Geomagnetic Event Review

September 2014 - February 2015

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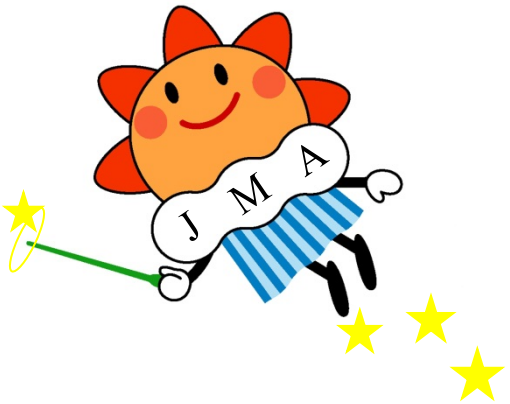
Takashi Ohkawa

Kakioka Magnetic Observatory

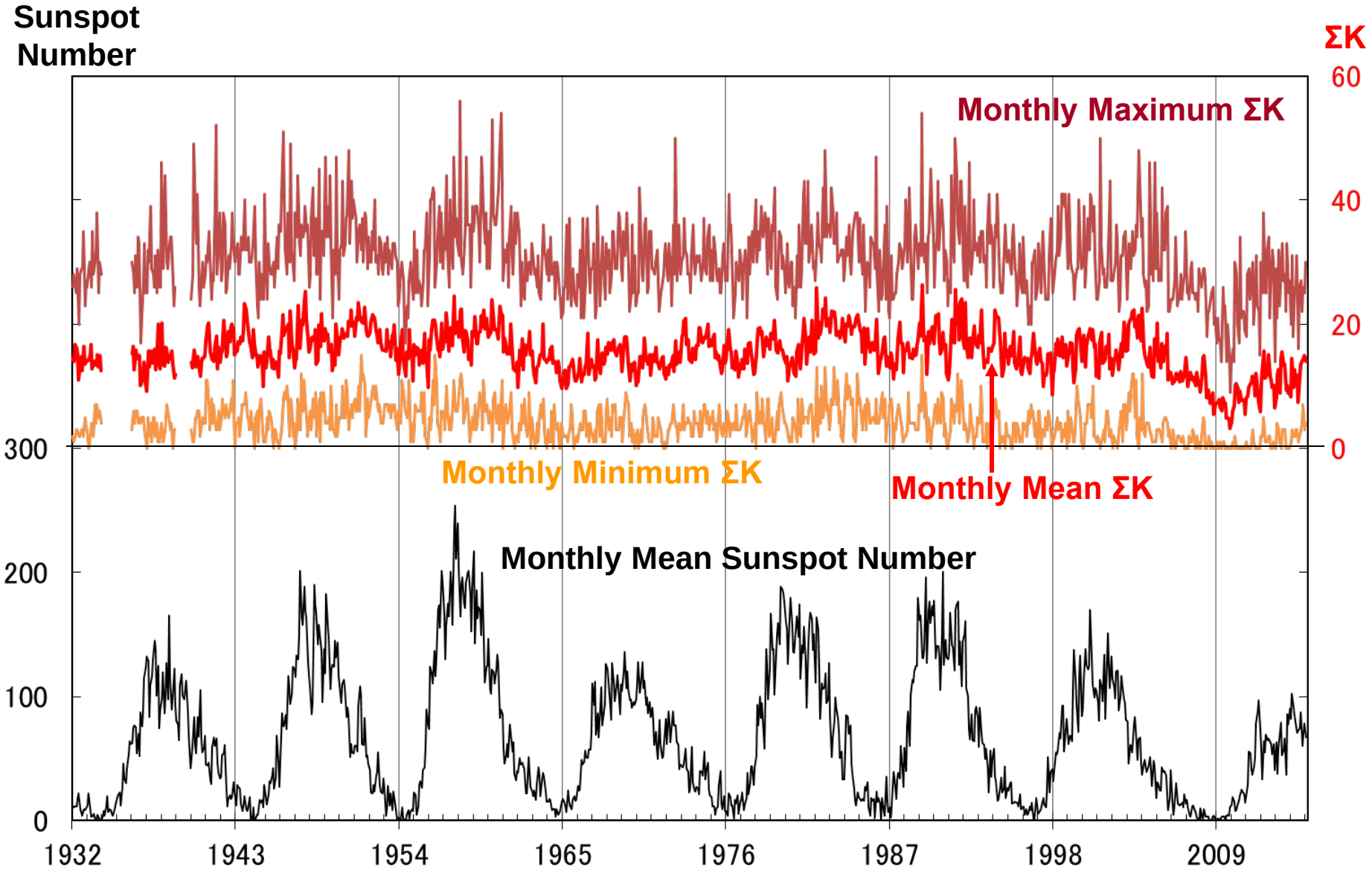
Japan Meteorological Agency



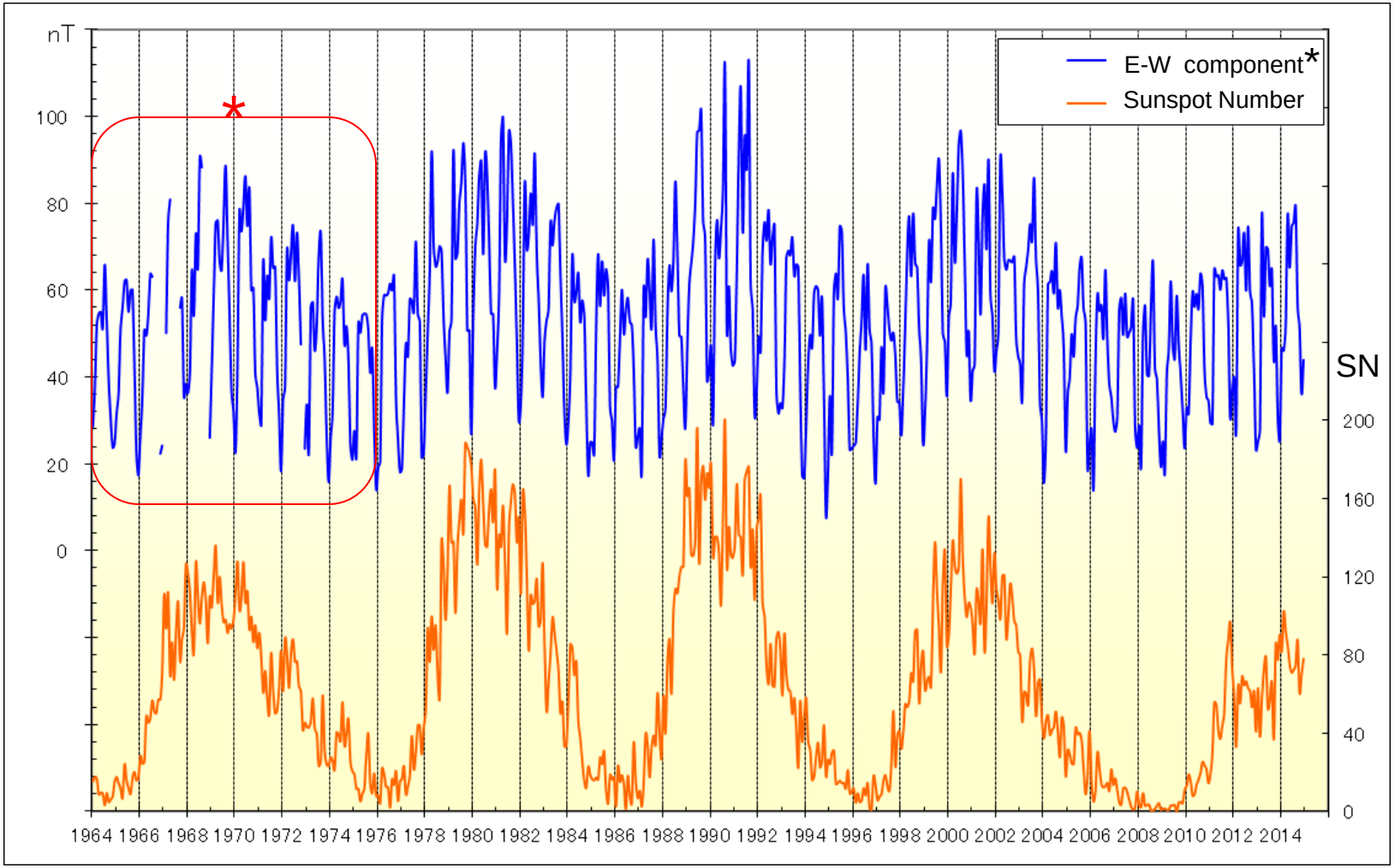
March 4 2015

The LUIGANS Spa & Resort

A comparison of daily total K-index（ΣK） at Kakioka with Sunspot Number from 1932 to 2015



A comparison of E-W geomagnetic component at Kakioka with Sunspot Number from 1964 to 2015

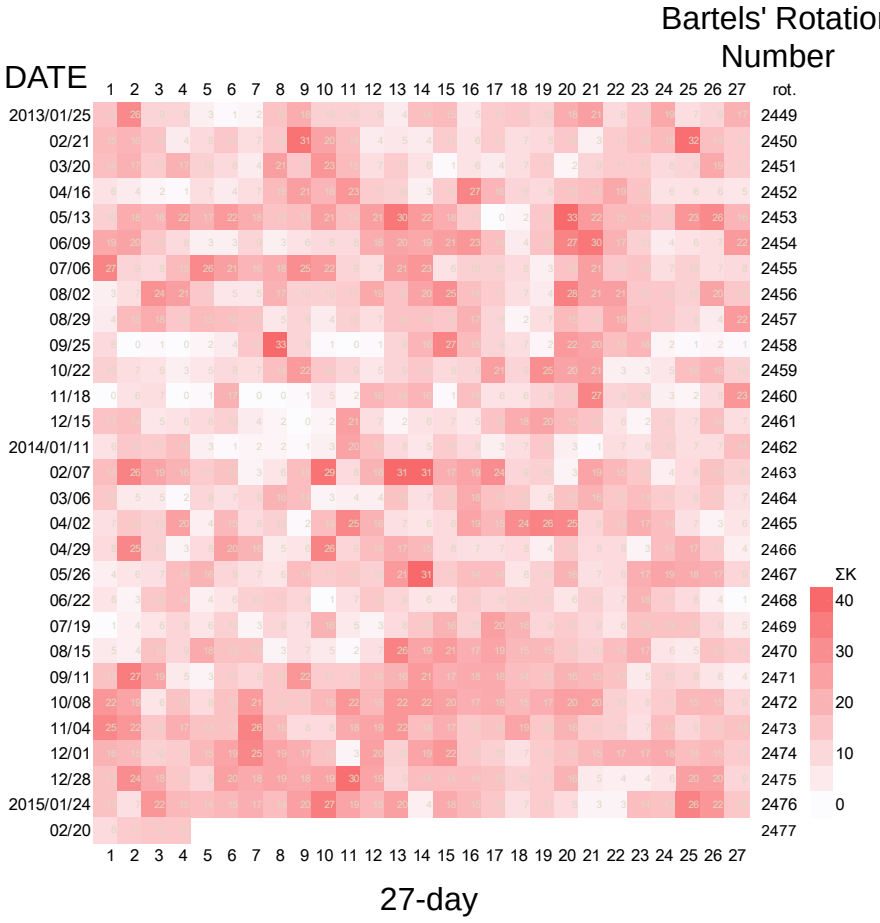


* the mean amplitude of the five international quiet days for each month

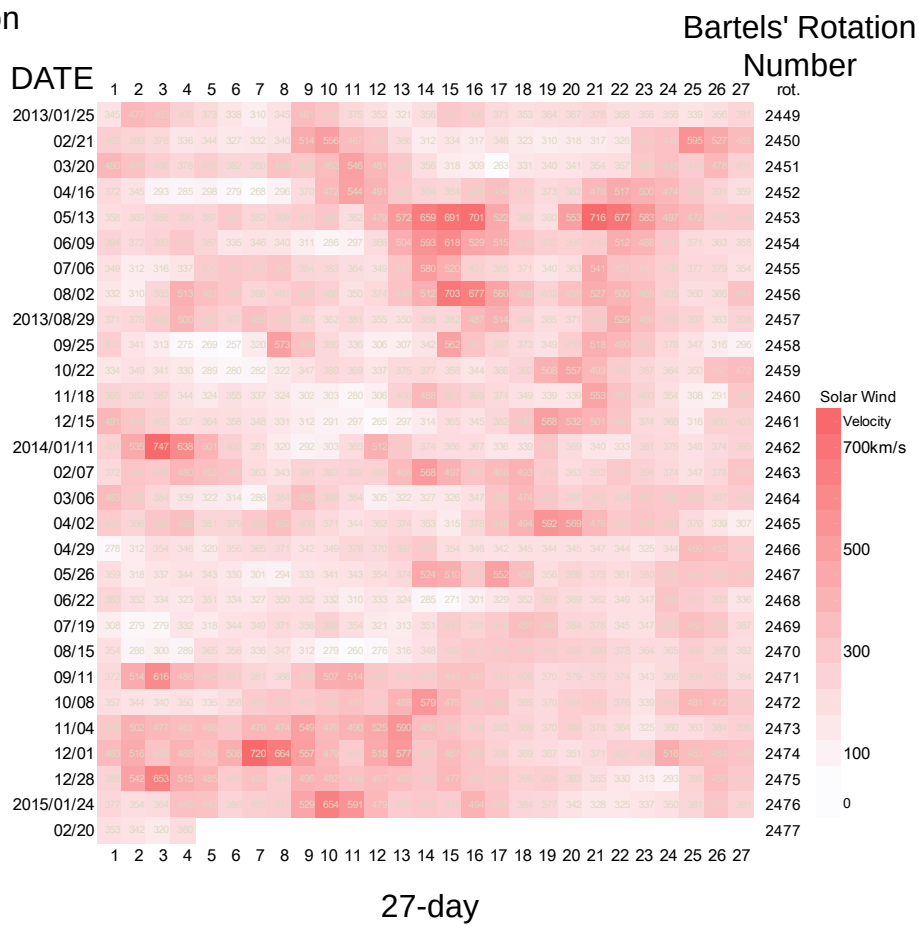
* the digitalized data from the bromide paper records between 1964 and 1975

The 27-day cycle in Σk at Kakioka and solar wind daily average velocity between 2013 and 2015

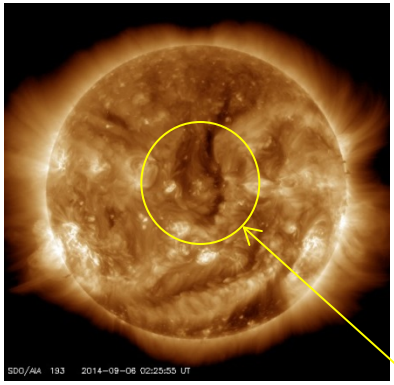
ΣK at Kakioka



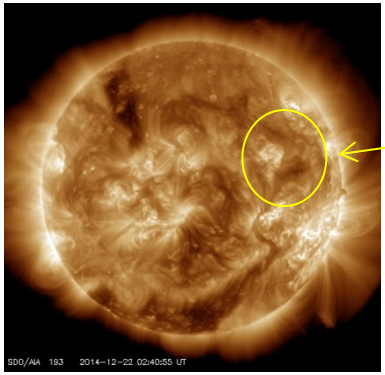
Ace Solar Wind Average Velocity



Coronal holes in images every 27-days for the reporting period

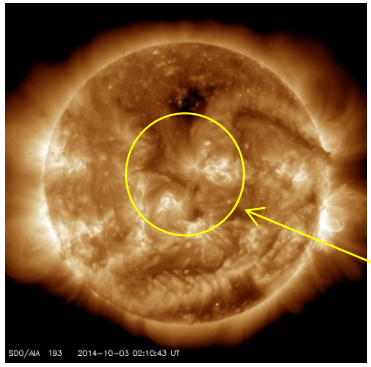


2014/09/06

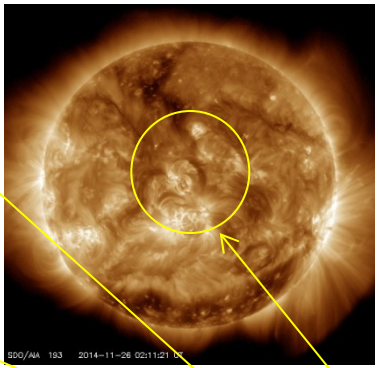


2014/12/22

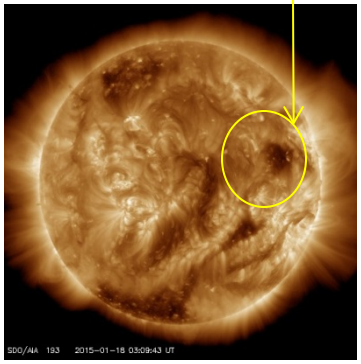
A new coronal hole appeared.



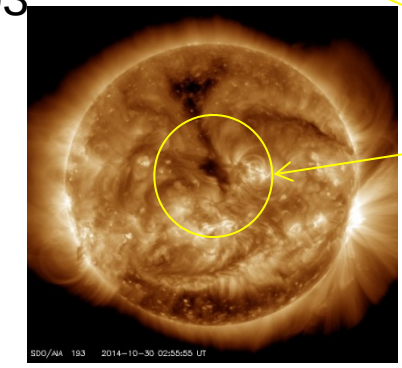
2014/10/03



2014/11/26

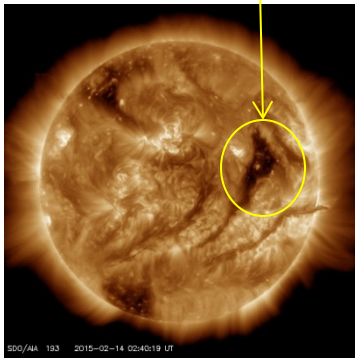


2015/01/18



2014/10/30

A very small coronal hole is recurrent with the sun's 27-day rotation period.



2015/02/14

Images from SDO_AIA193

Classification of the quality of geomagnetic phenomenon

- A : very distinct
- B : fair, ordinary, but unmistakable
- C : doubtful

(in the 1957 **IAGA** Copenhagen resolution)

Kakioka criteria for the quality classification

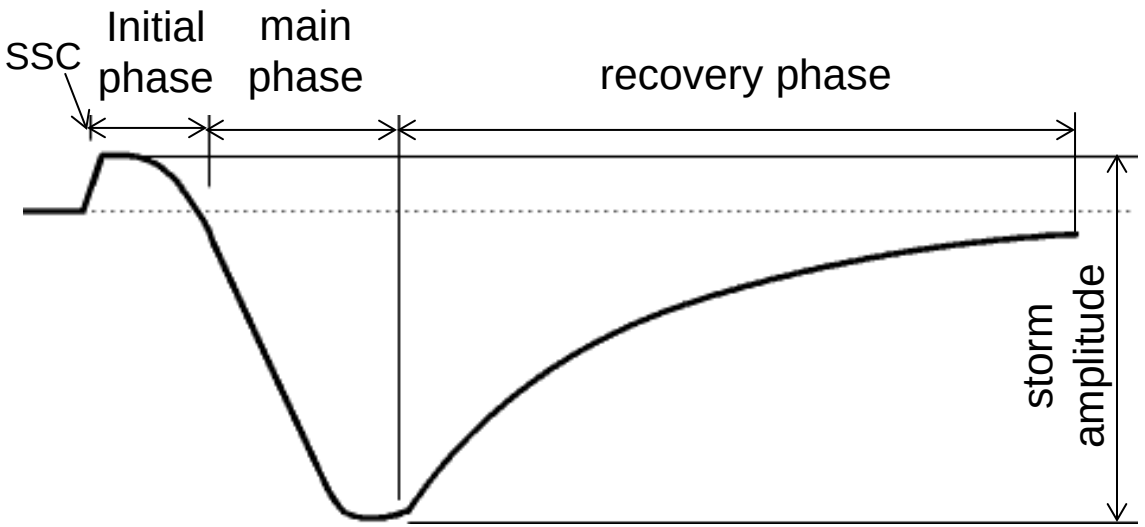
	A	B	C
si & ssc	15nT≦a	6nT≦a＜15nT	3nT≦a＜6nT

		A	B	C
sfe	k≦2	20nT≦a	7nT≦a	2nT≦a
	3≦k	25nT≦a	10nT≦a	5nT≦a

k : K-index　　a : geomagnetic amplitude

Classification of the activity of geomagnetic storm

- Starting of geomagnetic storm: H component decreases with large amplitude
  Type of *Storm Sudden Commencement*（SSC）
  maximum K-index ≧5 ＆ “disturbance amplitude” ≧40nT
  Type of *Storm Gradual* commencement（SG）
  K-index ≧5 for more than 2 periods ＆ “disturbance amplitude” ≧50nT
- Ending time of geomagnetic storm
  K-index ≦3
  ＆ “returning undisturbed level almost similar to quiet daily variation”

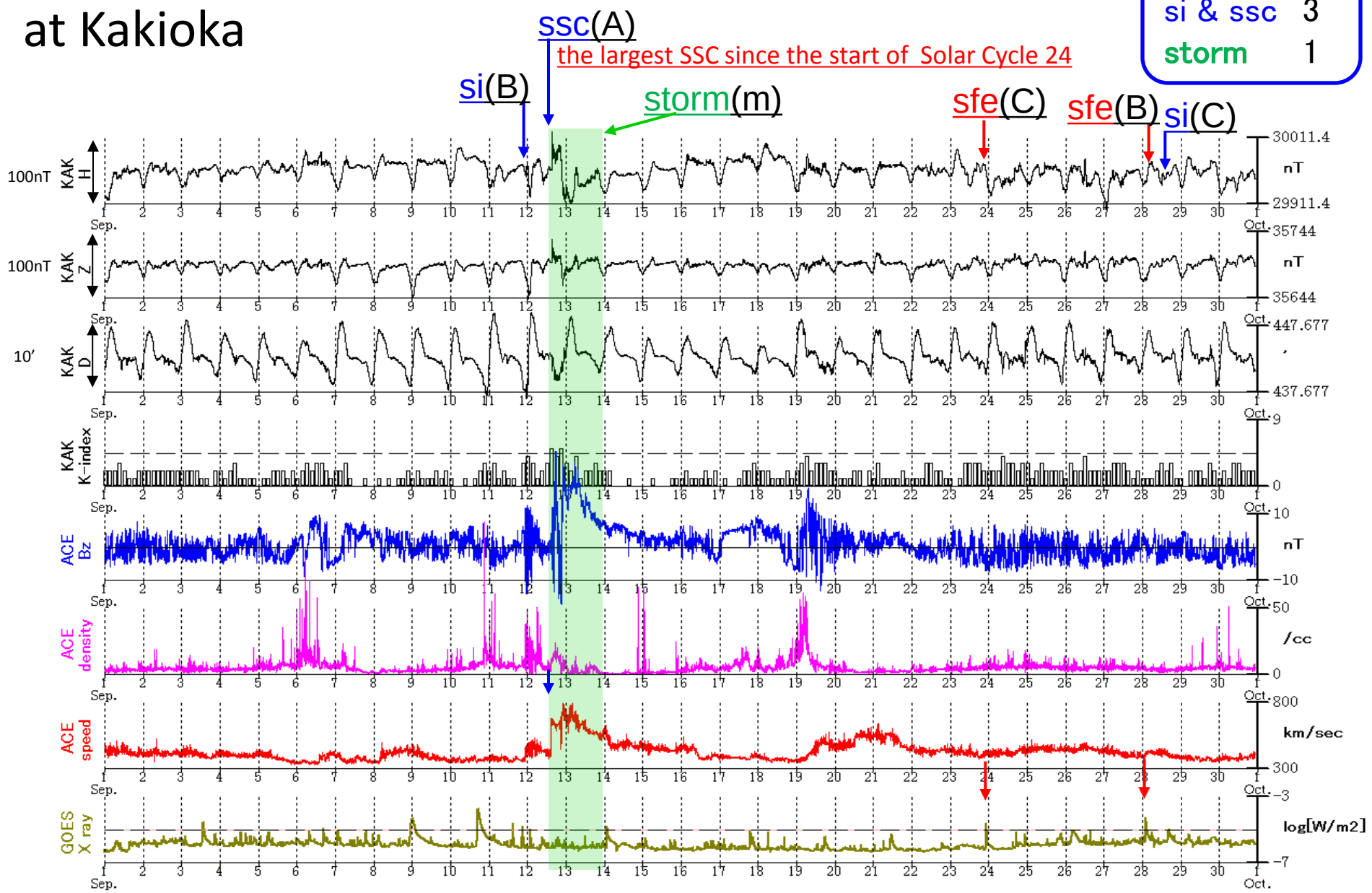


A sketch of H component field variation with SSC

Activity of geomagnetic storm on Kakioka criteria	
maximum K-index	Activity
K=8 or 9	s (severe)
K=6 or 7	ms (moderate severe)
K=5	m (moderate)

September 2014 geomagnetic variations at Kakioka

sfe	2
si & ssc	3
storm	1

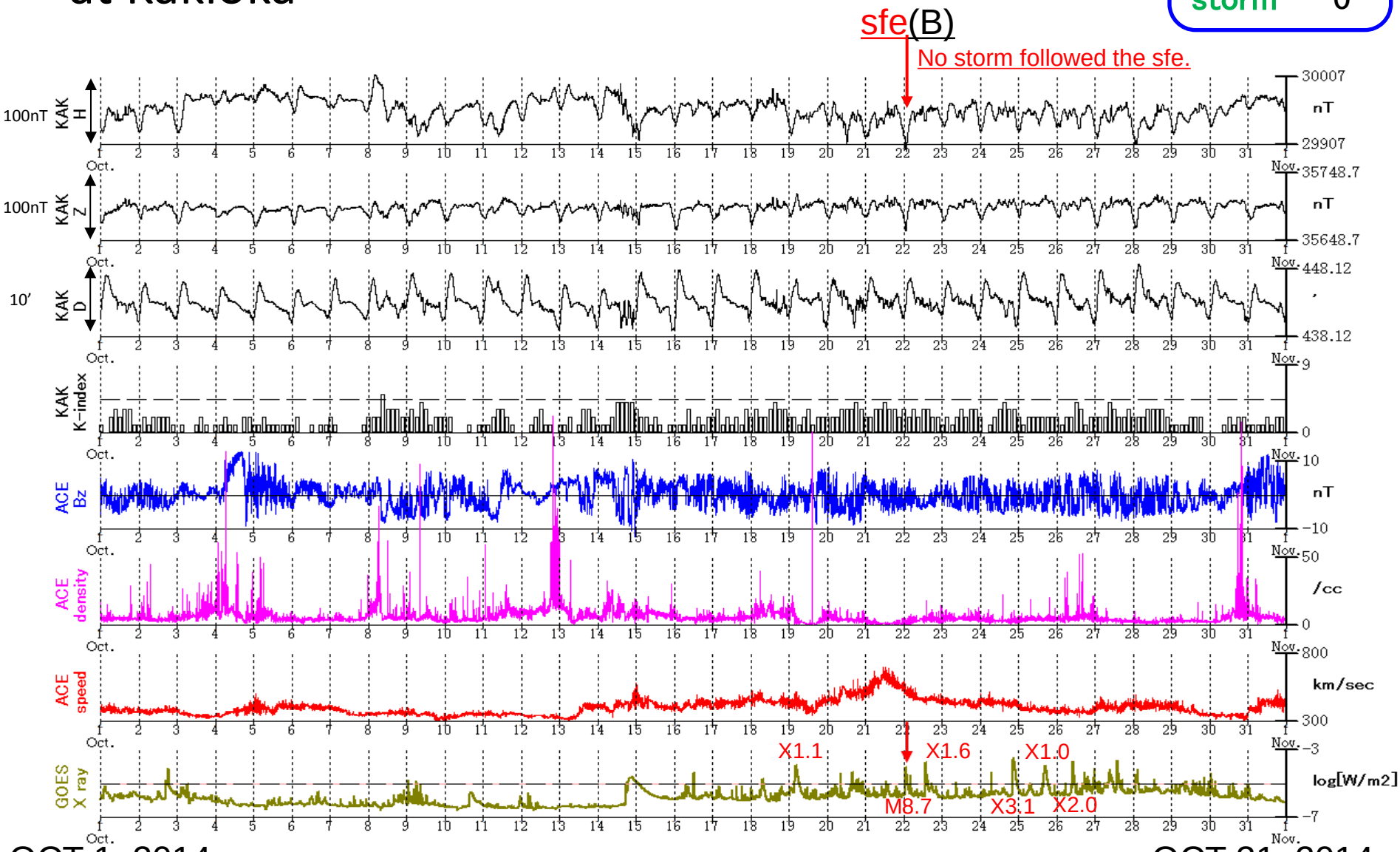


SEP 1, 2014

SEP 30, 2014

October 2014 geomagnetic variations at Kakioka

sfe	1
si & ssc	0
storm	0

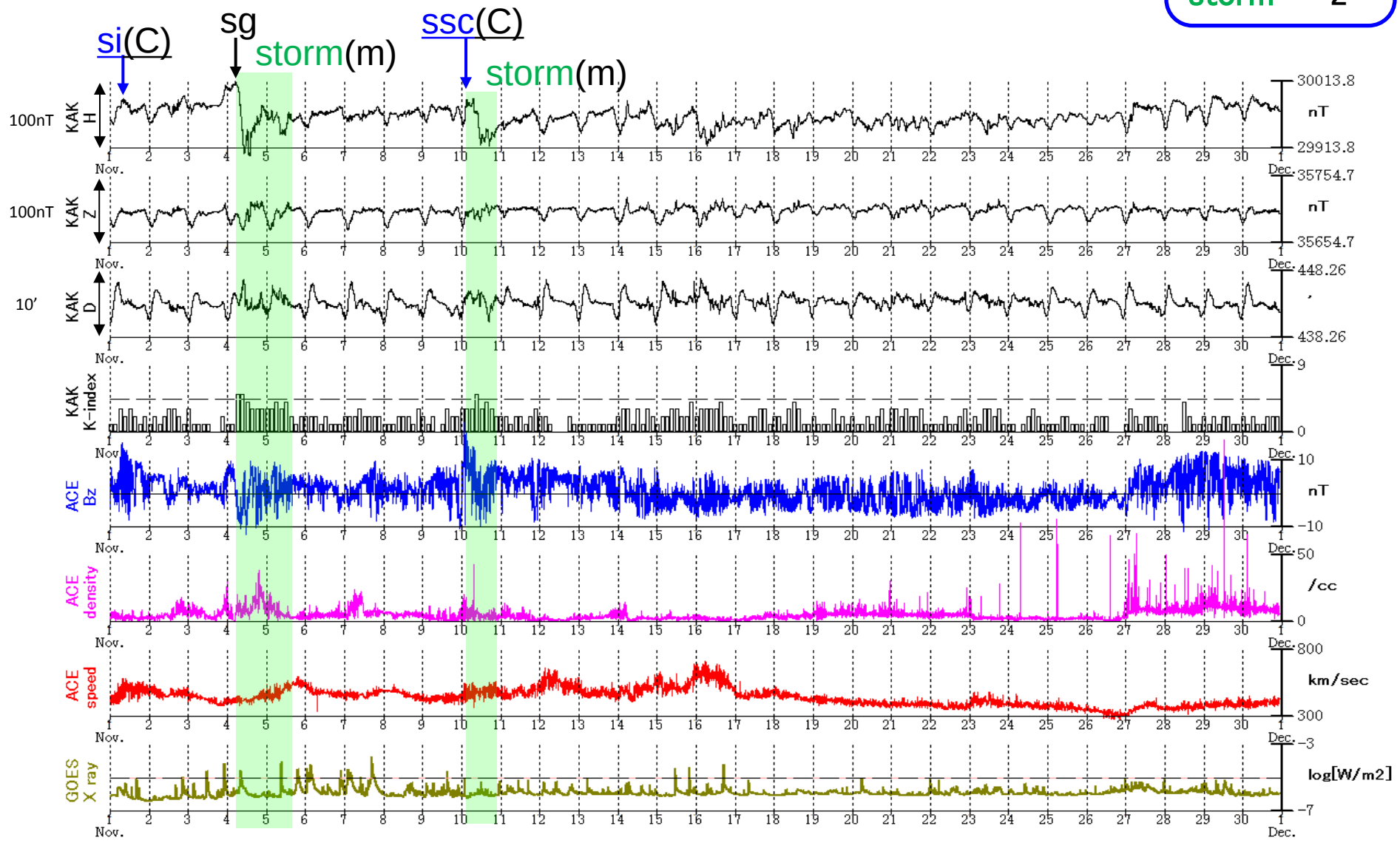


OCT 1, 2014

OCT 31, 2014

November 2014 geomagnetic variations at Kakioka

sfe	0
si & ssc	2
storm	2

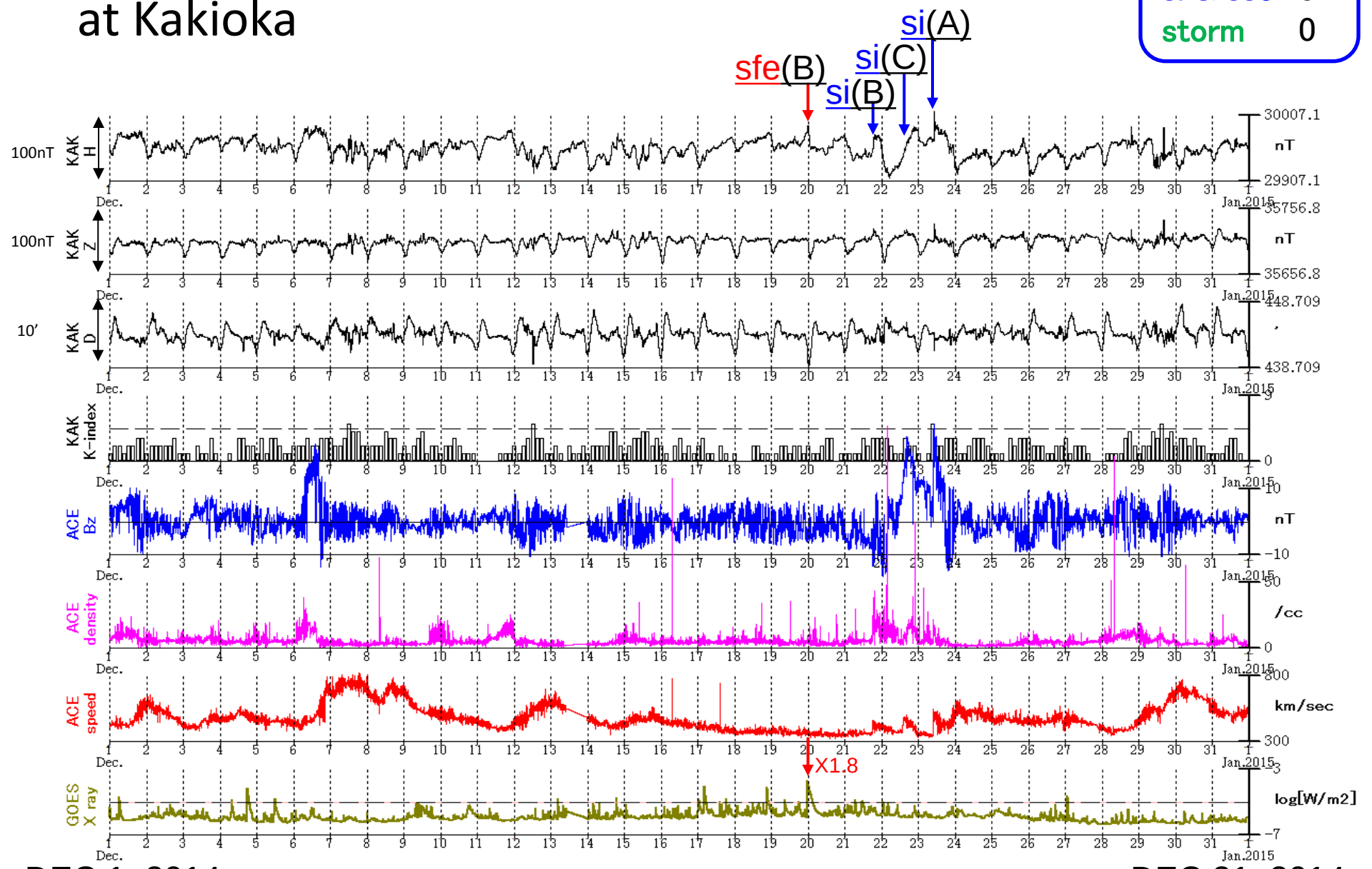


NOV 1, 2014

NOV 30, 2014

December 2014 geomagnetic variations at Kakioka

sfe	1
si & ssc	3
storm	0

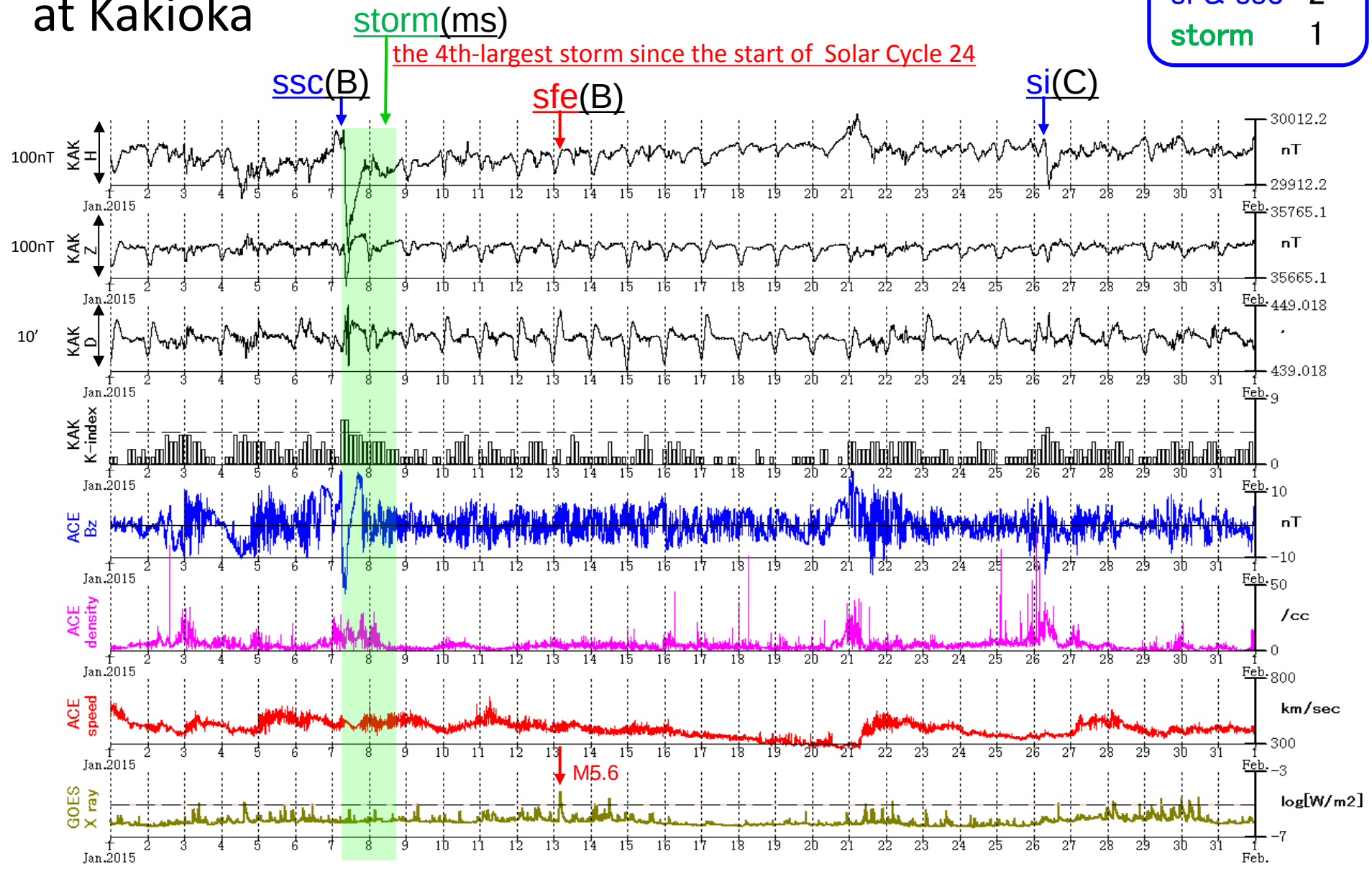


DEC 1, 2014

DEC 31, 2014

January 2015 geomagnetic variations at Kakioka

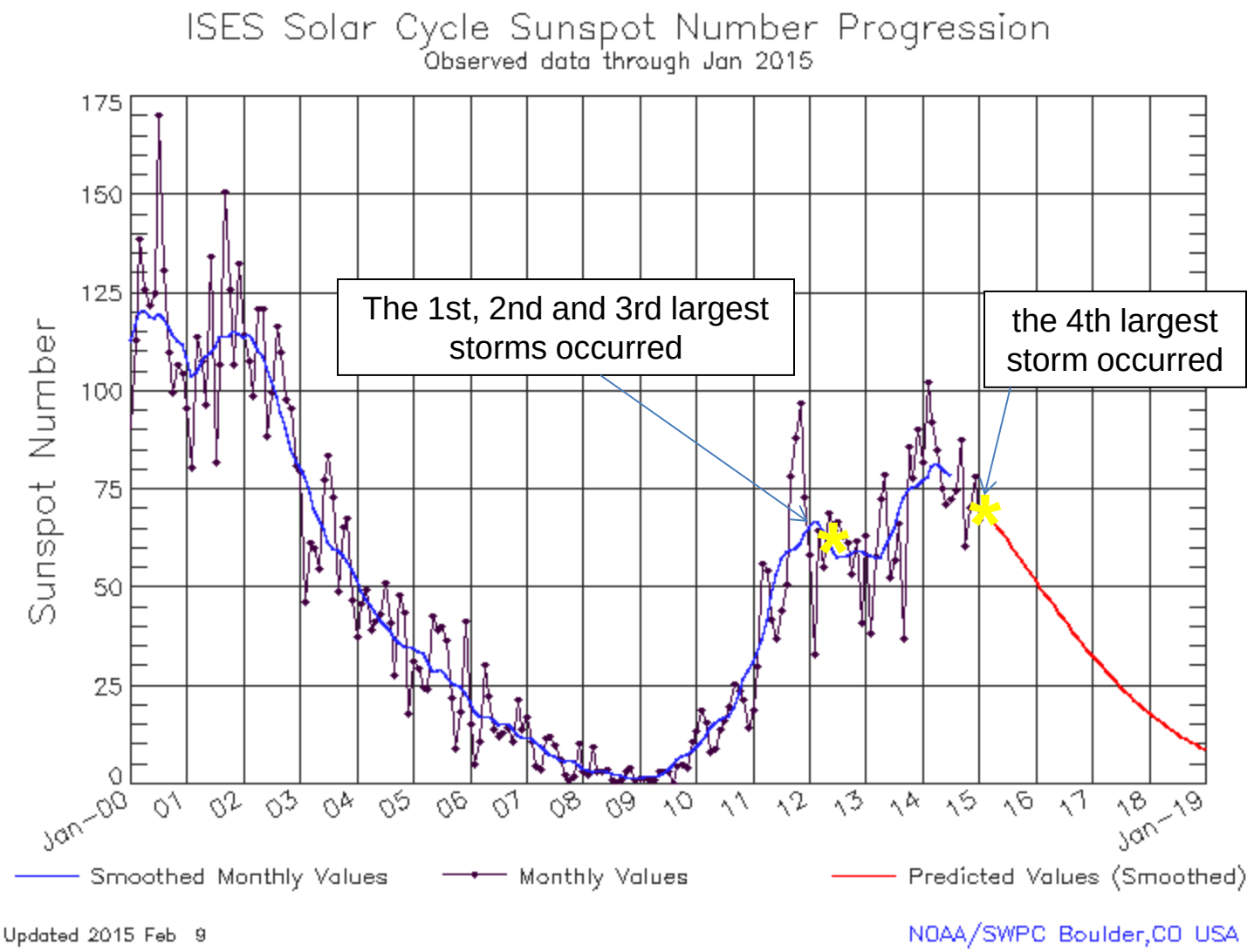
sfe	1
si & ssc	2
storm	1



JAN 1, 2015

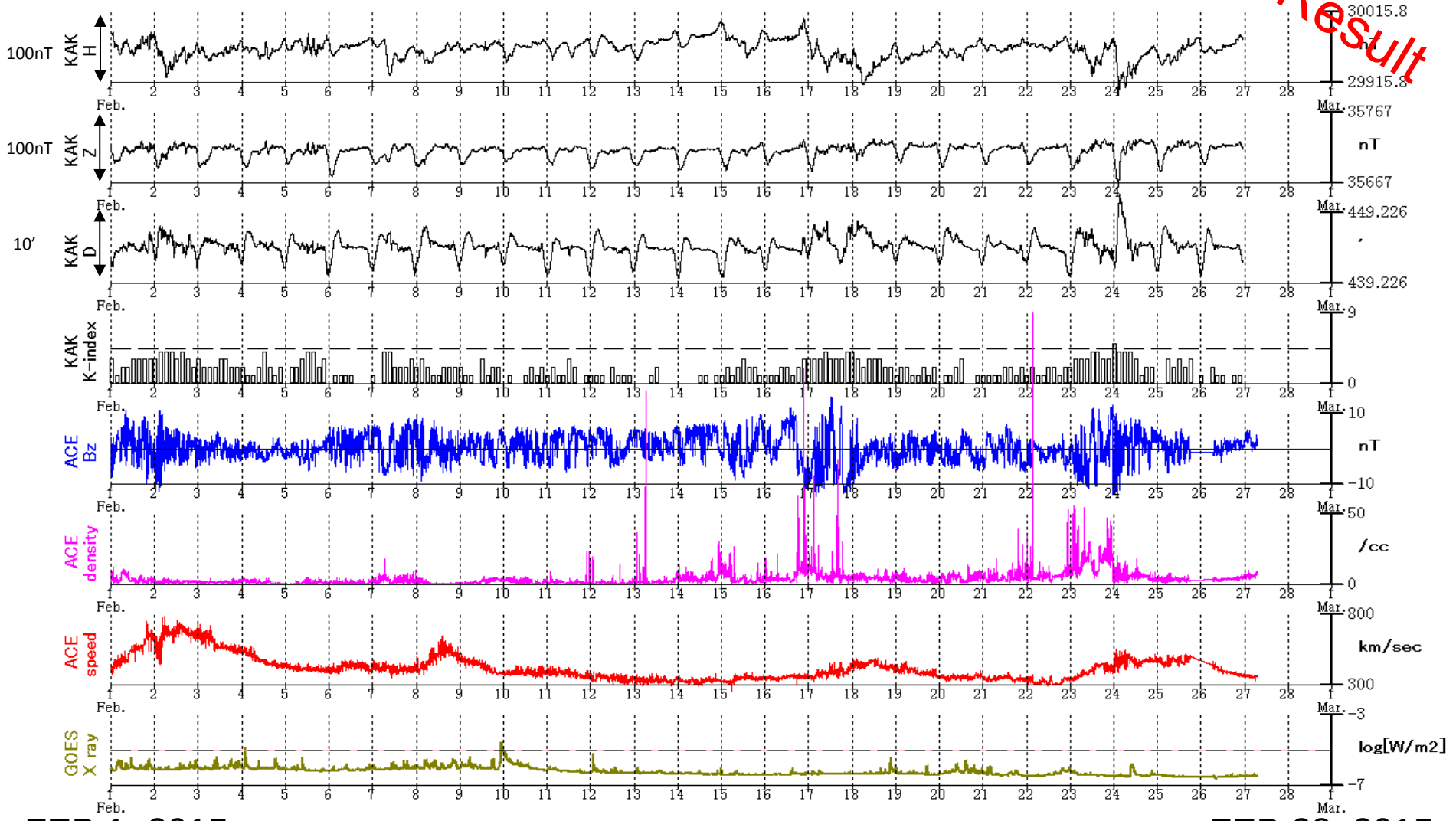
JAN 31, 2015

Large geomagnetic storm occurrences in the solar cycle 24



February 2015 geomagnetic variations at Kakioka

Provisional Result

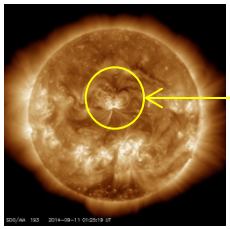


FEB 1, 2015

FEB 28, 2015

Geomagnetic storm event review

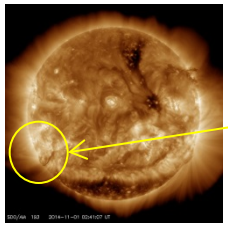
- September 12-13, 2014 *moderate* geomagnetic storm with SSC



A full-halo coronal mass ejection (CME) leaving the sun following a major X1.6 solar flare on 10 Sep 2014

SDO_aia193 (NASA) 2014/09/11

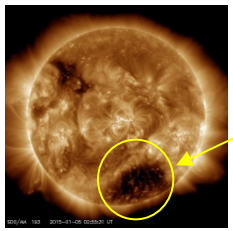
- November 4-5, 2014 *moderate* geomagnetic storm with SG



A large filament eruption occurred on 1 Nov 2014

SDO_aia193 (NASA) 2014/11/01

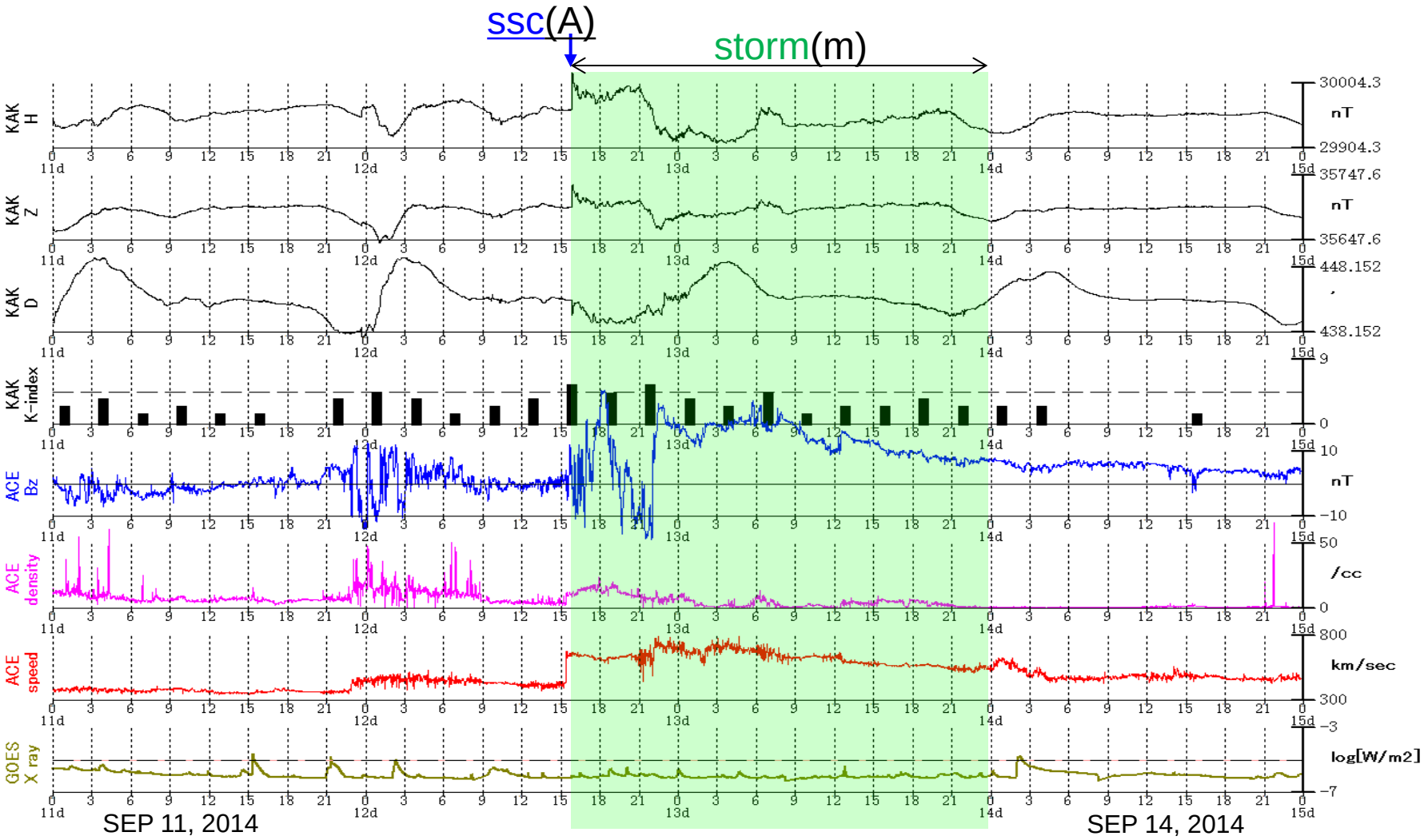
- January 7-8, 2015 *moderate severe* geomagnetic storm with SSC



A large southern polar coronal hole appeared. C-class solar flare eruptions occurred frequently

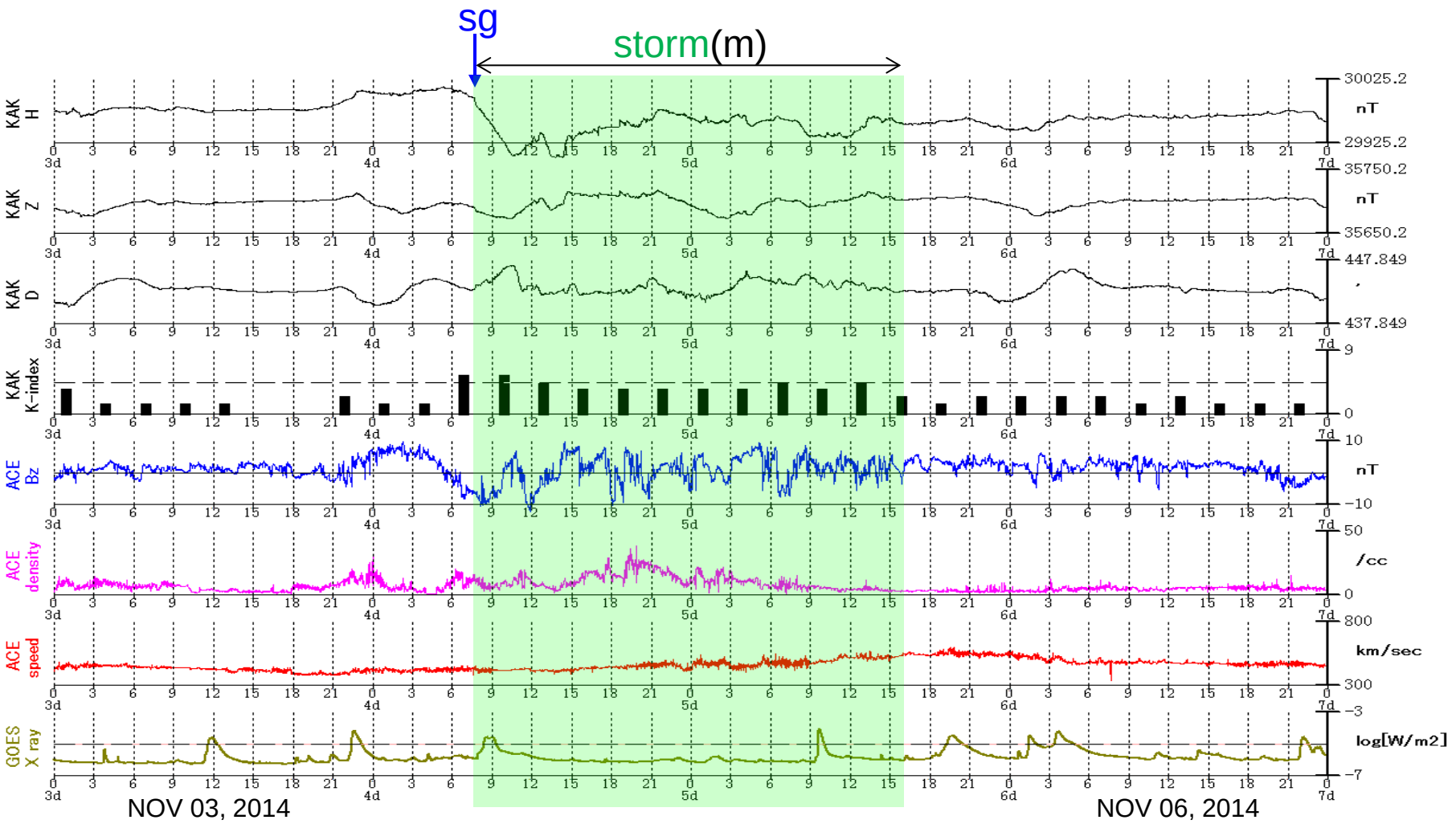
SDO_aia193 (NASA) 2015/01/05

September 12-13, 2014 *moderate* geomagnetic storm



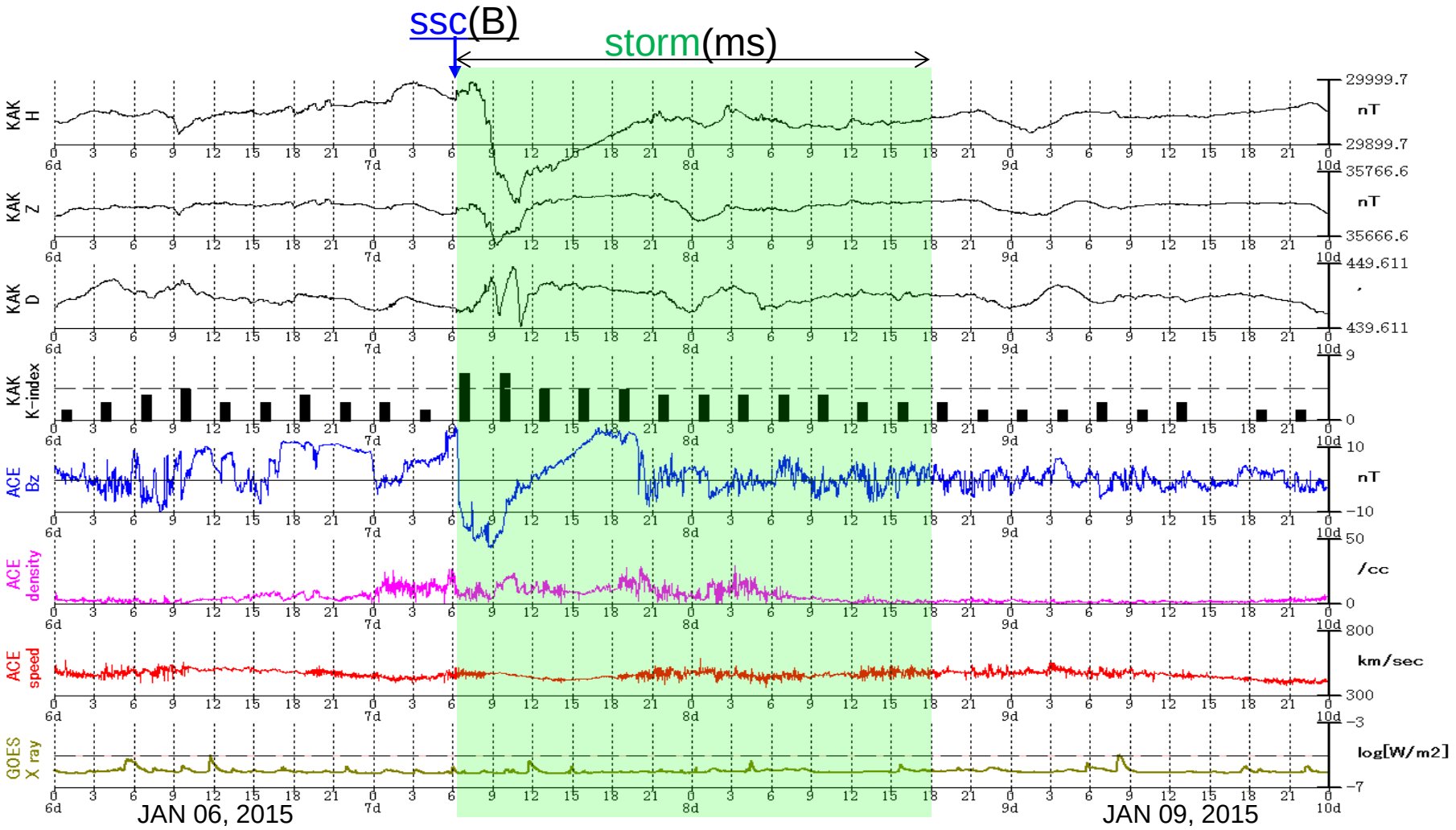
Geomagnetic Event	SSC Onset Time (UTC)	Type	Storm Activity	Storm Amplitude(nT)			SSC Amplitude(nT)		
				H	Z	D	H	Z	D
September 12-13, 2014 geomagnetic storm in association with a CME occurred on Sept. 10, 2014	2014/09/12 15:54	SSC	m (k=5)	109	71	85	57	35	20

November 4-5, 2014 *moderate* geomagnetic storm



Geomagnetic Event	SG Onset Time (UTC)	Type	Storm Activity	Storm Amplitude(nT)			SSC Amplitude(nT)		
				H	Z	D	H	Z	D
November 4-5, 2014 geomagnetic storm in association with a large filament eruption occurred on 1 Nov 2014	2015/11/04 7.7h	SG	m (k=5)	95	51	45	-	-	-

January 7-8, 2015 *moderate severe* geomagnetic storm



Geomagnetic Event	SSC Onset Time (UTC)	Type	Storm Activity	Storm Amplitude(nT)			SSC Amplitude(nT)		
				H	Z	D	H	Z	D
January 7-8, 2015 geomagnetic storm in association with a large southern polar coronal hole appearance	2015/01/07 06:16	SSC	ms (k=6)	188	80	82	14	9	7

DIGITAL DATA SERVICE

JAPANESE

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- Geomagnetic data
  - Kakioka(KAK)
  - Memambetsu (MMB)
  - Kanoya(KNY)
  - Chichijima(CBI)
- Geoelectric data
  - Kakioka(KAK)
  - Memambetsu (MMB)
  - Kanoya(KNY)
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  - Kakioka(KAK)
  - Memambetsu (MMB)
- Observational Investigation
  - Haraigawa(HRG)
- Annual means of geomagnetic data

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Kakioka geomagnetic field

Average 1-hour (00-59) Metadata | Digital data files
from 1924-01-31T15:00:00 to 1 month ago (-P1M)
Geomagnetic field (KAK)
definitive
DHZF

Average 1-hour (00-59) Metadata | Digital data files
from 1913-01-08T15:00:00 to 1916-12-31T14:00:00
Geomagnetic field (KAK)
definitive
DHZF

Average 1-minute (00:30-01:29) Metadata | Digital data files
from 1976-01-01T00:00:00 to 1 month ago (-P1M)
Geomagnetic field (KAK)
definitive
DHZF

Average 1-minute (00:30-01:29) Metadata | Digital data files
from 1964-01-01T00:00:00 to 1975-12-31T23:59:00
Geomagnetic field digitized from magnetograms (KAK)
quasi-definitive
DHZF

1-second (instantaneous) Metadata | Digital data files
from 1993-04-01T00:00:00 to 1 month ago (-P1M)
Geomagnetic field (KAK)
definitive
DHZF or XYZF

1-decisecond (instantaneous) Metadata | Digital data files
from 1997-06-01T00:00:00 to 1 month ago (-P1M)
Geomagnetic field (KAK)
variation
XYZF

Reproductions of Analog Magnetograms Metadata | Digital image files
from 1975-01-01T00:00:00 to 1975-12-31T00:00:00
Geomagnetic field (KAK)
variation
DHZ

JMA geomagnetic, geoelectric and atmospheric-electric data are available in IAGA 2002 format at the Kakioka website.
(http://www.kakioka-jma.go.jp/en/)

Thank you for your attention