in foreign countries. To save the cost without losing the quality, we used "ribbon scanning" method. This is the way to record just one image for a roll of film, so we need not take a photo of each flame. We can save the time and cost and refrain from accidental flame missing.

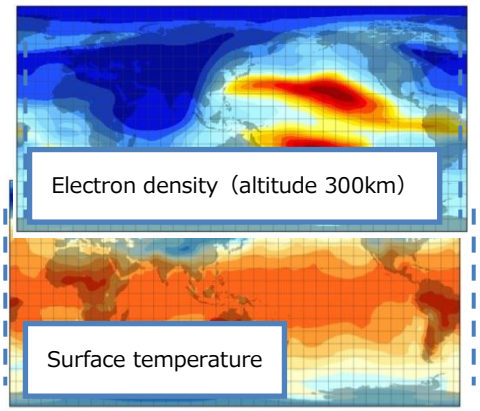
E) Trial study of empirical model for forecasting TEC near Japan area

We developed a empirical model using neural network for deducing the TEC map above Japan area. Input parameters are sunspot number and seasonal information, and we 24 hours' forecast with one hour duration as the 36-order coefficients of spherical harmonics function.

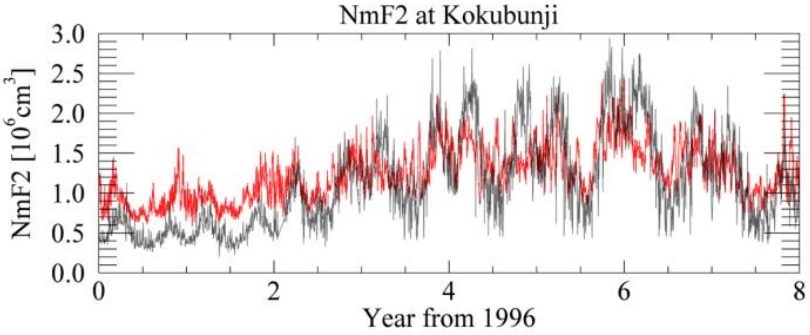


F) Present status of GAIA

GAIA (Ground-to-topside model of Atmosphere and Ionosphere for Aeronomy) project combines atmospheric and ionospheric models (developed separately thus far), and targets the development of a simulation model for the whole global atmosphere. Now we succeeded to reproduce some particular phenomena, e.g., stratospheric sudden warming using objective analysis data as an input parameter. In addition we try a long-term analysis of 30 years for comparing the results with observation.



Snapshot of simulation results of GAIA using objective analysis data



Comparison between simulated (red) and observed (black) results of NmF2 above Kokubunji (average of 12-16LT)

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G) DCPC process

NICT is approved as a candidate of DCPC on ICTSW-4 held on November 2013. Now we just finished a screening by document.

II. Highest priority product goals

- Connection of magnetosphere-ionosphere simulation code
- Data assimilation of ionosphere/magnetosphere

III. Highest priority data needs

- Operational observation data of ionosphere with ionosonde in Japan

IV. Recent information on user impacts

A) Research and hearing of user needs

We researched how the people use our space weather information with questioner and hearing since January 2013. We at first categorized the application of space weather, and extracted companies/public organizations. After that we call a phone for questioner to over fifty organizations, and had face-to-face hearing with ten; e.g., air traffic controller, pilot, airline company, space agency, resource investigation. From their requirements, we met the following two demands; (1) revise our web site for simplifying the structure, and adding detailed explanation, and (2) start lectures for the people in companies and public organizations.

B) Space Weather users forum 2014

Space Weather users forum 2014 was held on March 20, 2014 at Koganei campus NICT. As the beginning of the meeting we had the opening ceremony of ACE receiver. In the forum we had a report talk of recent space weather from NICT and after three invited lectures. More than 100 people attended to the meeting.

Space weather users forum 2014

Space weather users forum 2014

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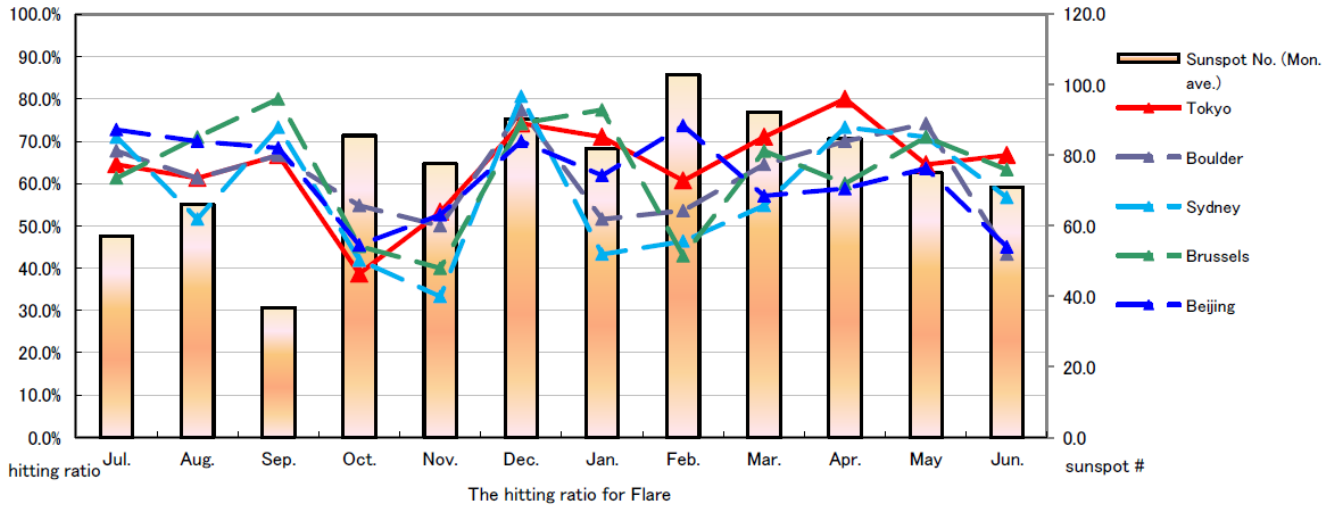
V. Forecast verification summary

	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Sunspot No. (Mon. av	57.0	66.0	36.9	85.6	77.6	90.3	82.0	102.8	92.2	84.7	75.0	71.0

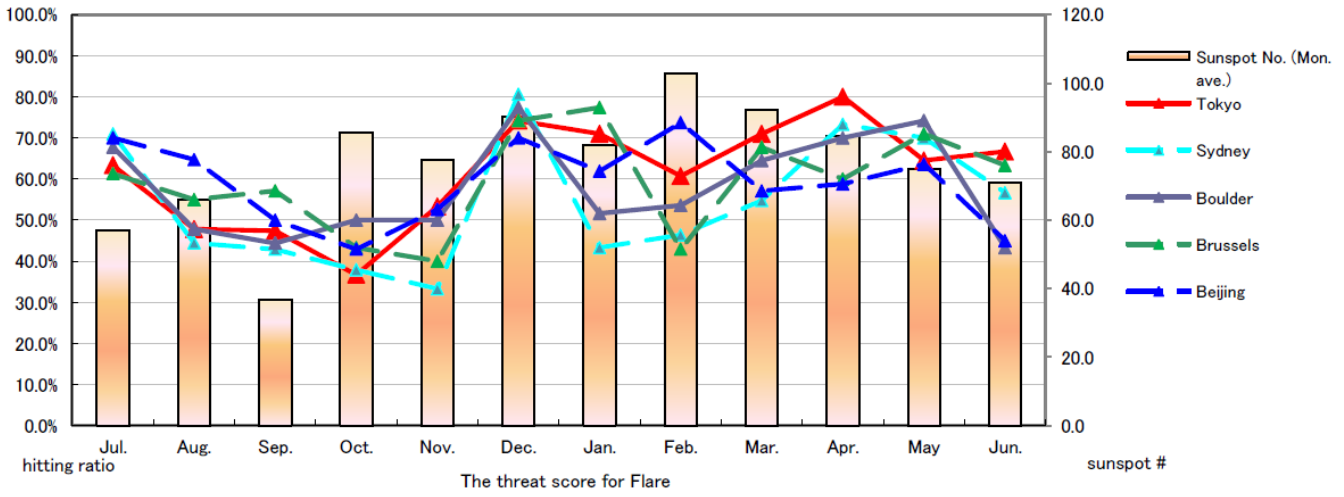
【The hitting ratio for Flare】

Flare		Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Ave.	ranking
Tokyo	06:00 UT	64.5%	61.3%	66.7%	38.7%	53.3%	74.2%	71.0%	60.7%	71.0%	80.0%	64.5%	66.7%	64.4%	1
Brussels	12:30 UT	61.3%	71.0%	80.0%	45.2%	40.0%	74.2%	77.4%	42.9%	67.7%	60.0%	71.0%	63.3%	62.8%	2
Beijing	06:30 UT	72.7%	70.0%	68.4%	45.5%	52.6%	70.0%	61.9%	73.7%	57.1%	58.8%	63.6%	45.0%	61.6%	3
Boulder	03:30 UT	67.7%	61.3%	66.7%	54.8%	50.0%	77.4%	51.6%	53.6%	64.5%	70.0%	74.2%	43.3%	61.3%	4
Sydney	00:00 UT	71.0%	51.6%	73.3%	41.9%	33.3%	80.6%	43.3%	46.4%	54.8%	73.3%	71.0%	56.7%	58.1%	5
														61.6%	



【The threat score for Flare: hitting No./all threat No.】

Flare		Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Ave.	ranking
Tokyo	06:00 UT	63.3%	47.8%	47.4%	36.7%	53.3%	74.2%	71.0%	60.7%	71.0%	80.0%	64.5%	66.7%	61.4%	1
Brussels	12:30 UT	61.3%	55.0%	57.1%	43.3%	40.0%	74.2%	77.4%	42.9%	67.7%	60.0%	71.0%	63.3%	59.4%	2
Beijing	06:30 UT	70.0%	64.7%	50.0%	42.9%	52.6%	70.0%	61.9%	73.7%	57.1%	58.8%	63.6%	45.0%	59.2%	3
Boulder	03:30 UT	67.7%	47.8%	44.4%	50.0%	50.0%	77.4%	51.6%	53.6%	64.5%	70.0%	74.2%	43.3%	57.9%	4
Sydney	00:00 UT	71.0%	44.4%	42.9%	37.9%	33.3%	80.6%	43.3%	46.4%	54.8%	73.3%	70.0%	56.7%	54.6%	5
														58.5%	



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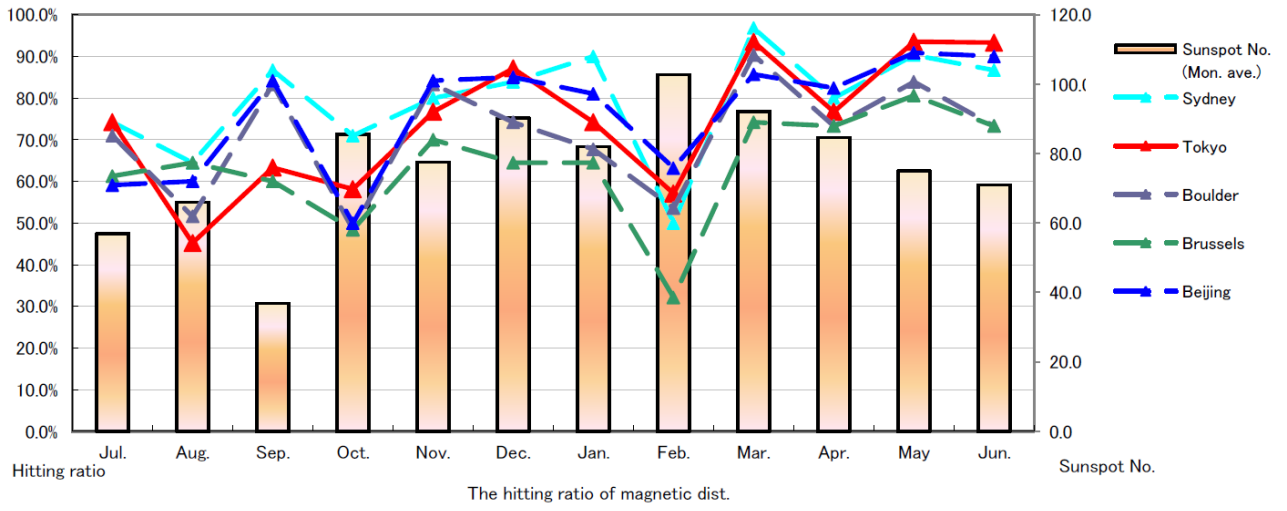
The hitting ratio of each RWC during July 2013 to June 2014

	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Sunspot No. (Mon.	57.0	66.0	36.9	85.6	77.6	90.3	82.0	102.8	92.2	84.7	75.0	71.0

The hitting ratio of magnetic disturbance *using Kakioka K-index

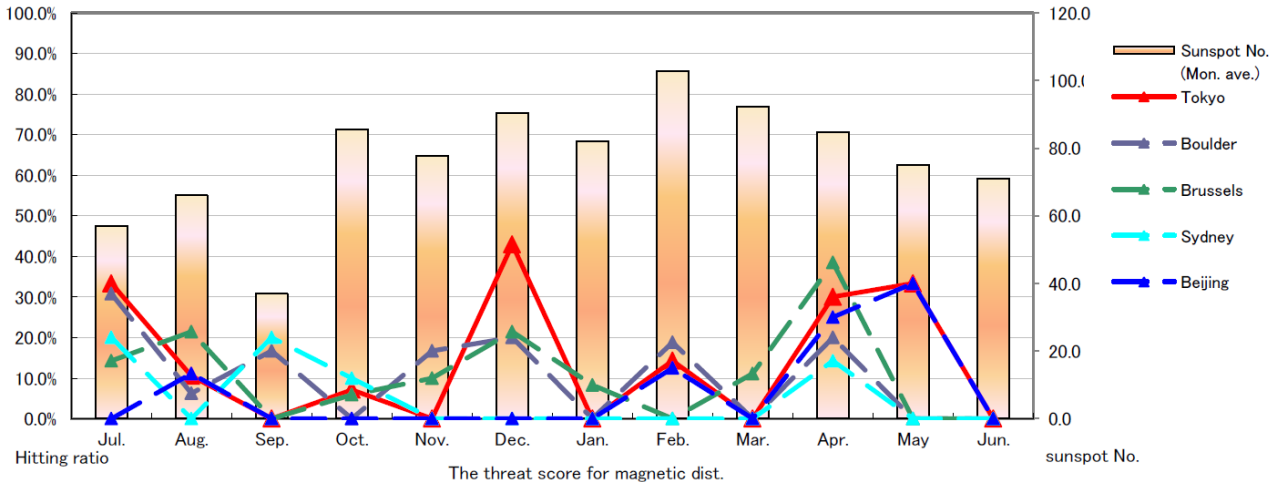
magnetic Dist.		Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Ave.	ranking
Sydney	00:00 UT	74.2%	64.5%	86.7%	71.0%	80.0%	83.9%	90.0%	50.0%	96.8%	80.0%	90.3%	86.7%	79.5%	1
Beijing	06:30 UT	59.1%	60.0%	84.2%	50.0%	84.2%	85.0%	81.0%	63.2%	85.7%	82.4%	90.9%	90.0%	76.3%	2
Tokyo	06:00 UT	74.2%	45.2%	63.3%	58.1%	76.7%	87.1%	74.2%	57.1%	93.5%	76.7%	93.5%	93.3%	74.4%	3
Boulder	03:30 UT	71.0%	51.6%	83.3%	48.4%	83.3%	74.2%	67.7%	53.6%	90.3%	73.3%	83.9%	73.3%	71.2%	4
Brussels	12:30 UT	61.3%	64.5%	60.0%	48.4%	70.0%	64.5%	64.5%	32.1%	74.2%	73.3%	80.6%	73.3%	63.9%	5
														73.1%	



The hitting ratio of magnetic dist.

【The threat score for magnetic disturbance: hitting No./all threat No.】

magnetic Dist.		Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Ave.	ranking
Tokyo	06:00 UT	33.3%	10.5%	0.0%	7.1%	0.0%	42.9%	0.0%	14.3%	0.0%	30.0%	33.3%	0.0%	14.3%	1
Brussels	12:30 UT	14.3%	21.4%	0.0%	5.9%	10.0%	21.4%	8.3%	0.0%	11.1%	38.5%	0.0%	0.0%	10.9%	2
Boulder	03:30 UT	30.8%	6.3%	16.7%	0.0%	16.7%	20.0%	0.0%	18.8%	0.0%	20.0%	0.0%	0.0%	10.8%	3
Beijing	06:30 UT	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%	25.0%	33.3%	0.0%	6.8%	4
Sydney	00:00 UT	20.0%	0.0%	20.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	0.0%	5.4%	5
														9.6%	



The threat score for magnetic dist.