

Did the Miyako earthquake affect Medium Wave broadcast reception on 9 November 2025?

--a report from Tanohata, Iwate, Japan



Receive Only DXpedition

- Date :** November 8th and 9th 2025
- Location :** Kitayamazaki, Iwate-ken
39.97N 141.94E
500km / 310miles NNE of Tokyo
- Getting there:** 2 hours ++ by Train
2 hours by car (rent-a-car)
- DXpedition site :**
500m / about a third of a mile from
sea shore / Pacific Ocean



SDR Receivers

**SDR Receivers : Perseus SDR
Airspy HF+discovery**

**Antenna : TDDF
(Twisted Double Delta Flag)**

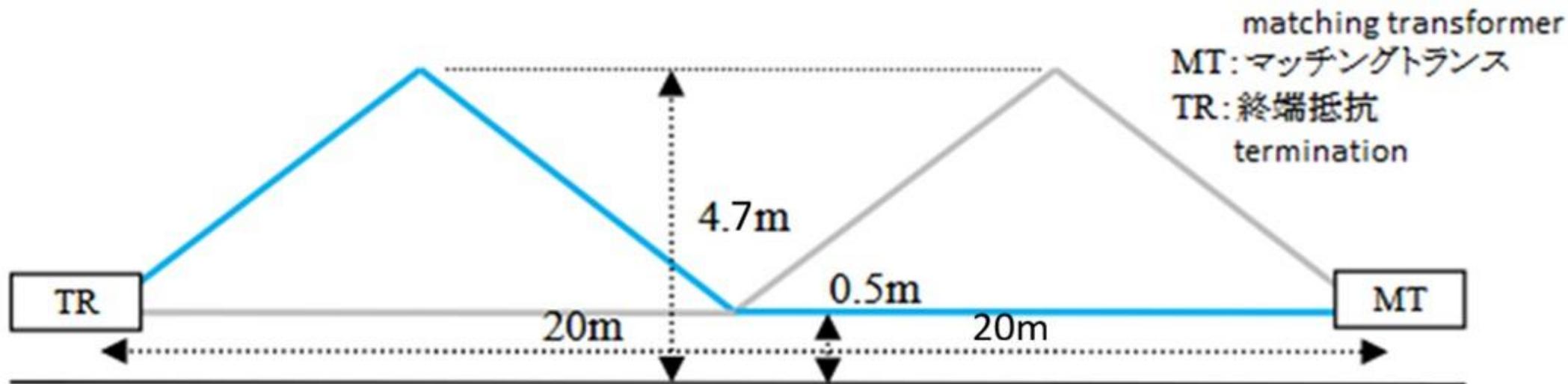
Recording Software : SDR Console etc

Playback Software : WavViewDX

Although radio amateurs were present, this was a receive-only DXpedition to hear trans-Pacific medium wave broadcast stations



Antenna = TDDF (Twisted Double Delta Flag)



Additional equipment included:

Pre-amplifier / Bias-T

Note: Low-noise amplifier is a must

Antenna = TDDF (Twisted Double Delta Flag)

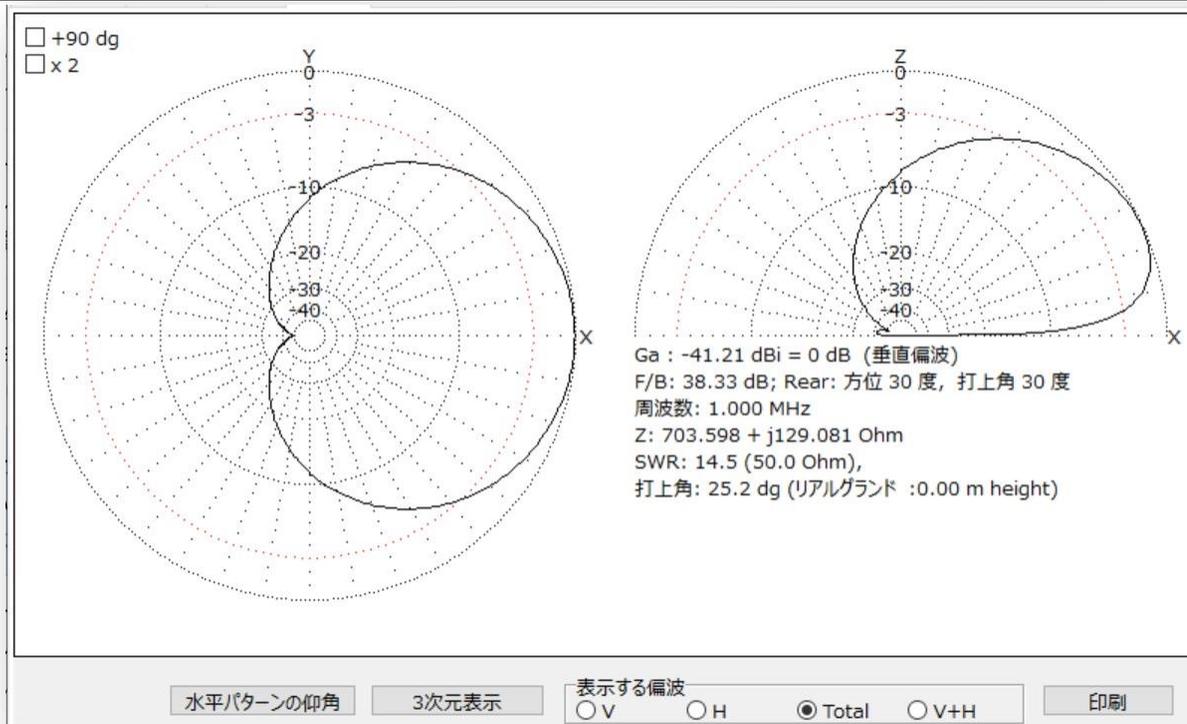


Chart by Kazu GOSUI exJF3BDT, exJA1PVQ

Length (Bottom) : 20m + 20m

Height : 4.7m

Direction : North East (For North America)



Past exciting DX catches from Tanohata include

Trans Pacific signals start to fade in roughly 2 hours before local sunset

2018 November 9th

870kHz R. Nacional – Argentina

930kHz R. Monte Carlo – Uruguay

1050kHz R. Uruguay

2021 November 20th

1030kHz WBZ – Boston, MA

Always

1530kHz KFBK – Sacramento, CA like a local station ▶▶▶

2025 November – Logged about 70 US/Mexico MW stations

The antipodes

Trans-Polar



WavViewDX playback software

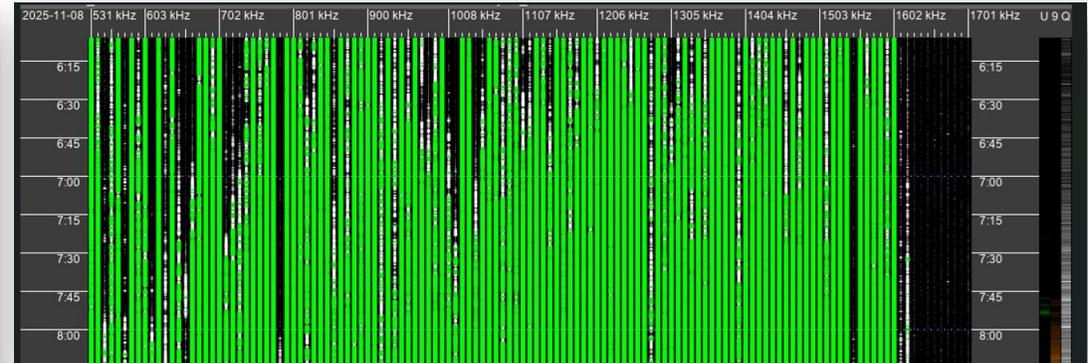
The target signals in North America were on channels at a 10kHz spacing, while signals in East Asia are on 9kHz spacing.

We played back the SDR files using WavViewDX (<https://rweiss.de/dxer/tools.html>), a software with many capabilities, including a choice of displaying all signals across the MW band at different channel spacings.

10kHz spacing

or

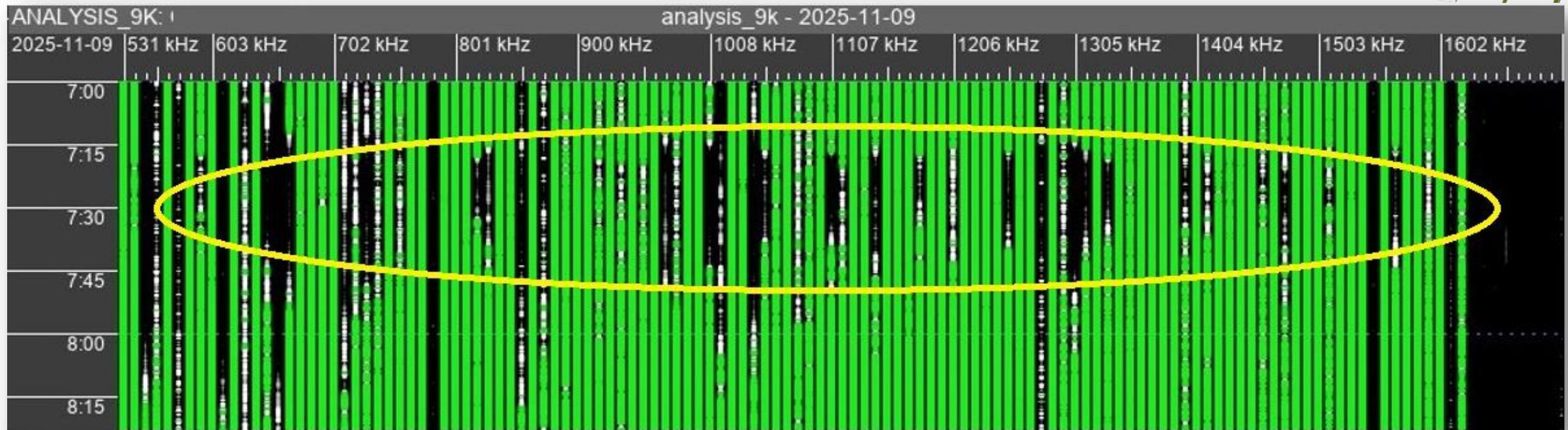
9kHz spacing



The green vertical lines on the displays represent stronger signals being received on broadcast channels. Gray or black areas represent weak or no signal.

9kHz Imported "view" of WavViewDX

Unusual Attenuation Recorded on 9 November 2025.



Despite our interest in 10kHz channels, I also checked the 9kHz channels from East Asia.

Attenuation occurred on some channels on 9 November, lasting roughly from 0715UT to 0745UT.

I had never seen such sudden attenuation before.

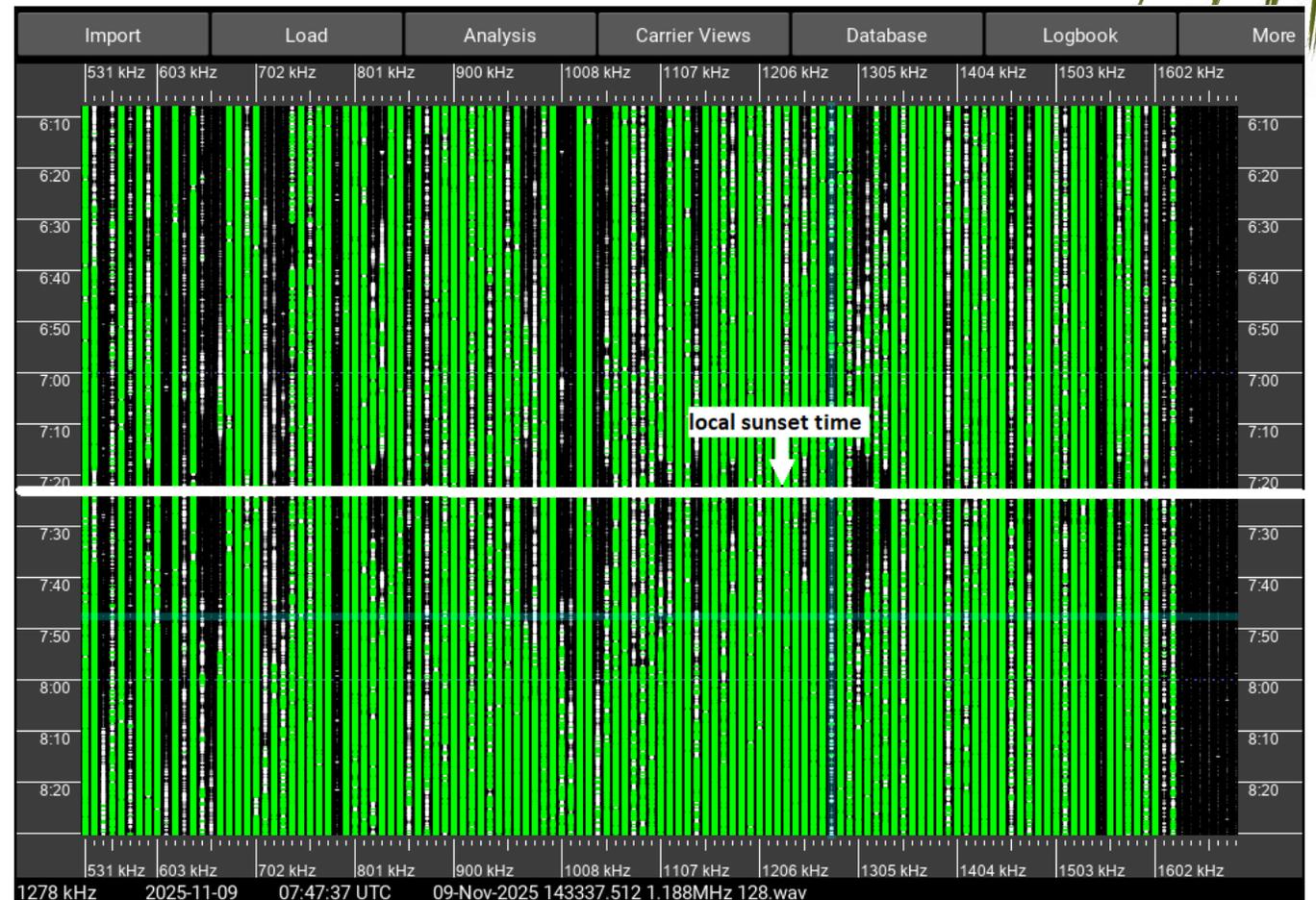
What was the cause of these sudden attenuations?

Was it local sunset?

These sudden drops in signal strength corresponded quite closely with local sunset, normally a time of disturbed propagation.

Local sunset on this date was at 0722UT.

Was that all that there was to it?

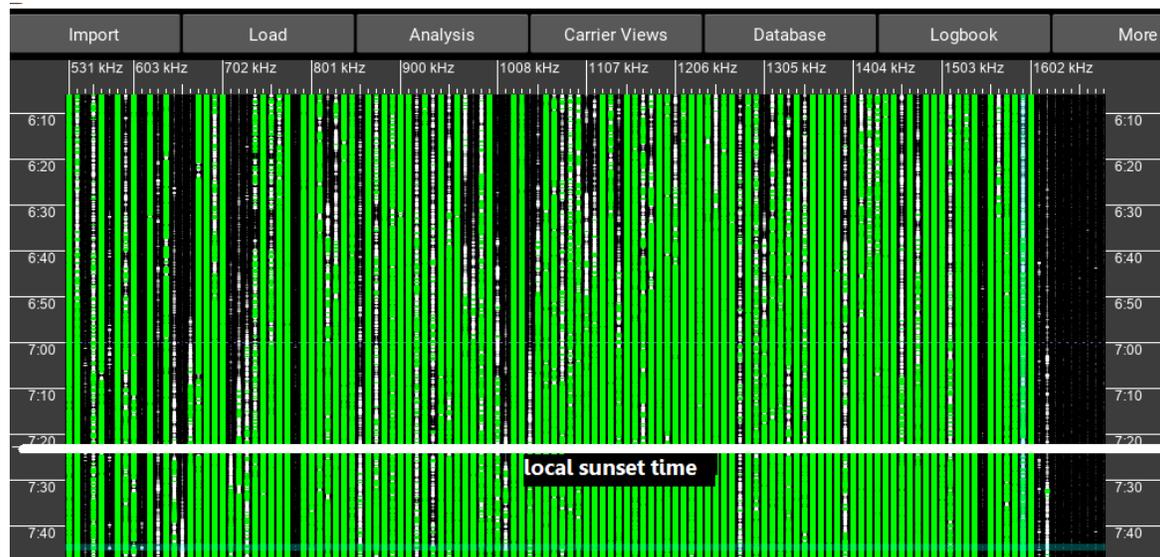


What was the cause of these sudden attenuations?

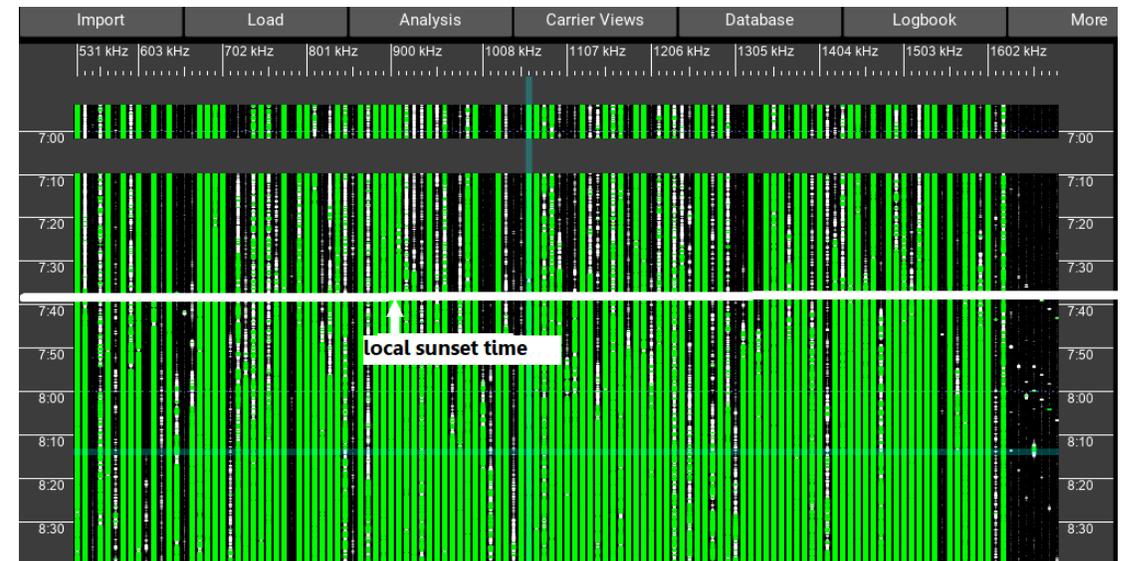
Was it local sunset?

But, the evening before, there were no signal drop-outs around local sunset, nor were there on an SDR recording made at Tanohata in 2024.

8 November 2025



26 October 2024

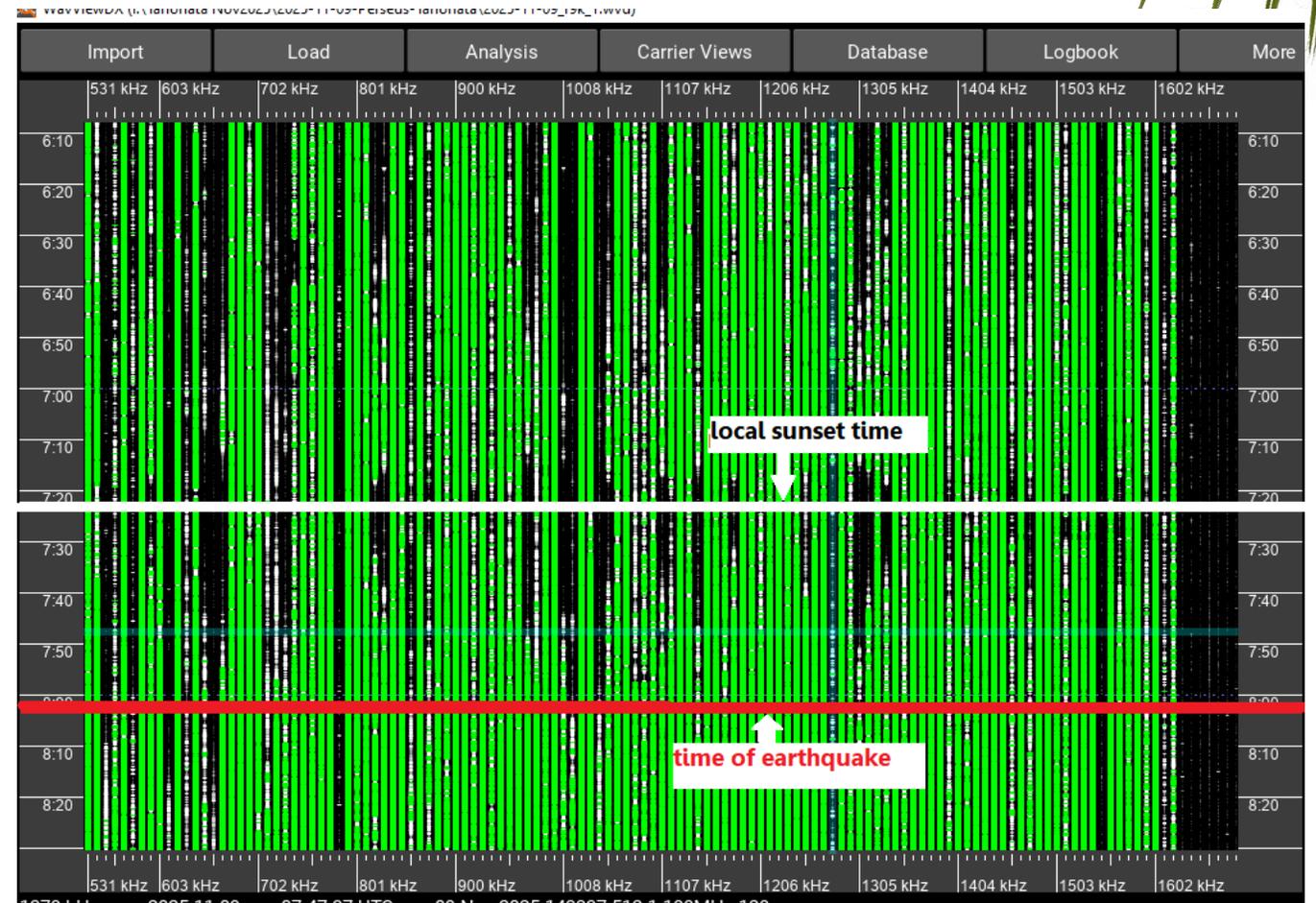


What was the cause of these sudden attenuations?

If not sunset, then what?

Did anything unusual occur on the 9th of November?

One striking event was the occurrence of a magnitude 6.9 earthquake at 0803UT, within an hour of the observed attenuation events. The epicentre was ~ 140km away from the listening site, and the biggest quake's shock took place right in the middle of our DXing session!



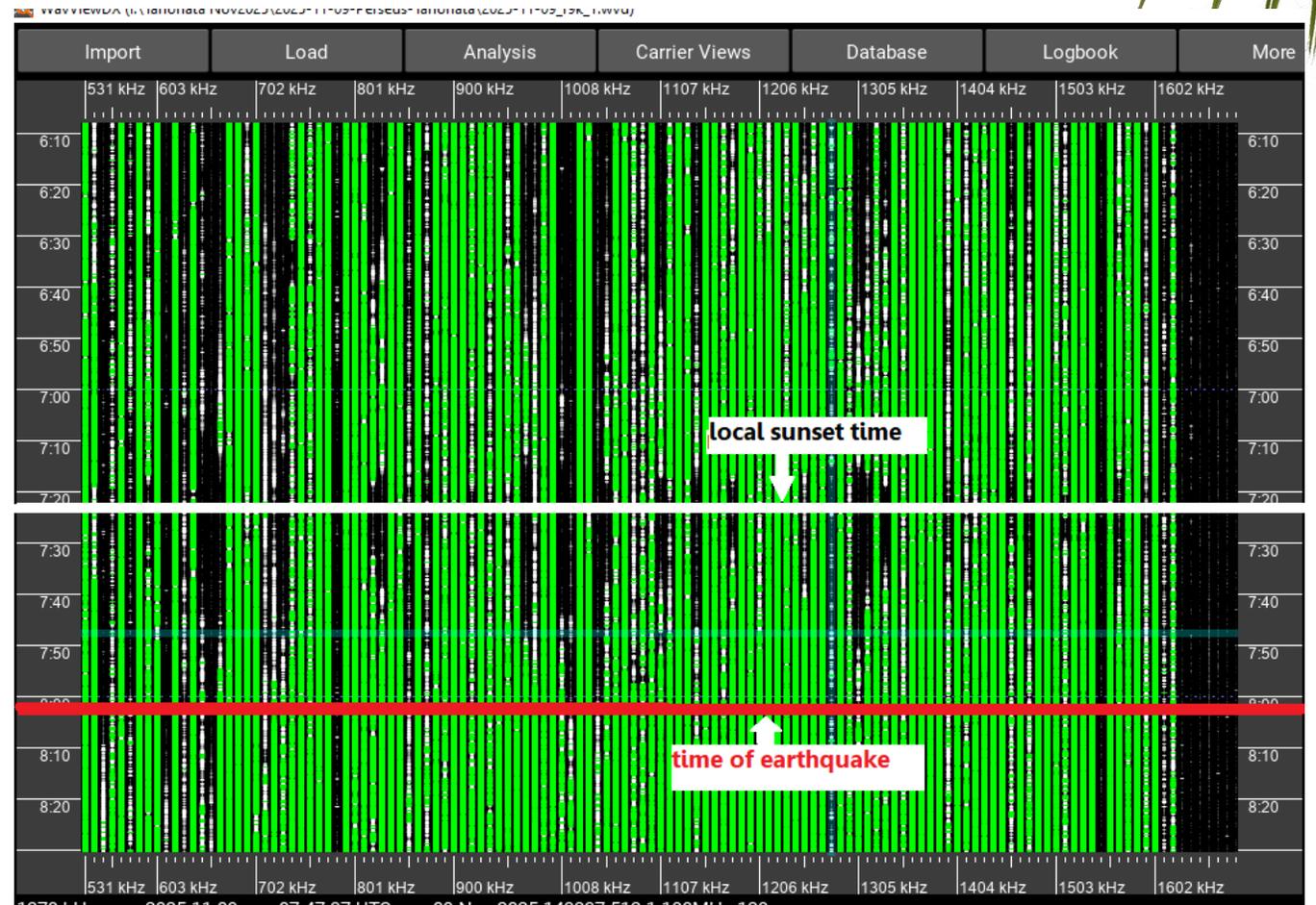
What was the cause of these sudden attenuations?

If not sunset, then what?

The signal drop-outs took place before the earthquake did.

Although there have been reports of changes in VLF signals and noise before earthquakes, we had not heard of signal strength precursors having been observed at medium frequencies.

That caused us to look more closely at which signals were actually getting attenuated, and by how much.



WavViewDX → Log Analysis

Divided into two groups

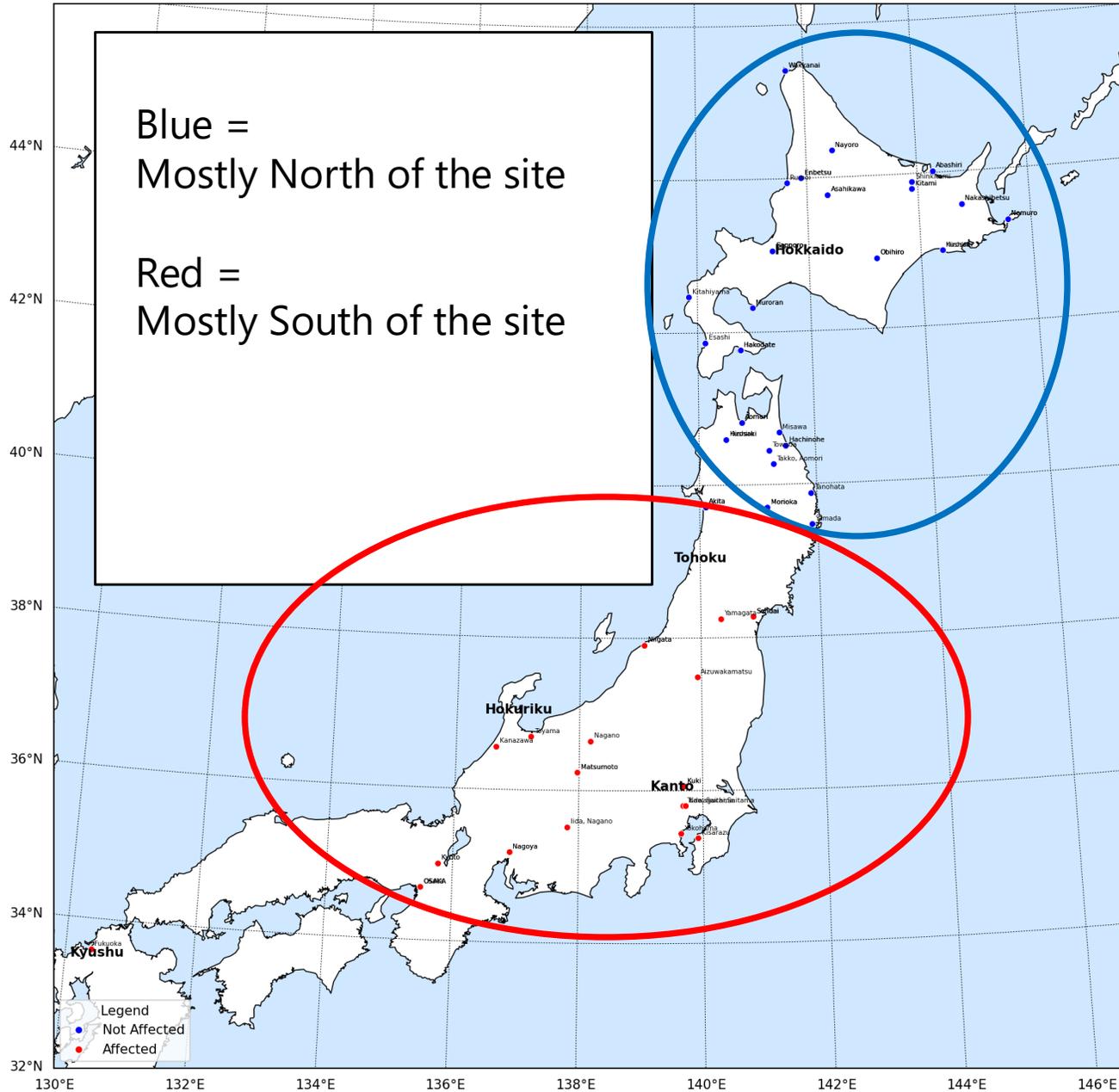
No visible Attenuation = Blue

Attenuated = Red

Frequency	Station	Location for Map	Latitude (N)	Longitude (E)	Indicator
540	JOSG NHK R 1	Matsumoto	36.24	137.97	Red
594	JOAK NHK R 1	Kuki	36.06	139.7	Red
693	JOAB NHK R 2	Kuki	36.06	139.7	Red
693	JOAB NHK R 2	Kuki	36.06	139.7	Red
819	JONK NHK R 1	Nagano	36.65	138.18	Red
828	JOBB NHK R 2	OSAKA	34.69	135.5	Red
891	JOHK NHK R 1	Sendai	38.27	140.87	Red
918	JOEF YBC Yamaga	Yamagata	38.25	140.33	Red
936	JOTR ABS Akita	Akita	39.72	140.1	Red
954	JOKR TBS Tokyo	Toda, Saitama	35.8	139.68	Red
981	NHK R 1 Sendai	Sendai	38.27	140.87	Red
1008	JONR ABC Asahi Hoso	Osaka	34.69	135.5	Red
1053	JOAR CBC Chubu-Nippon Hoso	Nagoya	35.18	136.9	Red
1089	JOHB NHK R 2	Sendai	38.27	140.87	Red
1107	JOMR MRO Hokuriku Hoso	Kanazawa	36.56	136.65	Red
1116	JODR BSN Niigata Hoso	Niigata	37.91	139.06	Red
1134	JOQR NCB Bunka Hoso	Kawaguchi,Sai	35.8	139.72	Red
1179	MBS Mainichi Hoso	Kyoto	35.01	135.77	Red
1242	JOLF NBS Nippon Hoso	Kisarazu	35.38	139.92	Red
1260	JOIR TBC Tohoku	Sendai	38.27	140.87	Red
1314	OBC R Osaka	Kyoto	35.01	135.77	Red
1332	JOSF Tokai Hoso	Nagoya	35.18	136.9	Red
1395	JOWE RFC R Fukushima	Aizuwakamatsu	37.49	139.93	Red
1422	JORF RF R Nippon	Yokohama	35.44	139.64	Red
1476	JOSD NHK R 2	Iida, Nagano	35.52	137.82	Red
1503	JOUK NHK R 1	Akita	39.72	140.1	Red
1512	JOSC NHK R 2	Matsumoto	36.24	137.97	Red
1593	JOQB NHK R 2	Niigata	37.91	139.06	Red

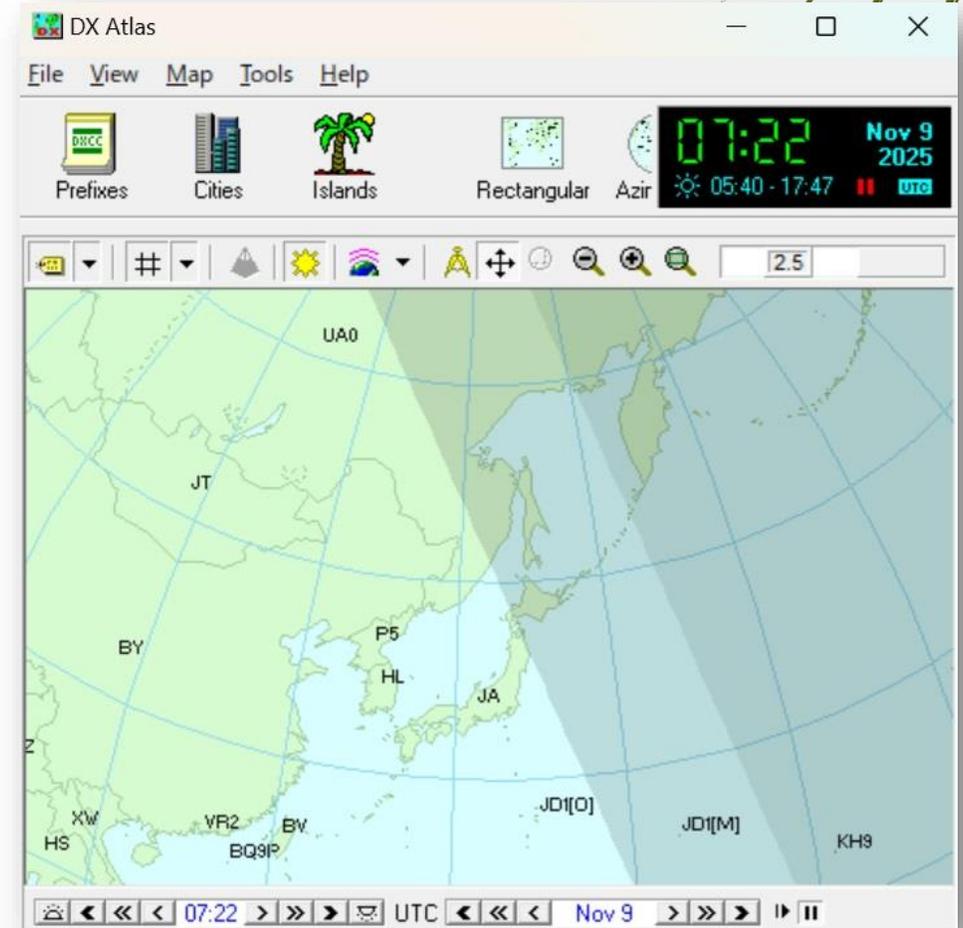
Frequency	Station	Location for Map	Latitude (N)	Longitude (E)	Indicator
531	JOQG NHK R 1	Morioka	39.7	141.15	Blue
567	JOIK NHK R 1	Sapporo	43.06	141.35	Blue
585	JOPG NHK R 1	Kushiro	40.6	140.47	Blue
603	JOOG NHK R 1	Obihiro	42.92	143.2	Blue
621	JOCG NHK R 1	Asahikawa	43.77	142.37	Blue
639	JOWN STV Sapporo TV	Hakodate	41.77	140.74	Blue
675	JOVK NHK R 1	Hakodate	41.77	140.74	Blue
675	JOVK NHK R 1	Hakodate	41.77	140.74	Blue
684	JODF IBC Iwate Hoso	Morioka	39.7	141.15	Blue
702	JOKD NHK R 2	Kitami	43.8	143.89	Blue
747	JOIB NHK R 2	Sapporo	43.06	141.35	Blue
774	JOUB NHK R 2	Akita	39.72	140.1	Blue
792	NHK R 1 Asahika	Enbetsu	44	141.9	Blue
801	JOQS HBC Hokkaido Hoso	Nemuro	43.33	145.58	Blue
837	NHK R 1 Asahika	Nayoro	44.35	142.47	Blue
846	JOPG NHK R 1	Hirosaki	42.98	144.38	Blue
864	HBC Hokkaido Hoso	Enbetsu	44	141.9	Blue
882	JOWS STV Sapporo TV	Esashi	42.15	139.52	Blue
900	JOHO HBC Hokkaido Hoso	Hakodate	41.77	140.74	Blue
909	JOVX STV Sapporo TV	Abashiri	44.02	144.28	Blue
927	NHK R 1 Asahika	Wakkanai	45.41	141.67	Blue
945	JOIQ NHK R 1	Muroran	42.32	140.97	Blue
963	JOTG NHK R 1	Aomori	40.82	140.74	Blue
999	NHK R 1 Aomori	Hachinohe	40.51	141.49	Blue
1026	NHK R 1 Aomori	Takko, Aomori	40.27	141.27	Blue
1062	JOXS STV Sapporo TV	Nemuro	43.33	145.58	Blue
1071	JOWM STV Sapporo TV	Obihiro	42.92	143.2	Blue
1098	JOFN HBC Hokkaido Hoso	Kitahiyama	42.47	139.85	Blue
1125	JOIZ NHK R 2	Muroran	42.32	140.97	Blue
1152	JOPC NHK R 2	Kushiro	42.98	144.38	Blue
1188	JOKP NHK R 1	Kitami	43.8	143.89	Blue
1197	STV Sapporo TV Hoso	Enbetsu	44	141.9	Blue
1215	JOGE RAB Aomori Hoso	Hirosaki	40.6	140.47	Blue
1224	NHK R 1 Morioka	Tanohata	39.88	141.9	Blue
1233	JOGR RAB Aomori Hoso	Aomori	40.82	140.74	Blue
1269	JOHW HBC Hokkaido Hoso	Obihiro	42.92	143.2	Blue
1287	JOHR HBC Hokkaido Hoso	Sapporo	43.06	141.35	Blue
1323	NHK R 1 Morioka	Yamada	39.47	141.9	Blue
1341	NHK R 1 Kushiro	Nakashibetsu	43.57	144.77	Blue
1359	NHK R 2 Hokkaido	Nemuro	43.33	145.58	Blue
1368	JOTS HBC Hokkaido Hoso	Wakkanai	45.41	141.67	Blue
1377	JOTZ NHK2	Hachinohe	40.51	141.49	Blue
1386	JOQC NHK R 2	Morioka	39.7	141.15	Blue
1440	JOWF STV Sapporo TV	Sapporo	43.06	141.35	Blue
1449	JOQM HBC Hokkaido Hoso	Abashiri	44.02	144.28	Blue
1467	JORC NHK2	Hirosaki	40.6	140.47	Blue
1485	RAB Aomori Hoso	Towada	40.45	141.2	Blue
1494	JOTL HBC Hokkaido Hoso	Nayoro	44.35	142.47	Blue
1521	JOTC NHK2	Aomori	40.82	140.74	Blue
1539	NHK R 2 Hokkaido	Nakashibetsu	43.57	144.77	Blue
1557	JOHS HBC Hokkaido Hoso	Rumoi	43.94	141.64	Blue
1575	AFN The Eagle Misawa	Misawa	40.68	141.38	Blue
1584	NHK R 1 Kitami	Shinkitami	43.89	143.9	Blue
1602	JOCC NHK R 2	Asahikawa	43.77	142.37	Blue

Japan Map: Affected vs Not Affected



Plotting on map

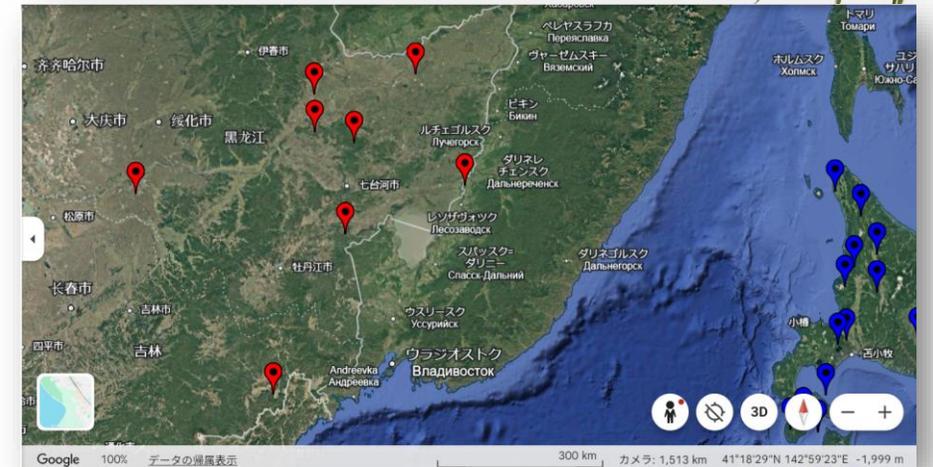
“DX Atlas” shows greyline of that time



Not only domestic stations but also signals from China

Stations from North-Eastern part of P.R.China

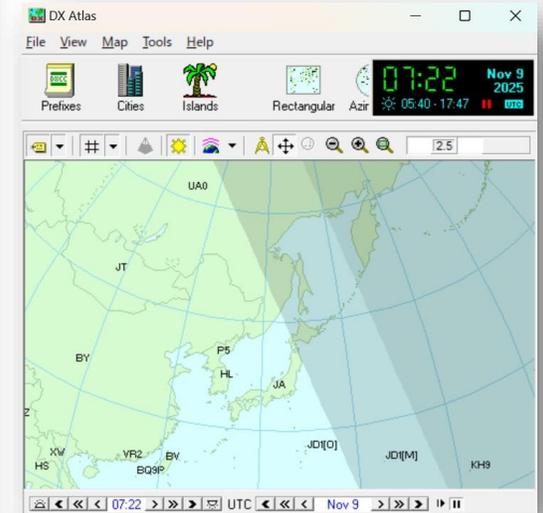
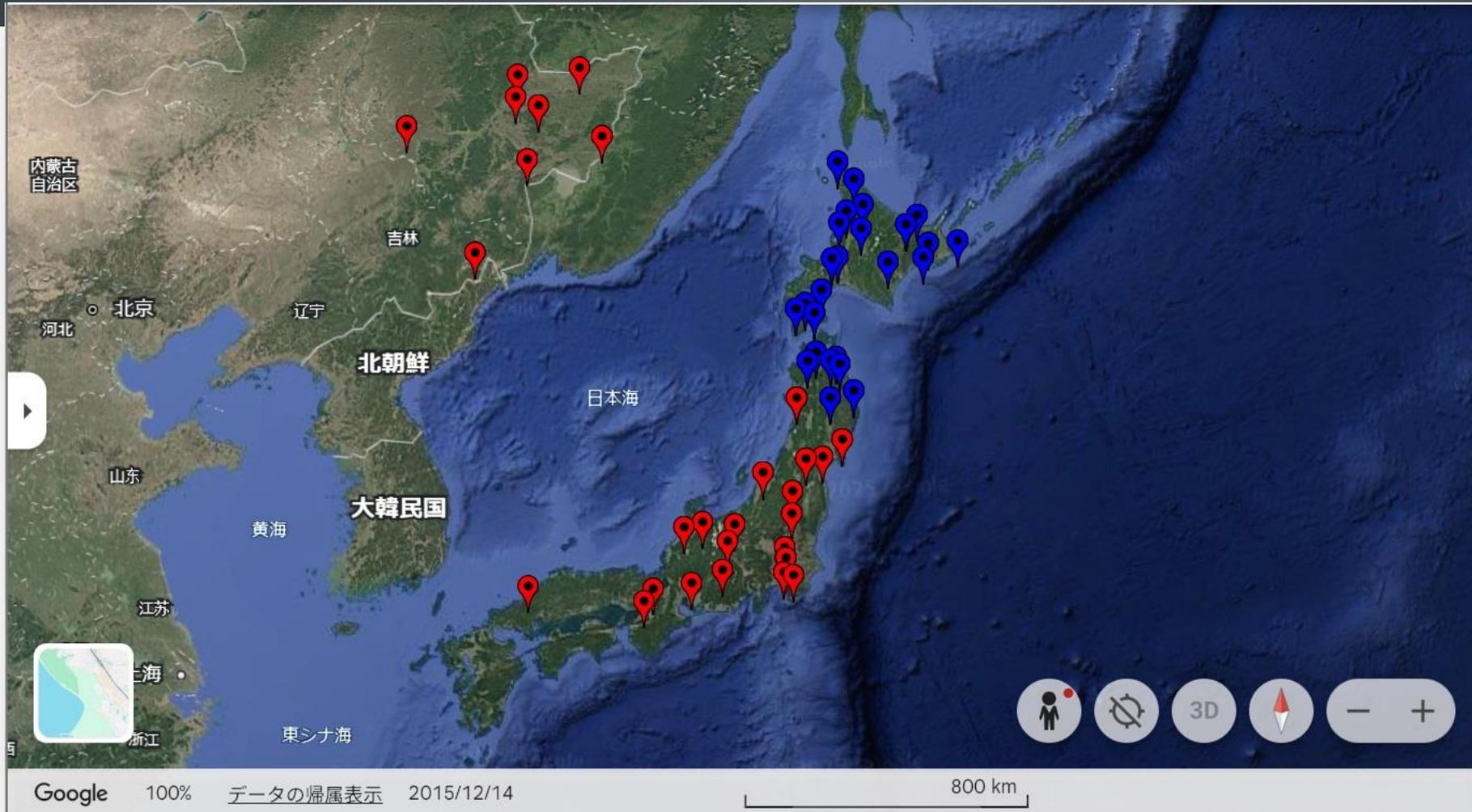
Time UTC	Frequency kHz	Station	City Name
6:59	666	Jiamusi GD Zo	Jiāmùsī
6:59	828	CNR2 Jingji	Shuāngyāshān
8:00	972	Harbin JGD Mi	Hā'ěrbīn
7:00	1035	CNR1 Zhongguo	Tóngjiāng
7:00	1035	CNR1 Zhongguo	Jīxī
6:59	1143	Jiamusi GD Ji	Jiāmùsī
6:59	1179	Shuangyashan	Shuāngyā
6:59	1206	Yeonbyeon Jos	Yánjí / Lóngjǐng
7:13	1251	CNR1 Zhongguo	Hǔtóu Zhèn
6:58	1413	Hegang RGD	Hègǎng
6:59	1566	Yanbian Xinwe	Yánjí / Lóngjǐng



Plotting them onto google map

Blue = No

Red = Attenuated

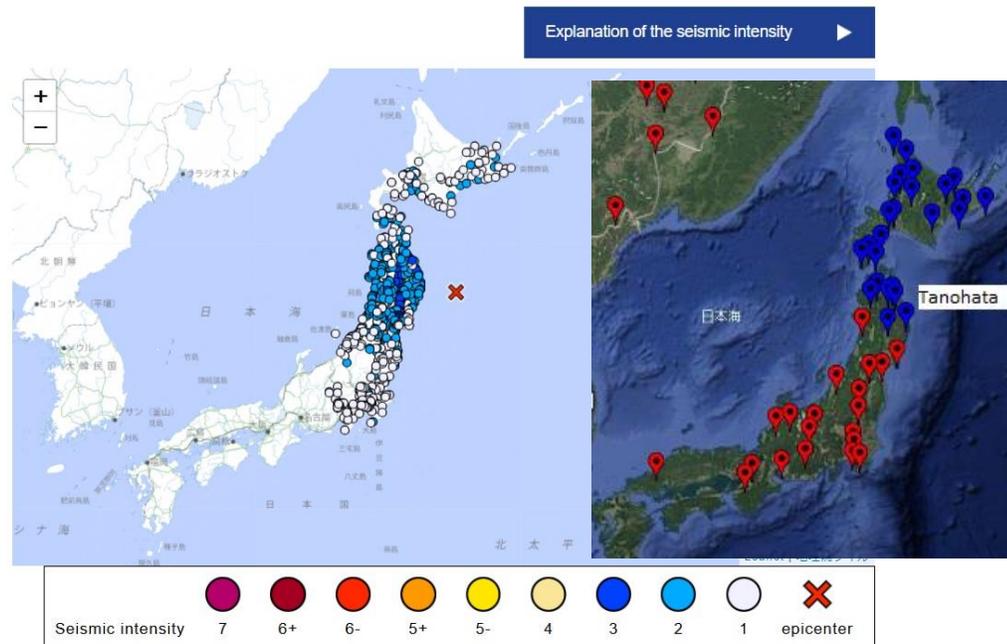


Compare Miyako earthquake intensities with attenuated signals

Was there any correlation at all?

Earthquake information : Detail information

Issued on 2025/11/09 17:16



The attenuations occurred before the earthquake did.

But the only easily available data about the earthquake's effects on Japan's land mass was from the time of the earthquake itself.

Was there at least some correlation between the intensity of the earthquake at various sites and the sites of observed attenuation?

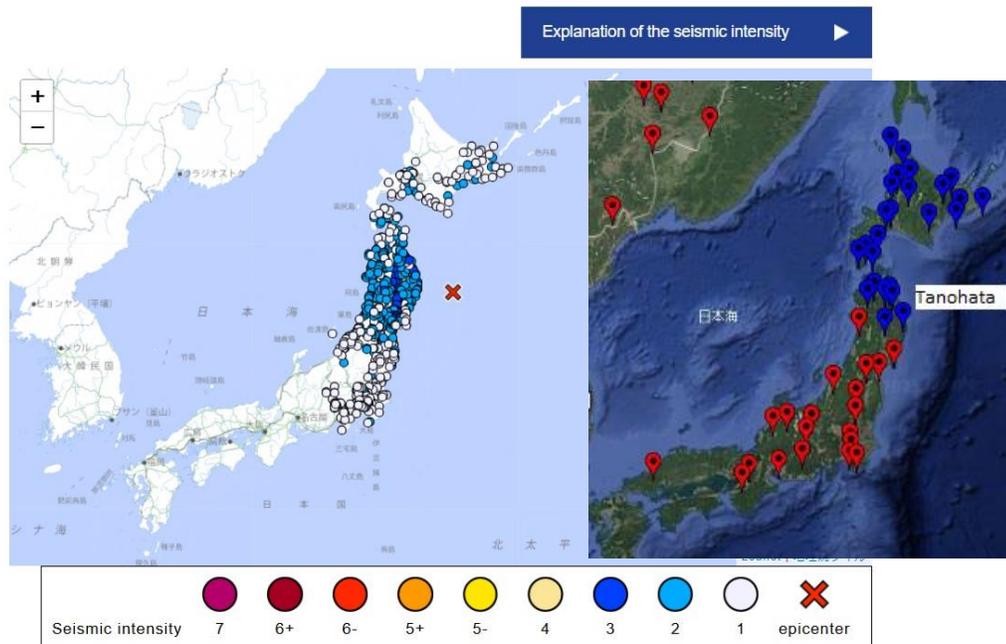
Observed at	Latitude	Longitude	Magnitude	Epicenter depth	Place name of epicenter
2025/11/09 17:03	39.4N	143.5E	6.7	10km	Off the Coast of Sanriku

Compare Miyako earthquake intensities with attenuated signals

Was there any correlation at all? Not really?

Earthquake information : Detail information

Issued on 2025/11/09 17:16



The earthquake was felt less strongly in areas further to the north of the receiving site from where signals were not attenuated.

However, the earthquake also did not register very much further south in Japan, from where signals had been attenuated.

➤ Was there some more obvious cause of the signal drop-outs that we had missed?

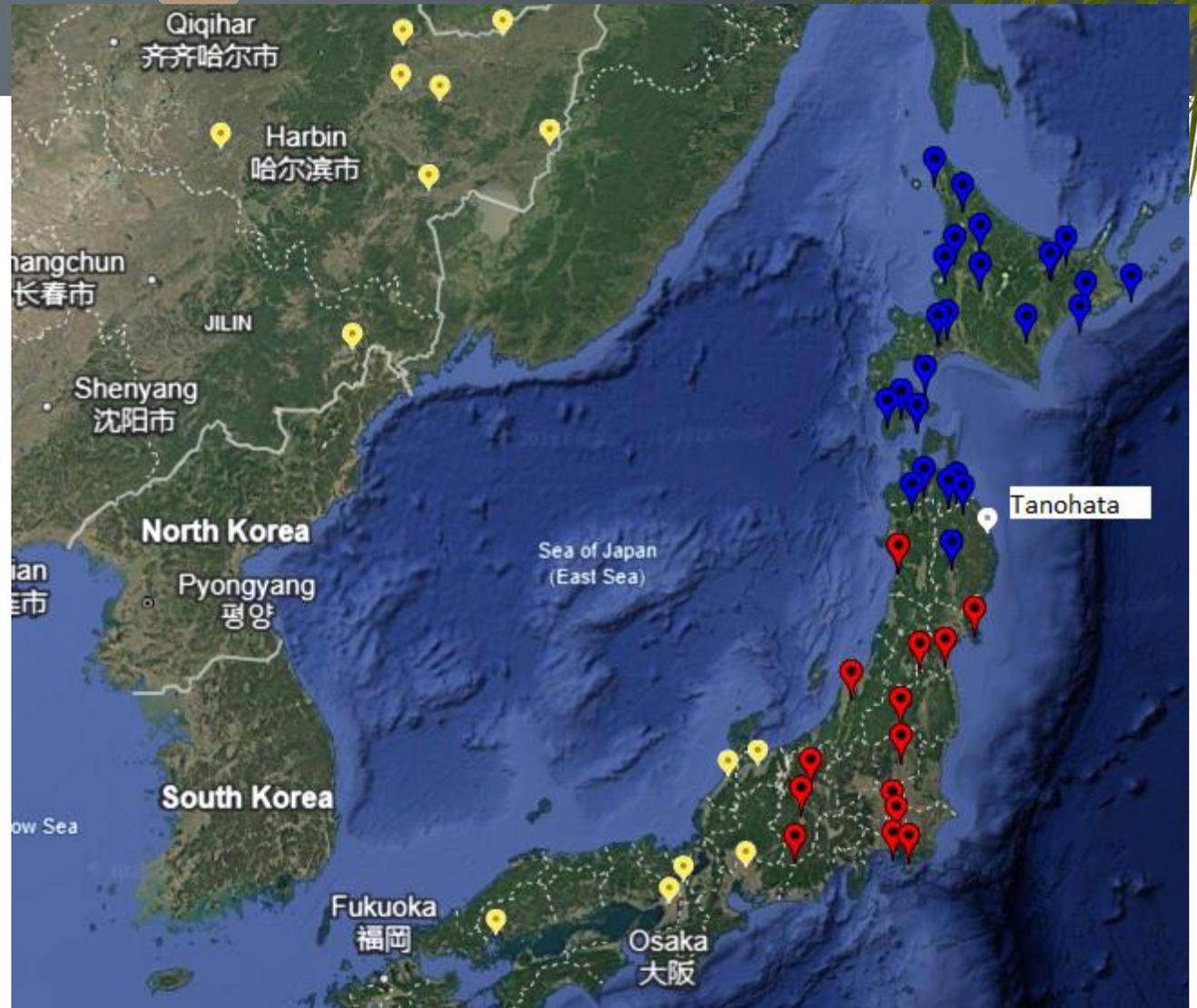
Observed at	Latitude	Longitude	Magnitude	Epicenter depth	Place name of epicenter
2025/11/09 17:03	39.4N	143.5E	6.7	10km	Off the Coast of Sanriku

Variability in attenuation of signals

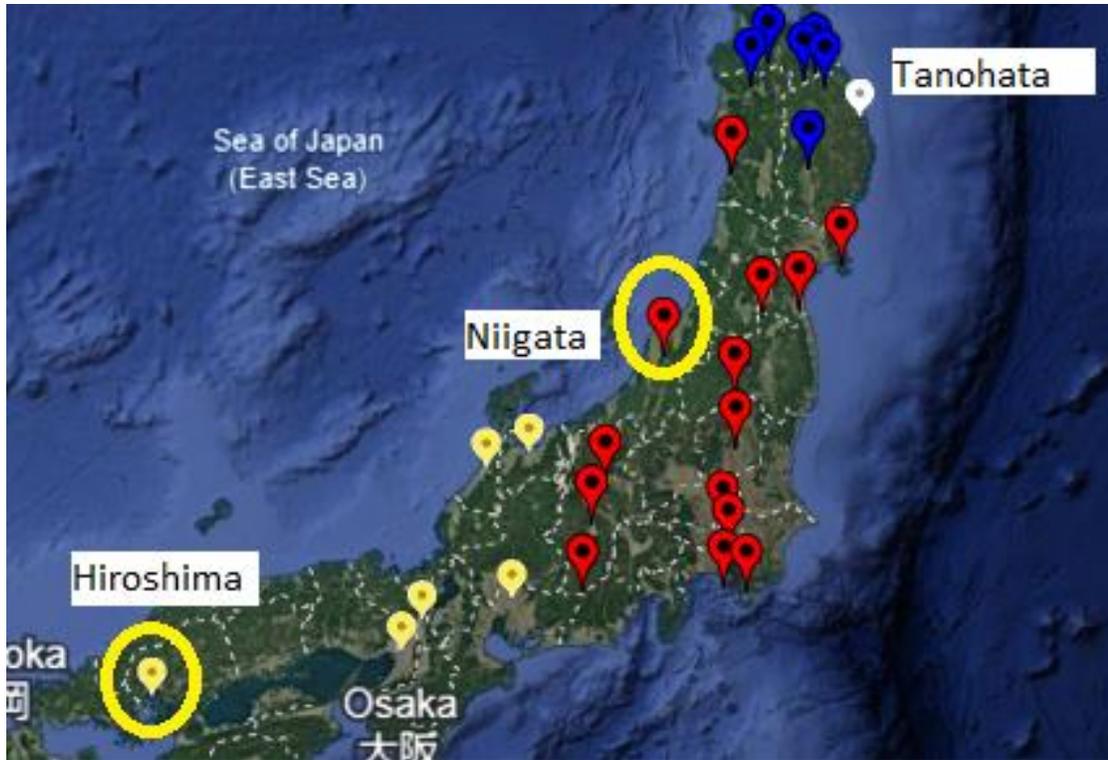
In fact, when the signal strengths were observed closely, it was found that more distant signals from the south of Japan and from China were found to be attenuated even more than signals nearer the earthquake epicenter.

An updated version of the previous Google map illustrates this clearly.

The yellow pins indicate $>25\text{dB}$ declines in signal strength during the attenuation event.



Variability in attenuation of signals as a function of distance

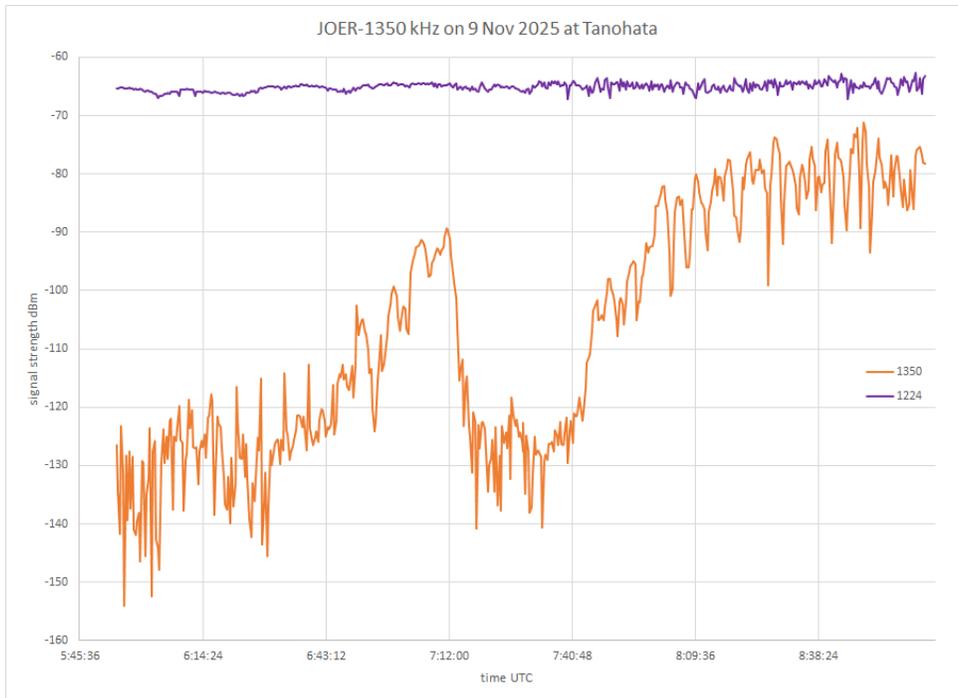


An example in the following slide shows the difference in attenuation observed in signals from JOER-1350kHz in Hiroshima, at 1040 km from Tanohata, and JODR-1116kHz in Niigata at 340 km away.

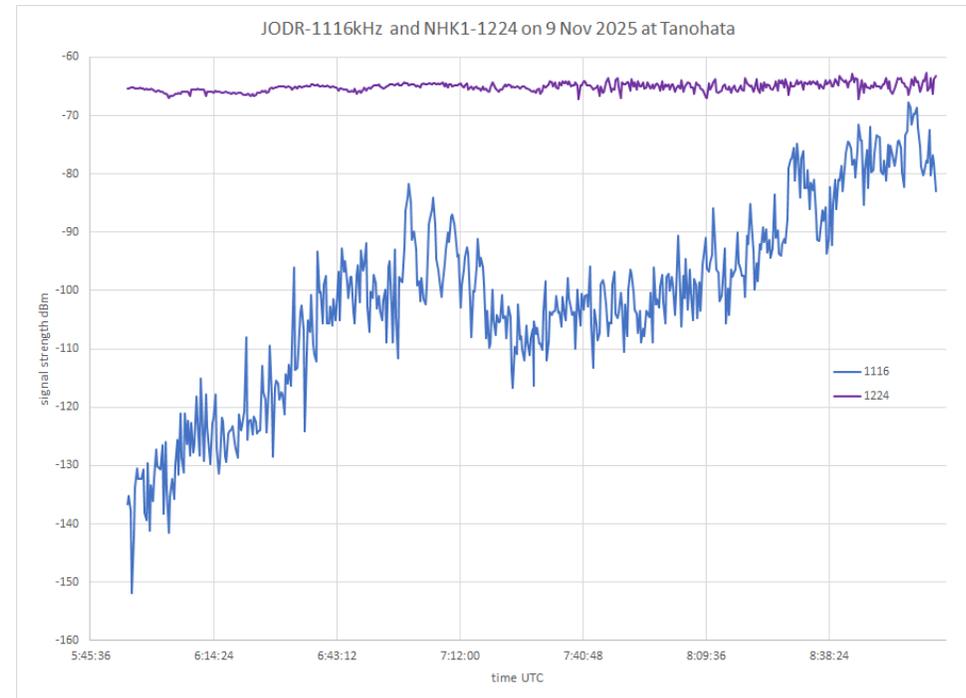
Variability in attenuation of signals as a function of distance

Plus , for reference, a ground wave signal from an NHK relay on 1224kHz, 5km away

JOER-1350kHz, Hiroshima



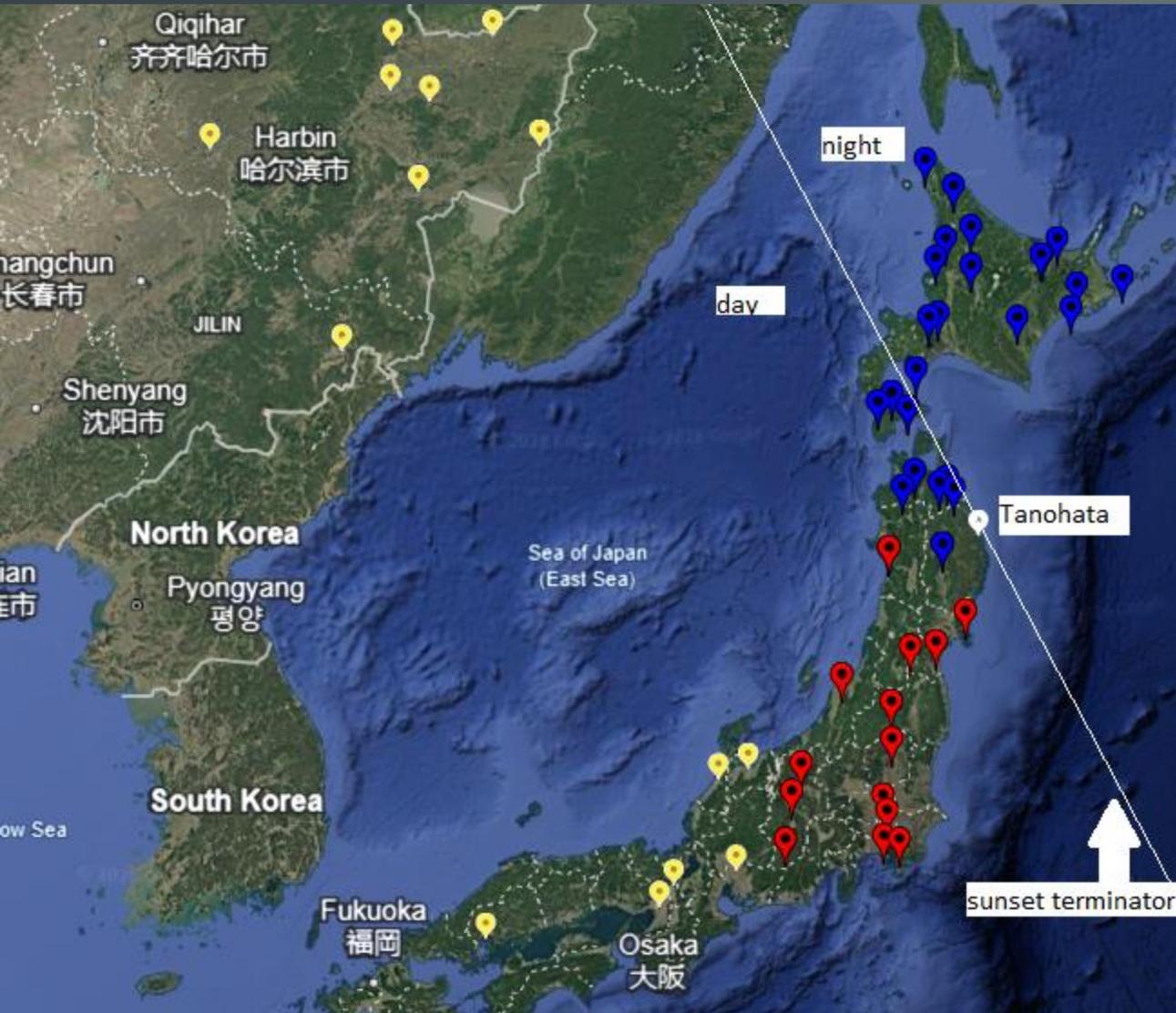
JODR-1116kHz, Niigata



There was much deeper attenuation of the more distant JOER's signal compared with that from JODR's closer transmitter

The purple trace shows no attenuation of the ground wave from nearby NHK-1224 .

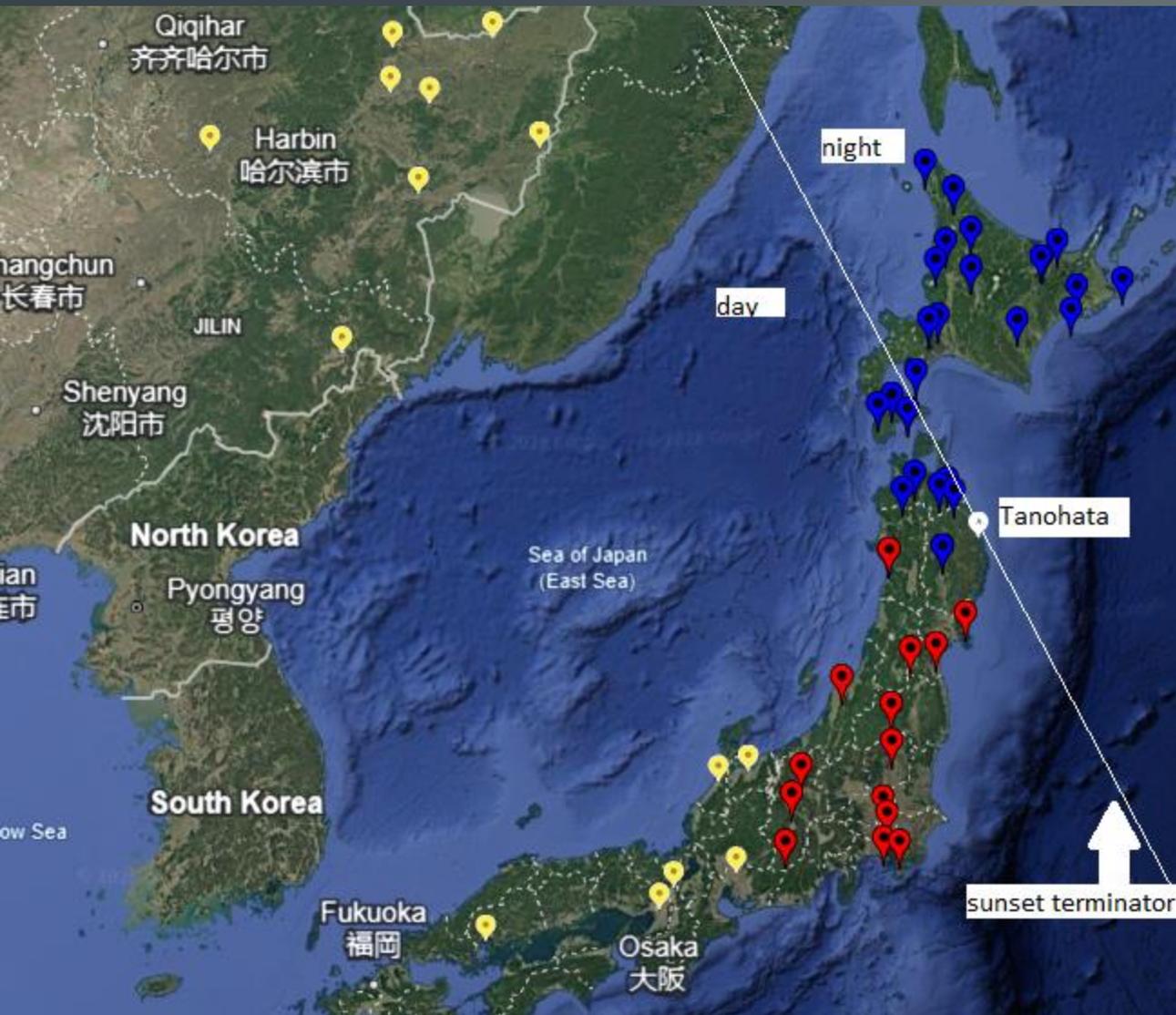
Signals observed related to the sunset terminator



Perhaps the position of the sunset terminator really was more important than the time of the earthquake.

Sunset at Tanohata was 0722UT on 9 November, a few minutes after the attenuation event began.

Signals observed related to the sunset terminator



- The unaffected signals tended to be on the night time side of the terminator
- The affected signals were on the daytime side.
- The more deeply affected signals were further away from the receiver on the daytime side.

A solar flare?

Why would more distant signals on the daylight side of the terminator be attenuated more?

What event would influence propagation of signals at medium frequencies from the day time side of the terminator but not the night time side?

--a solar flare perhaps?

In fact, there had been an X1.7 solar flare that peaked at 0735UT on 9 November. It was reported by NCIT, Japan's National Institute of Information and Communication, as well as by NOAA.

Report of Solar Flare

<https://swc.nict.go.jp/report/topics/202511121600.html>

NCIT Japan's National Institute of Information and Communications Technology

There were four X-class solar flares from November 9th to 14th, with the first one at 07:35UTC on 9 November.

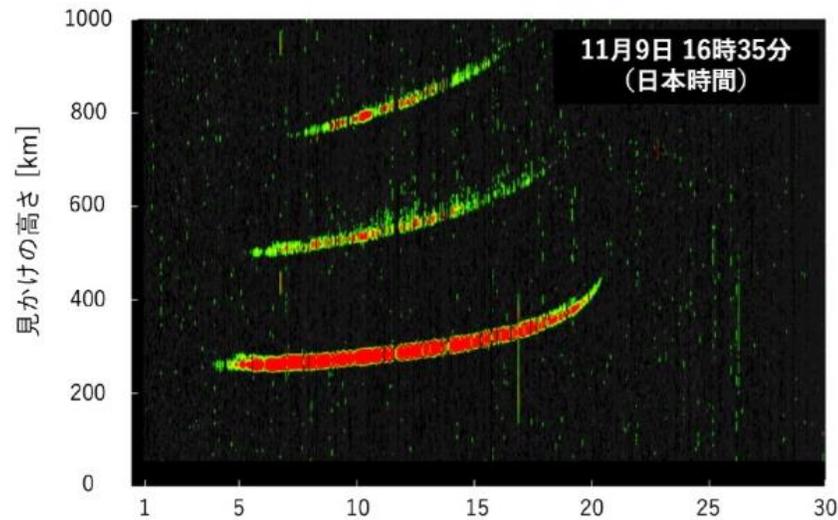
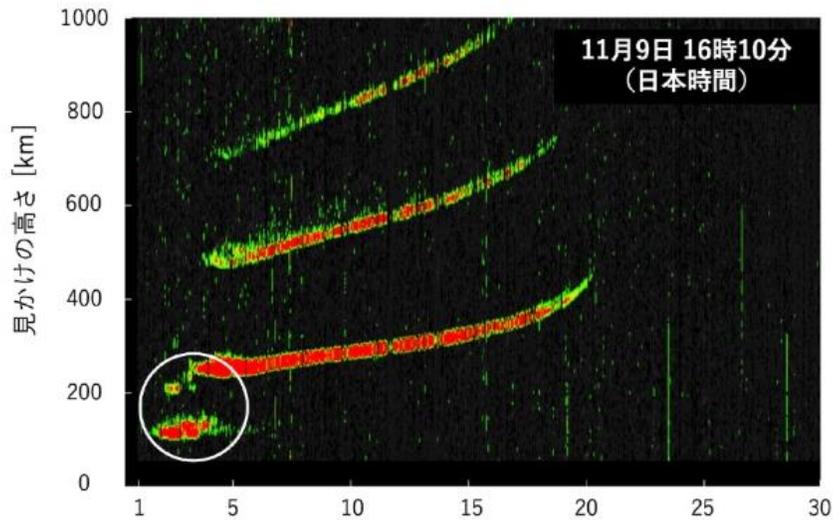
No.	発生日（日本時間）	発生時刻（日本時間）	規模
1	2025年11月9日	16時35分 (07:35UTC)	X1.7
2	2025年11月10日	18時19分	X1.2
3	2025年11月11日	19時04分	X5.1
4	2025年11月14日	17時30分	X4.0

大規模（Xクラス）太陽フレア一覧

Report of Solar Flare

<https://swc.nict.go.jp/report/topics/202511121600.html>

From: NCIT Japan's National Institute of Information and Communications Technology



X-axis is frequency (MHz)

Y-axis is apparent height (km)

Time is Japan time (UTC+9)

The report stated: “Ionospheric observation by ionosonde (Okinawa, Oogimi), The disappearance of the ionospheric echo in the area indicated by the white circle can be confirmed “ (between observations made at 0710 and at 0735UTC; Okinawa was in the sun lit area throughout the period.)

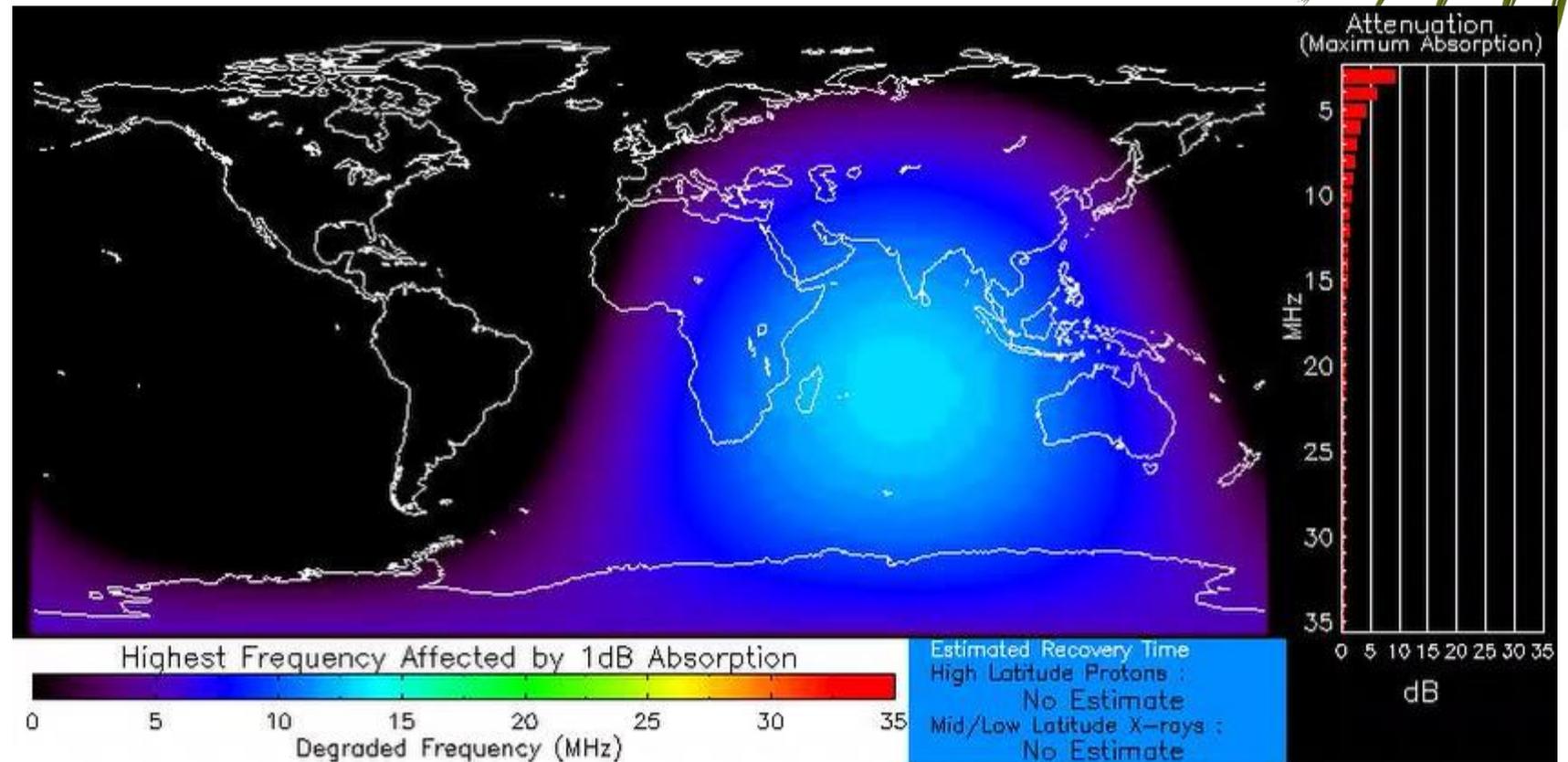
This report said that there was a “Dellinger Phenomenon” observed in Okinawa---which is better known in America as a “radio blackout”.

Progression of the solar flare

courtesy of Gwyn Griffiths, G3ZIL, using SWPC's D-Region Absorption Product (D-RAP) model

D-RAP models the increased absorption in the D-region due to solar X-rays and particles, with the resulting effect on radio propagation conditions.

The rapidly increasing effect of the solar flare is seen in the heat map displayed in this video.



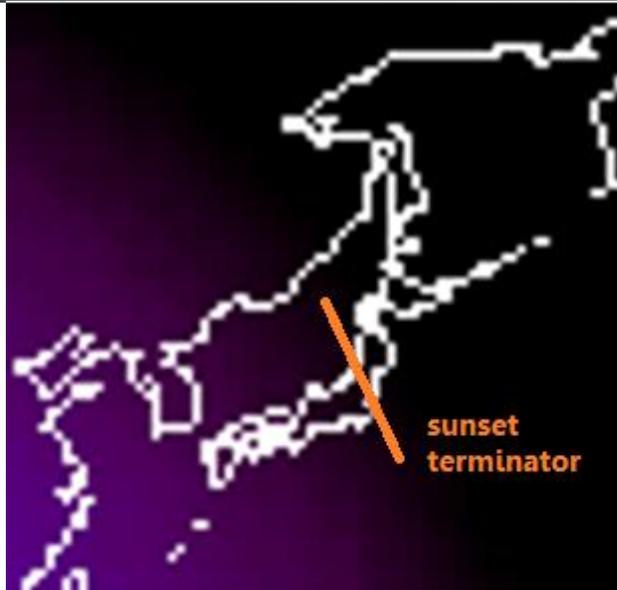
Elevated X-ray flux
Product Valid At : 2025-11-09 07:10 UTC

Normal Proton Background
NOAA/SWPC Boulder, CO USA

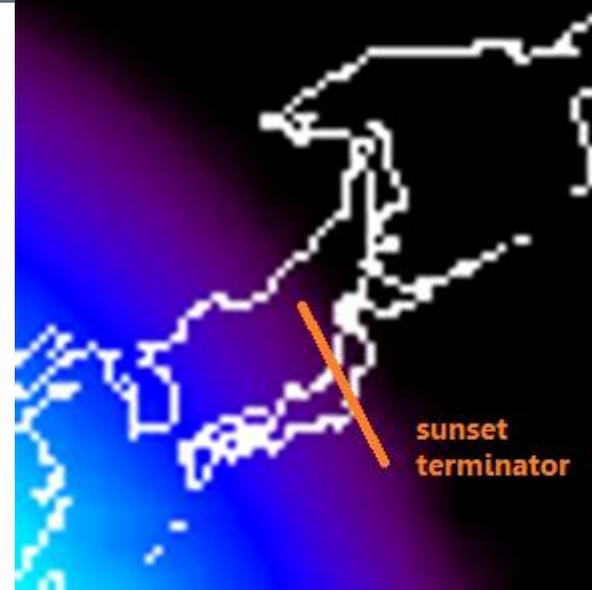
Comparison of signal absorption over Japan, 8-9 November 2025

using detail from the D-RAP model graphics

8 Nov 2025
0735UT



9 Nov 2025
0735UT



The D-RAP model displays the intensity of absorption in the D-region.

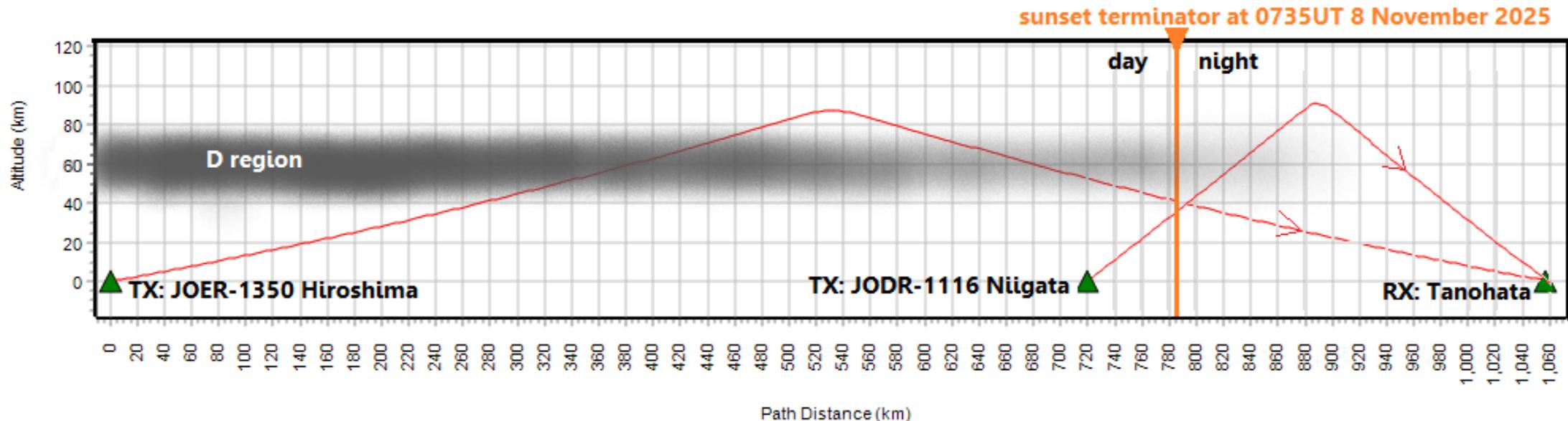
8 November 2025 was a normal day, with absorption near the terminator at 0735UT determined by waning solar radiation.

The model for 9 November 2025 at that time shows considerably more D-region absorption over southwestern Japan due to the solar flare.

Comparison of signal absorption over Japan, 8-9 November 2025

Ray-tracing from Proplab-Pro 3.2; the D-region representation is more speculative.

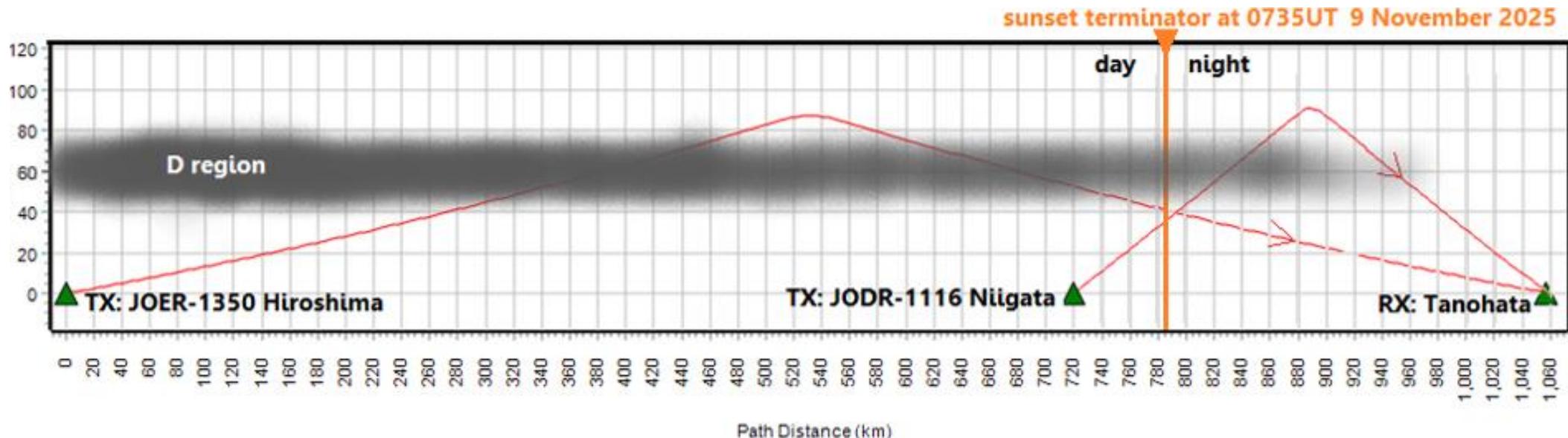
- First order simulation of medium wave skywave propagation assumes that such signals are heavily absorbed during the day time, due to solar illumination of in the D-region.
- In reality, the hours before sunset and after sunrise feature a less dense D-region due to lower intensity solar illumination at those times, particularly in the months around the winter solstice in temperate regions.



Comparison of signal absorption over Japan, 8-9 November 2025

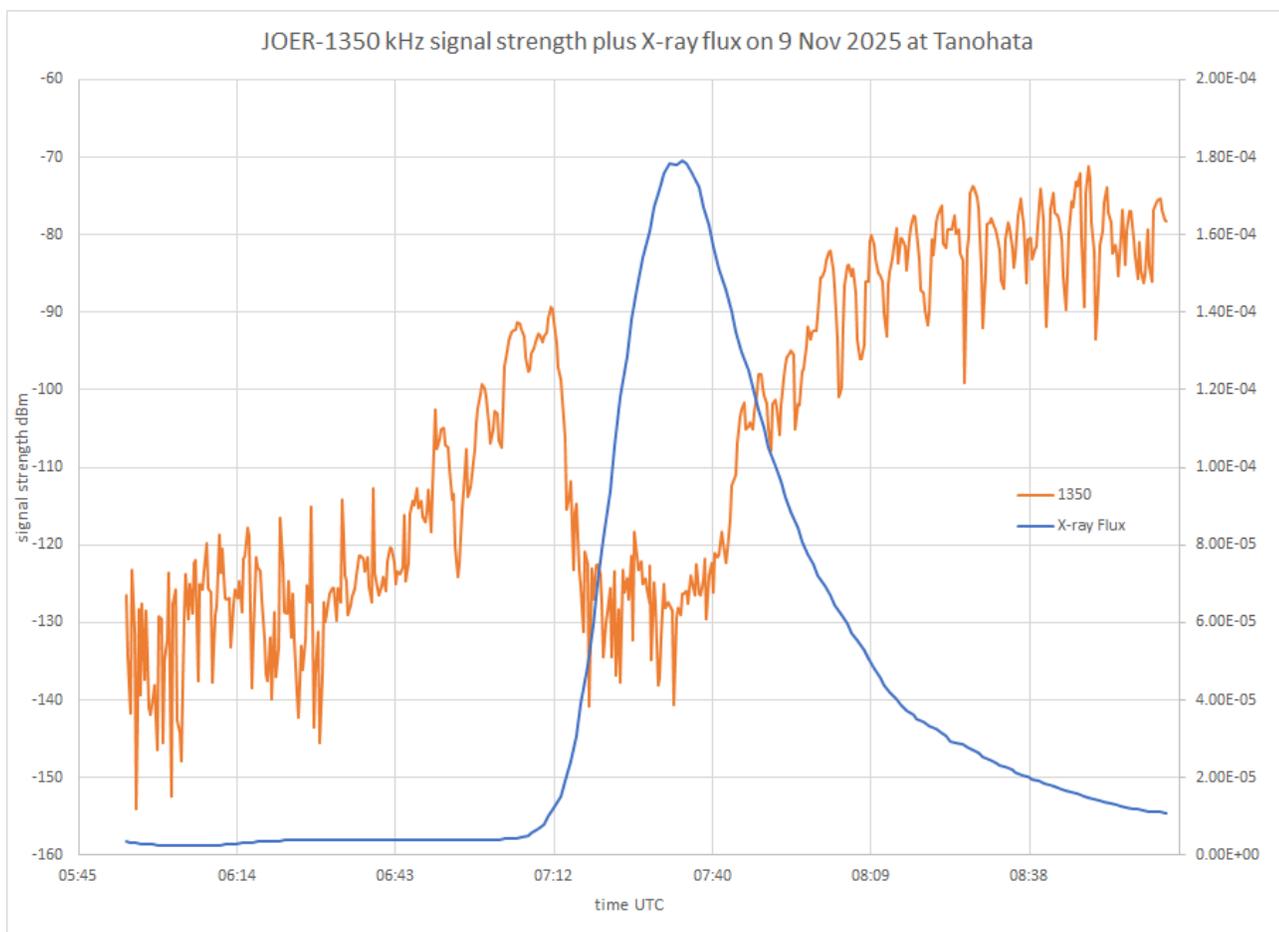
Ray-tracing from Proplab-Pro 3.2; the D-region representation is more speculative.

- This situation can allow signals at medium frequencies to propagate by skywave from the day time side of the terminator despite the D-region still being somewhat energized by sunlight.
- It looks as if the X-rays from this major solar flare on 9 November induced greater absorption in the D-region, suddenly attenuating signals propagated from the sunlit side of the terminator, at least for the duration of the flare.



An Explanation for the signal dropouts?

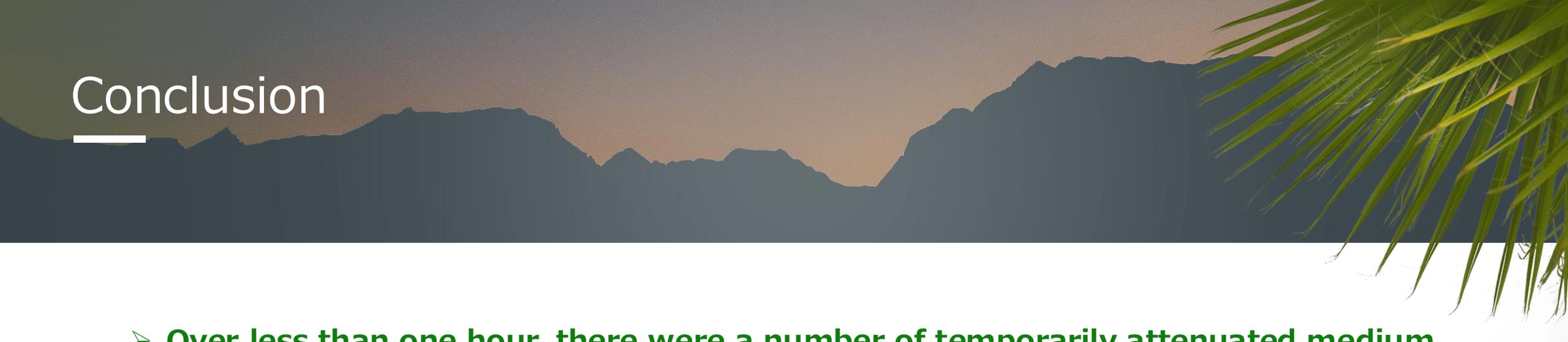
an example using JOER-1350's signal strength observation



The progression of the X-ray flux from the solar flare (blue trace at left) maps quite nicely to the attenuation and recovery of the signal from JOER-1350kHz in Hiroshima, where local sunset did not occur until 0810UT on 9 November.

- The solar flare knocked down JOER's signal by over 30dB in five minutes

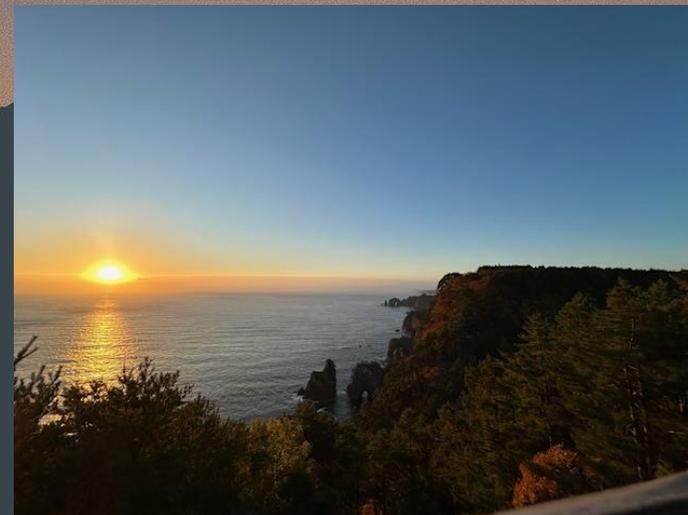
Conclusion



- Over less than one hour, there were a number of temporarily attenuated medium wave broadcast signals noted around local sunset at Tanohata, Iwate, Japan on 9 November 2025.
- Two unusual and unrelated events took place within that hour: a nearby earthquake, and a solar flare.
- The earthquake was obvious at the time, causing the DXers to look at the signal strength changes that had occurred, to see if there could have been any relationship with the quake.
- The solar flare was discovered later, and it appears that the X-ray flux from the solar flare mapped more closely to the attenuations observed.

Satoshi Miyauchi,
JP1SCQ

Nick Hall-Patch
VE7DXR



Thank you

Appendix

Historical video by Satoshi MIYAUCHI,
JP1SCQ

<https://youtube.com/shorts/fneFARjldBs>

Reception videos of 2025 Dxpedition
by Sakae OBARA, JH0BDK/AB5MF

<https://youtu.be/98NVG87w1mk>

<https://youtu.be/5zCbxQ8oeok>

Totsuka DXers Circle

<https://www.tdxc.net/>