STRONG MAGNETIC STORM ON 25-26 AUGUST 2018 WITH REFERENCE TO THE SOLAR CYCLE 24 DECLINING

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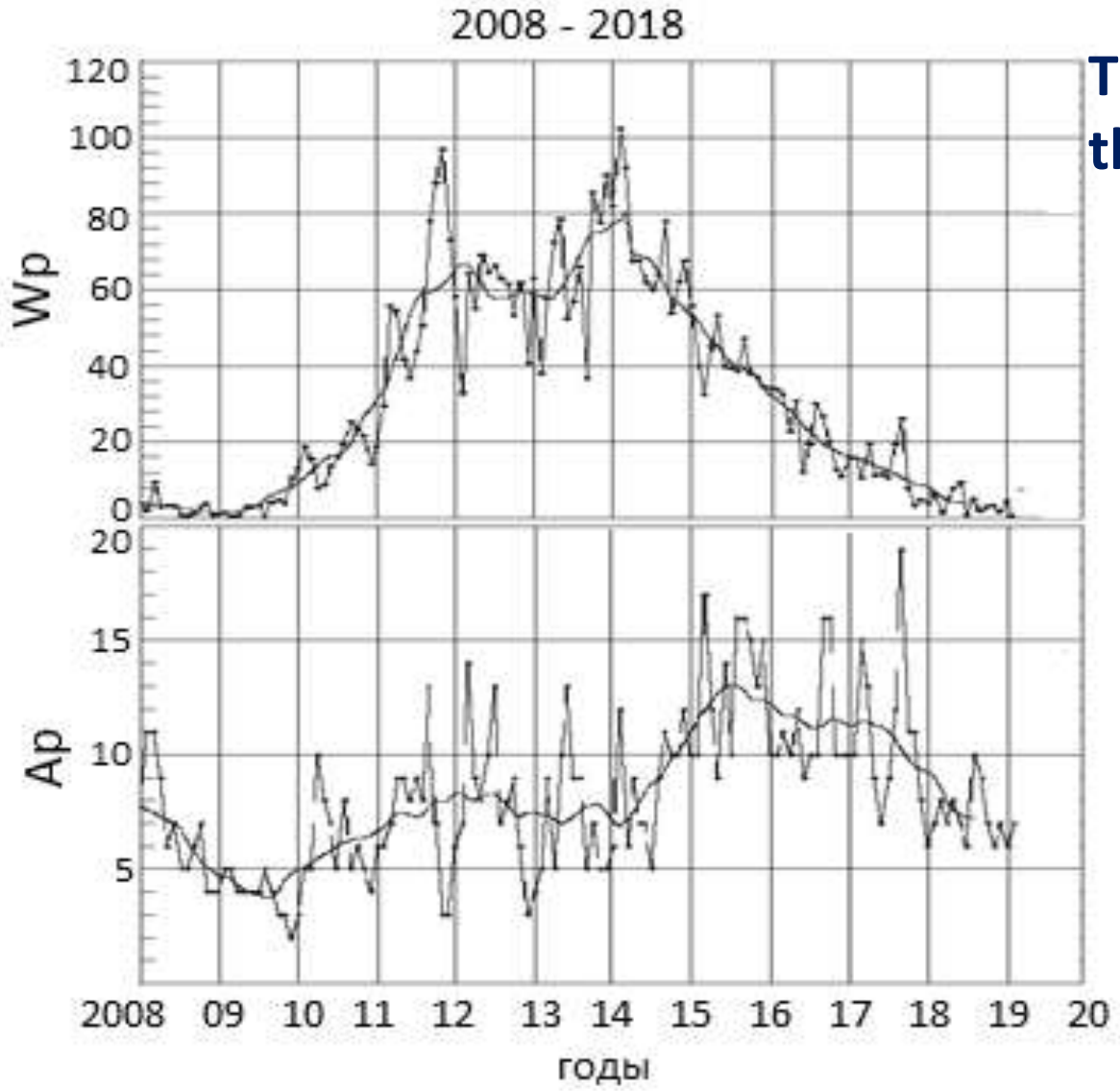
- **The solar cycle 24 continues to produce surprises. After the sever magnetic storm on September 2017, the new strong magnetic storm occurred on August 2018.**

- ***Our aim is to compare the high-latitude ground-based geomagnetic effects of these strong magnetic storms.***

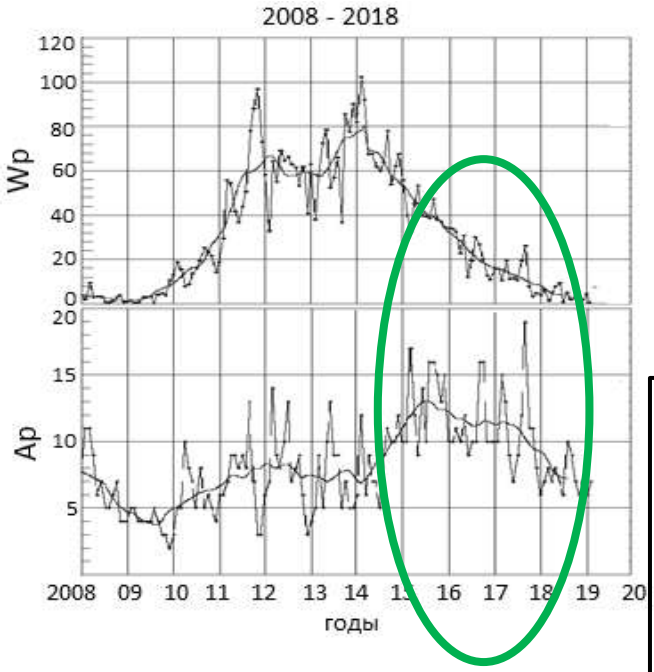
The solar (Wp index) and planetary magnetic (Ap index) activity



The magnetic storms in the solar cycle 24 declining

storm		Dst, nT
1. March	2015	-223
2. June	2015	-204
3. August	2018	-174
4. December	2015	-155
5. September	2017	-124
6. May	2017	-123
7. October	2016	-104

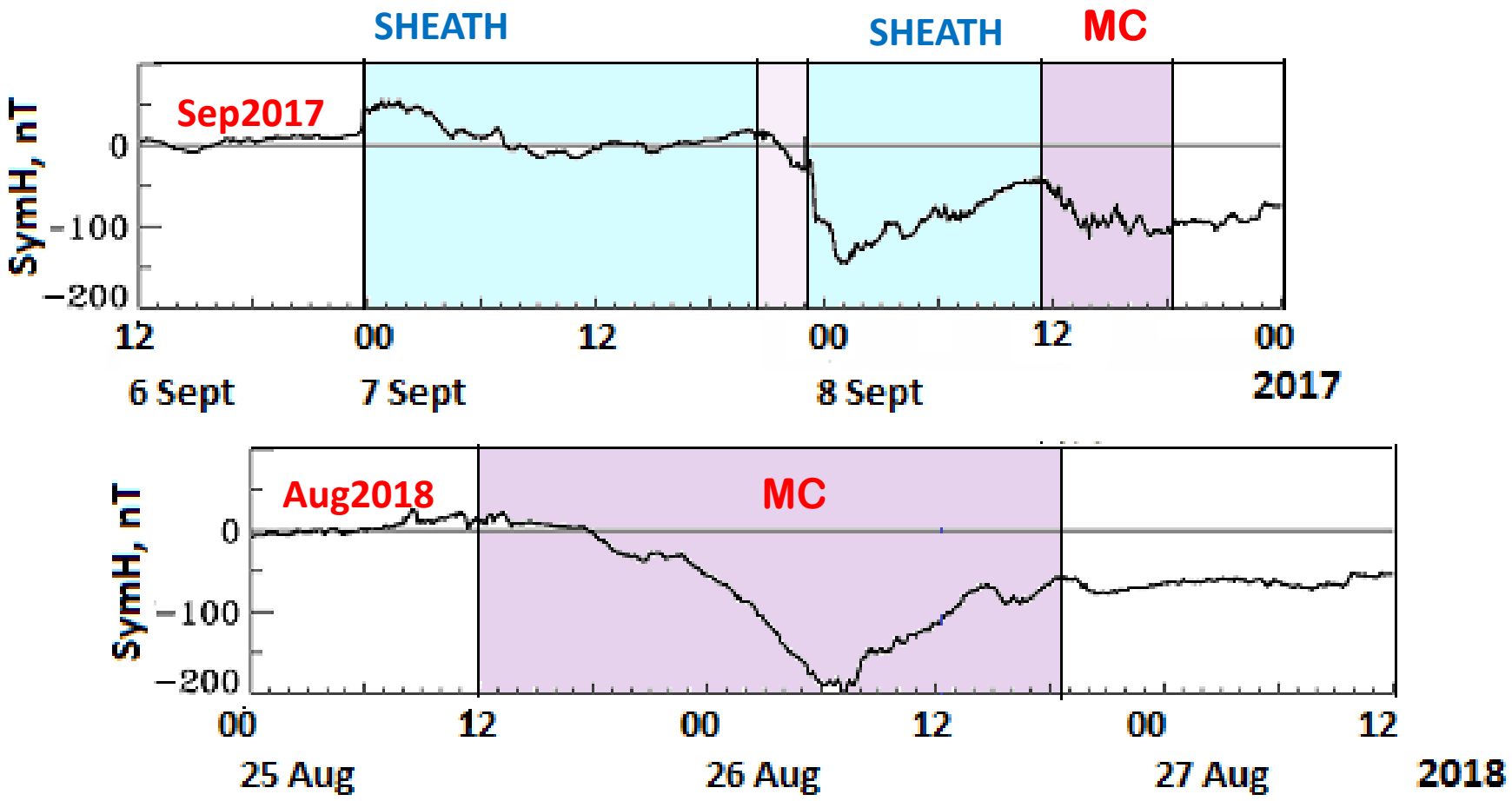
There is no relationship between the storm intensity (Dst index) and planetary geomagnetic activity (Ap index) .



It is important to note the untypical behavior of the solar cycle 24 declining.

In the solar activity declining, all 7 strong magnetic storms with Dst < -100 nT have been caused by CMEs or Sheaths which most often are associated with flares or filament eruptions, both of which are relatively rare in the low part of the cycle.

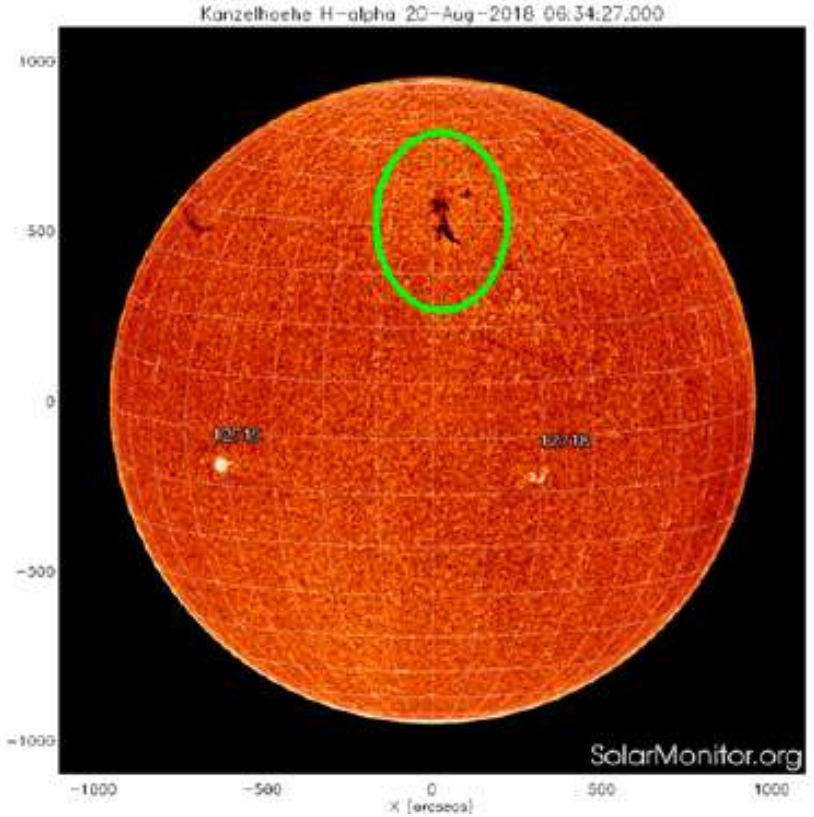
The intensity (*SimH* index) of these magnetic storms



The Sep1017 storm was caused by the coronal mass ejection (CME) associated with the 6 September X-9 flare.

The Aug 2018 storm was caused by the Aug25 CME which was thought to be associated with a filament eruption on 20 August.

Image of the Sun at 546 nm wavelength



The 20 August filament was located near the central meridian between 35 and 50 degrees North around 19 UT.
There were no flares on this day and 5 days later.

Image source:
Kanzelhöhe Observatory in Austria

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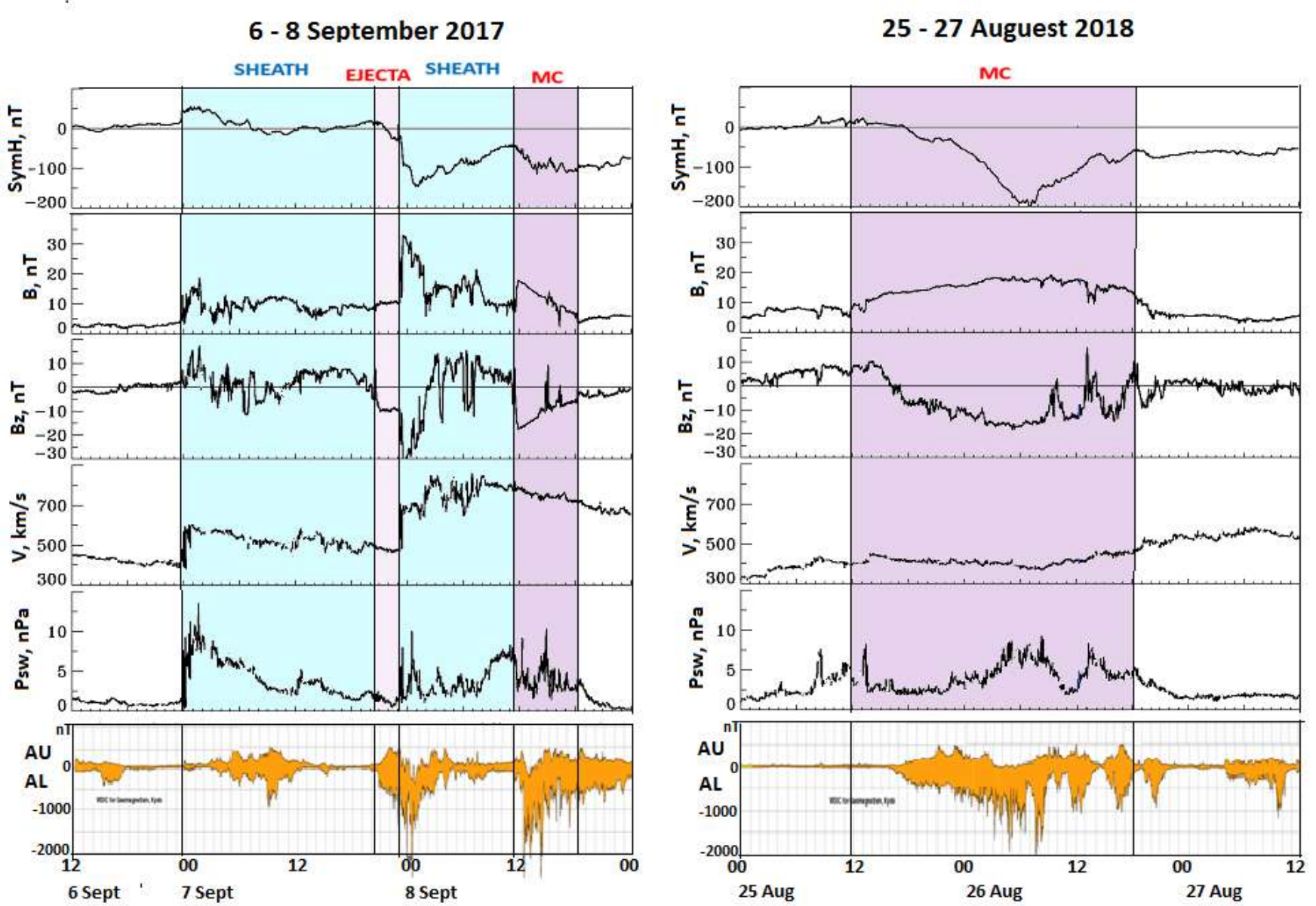
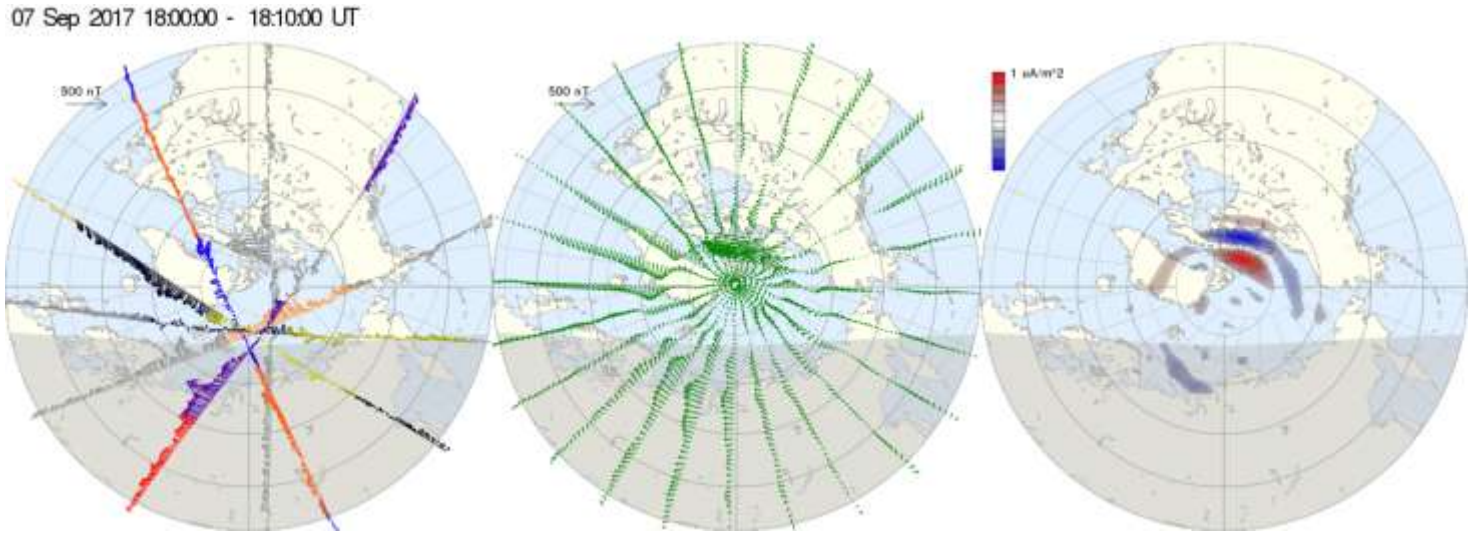
The CME itself was too weak to be automatically detected by satellites. After additional manual analysis, the CME was estimated to have only minor Earth-directed parts. However, its geomagnetic effects were not minor.



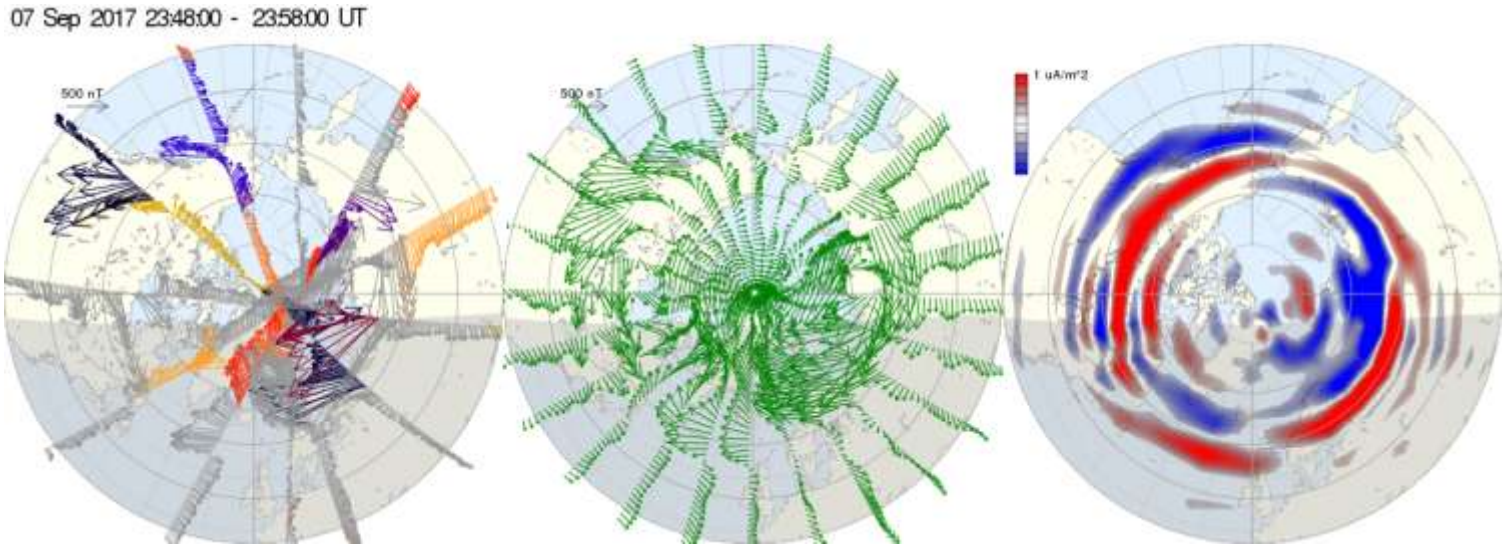
The interplanetary conditions in the Sep2017 storm are stronger than in Aug2018 storm, however, the Dst values in the first event were smaller than in the second case, probably, due to shorter duration of the negative IMF Bz valued .

AMPERE (Active Magnetosphere and Planetary Electrodynamics Response Experiment) project consists of 66+ commercial satellites in 780 km polar circular orbits distributed over 6 orbital planes to provide global telephone service.



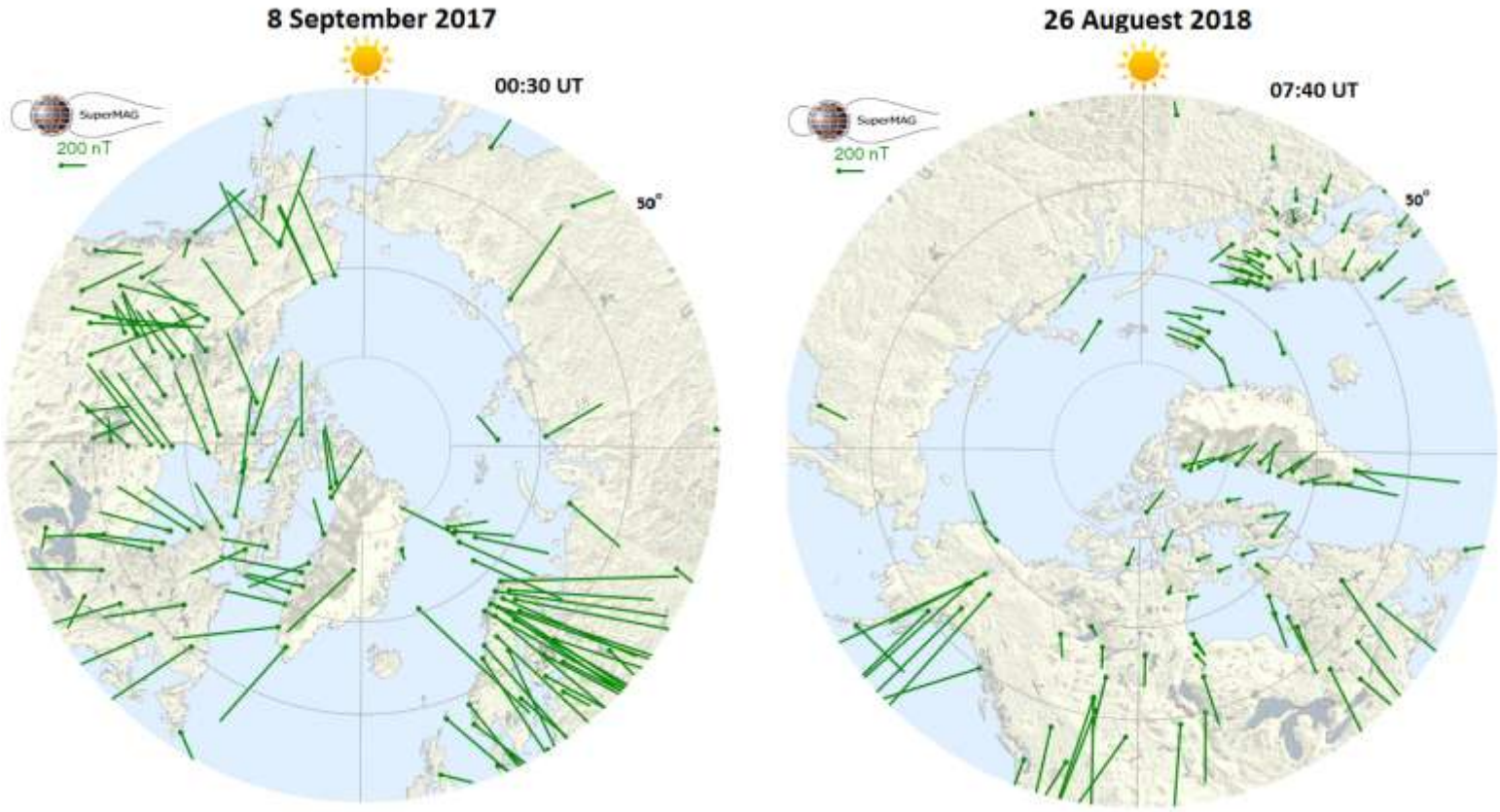
Before the magnetic storm on 7 September

Blue - downward , red - upward currents



In the storm main phase beginning

Storm main phase

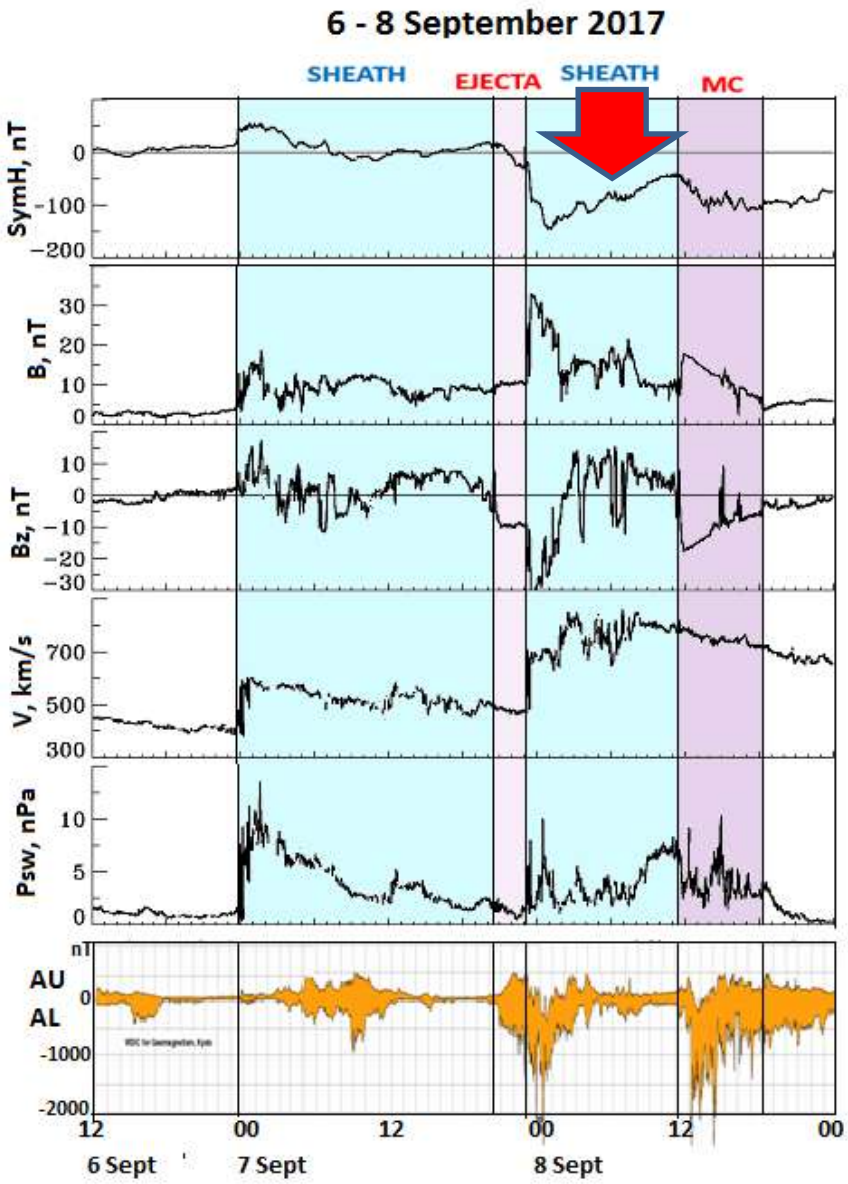


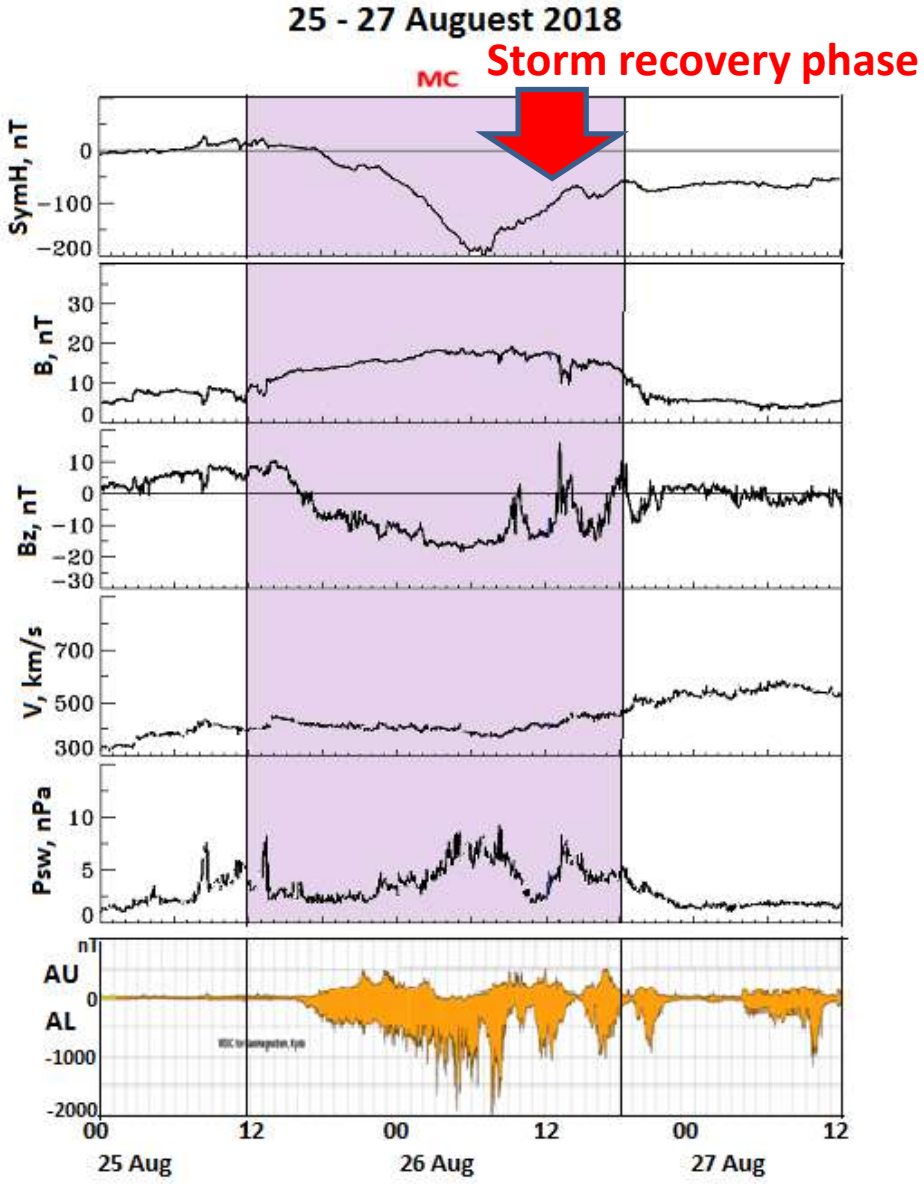
The maps of the magnetic vectors from the ground stations after the SuperMAG data

The planetary geomagnetic disturbances in the main phase of the Sep2017 storm were stronger than in the Aug2018 storm despite the fact that the Dst values in the first event were smaller than in the second storm.

Aurora in the main phase of Aug2018 storm

aurora outside Fort Wainwright, AK on Aug 26, 2018. Credit: Jennifer Ocampo/@jennifernocampo

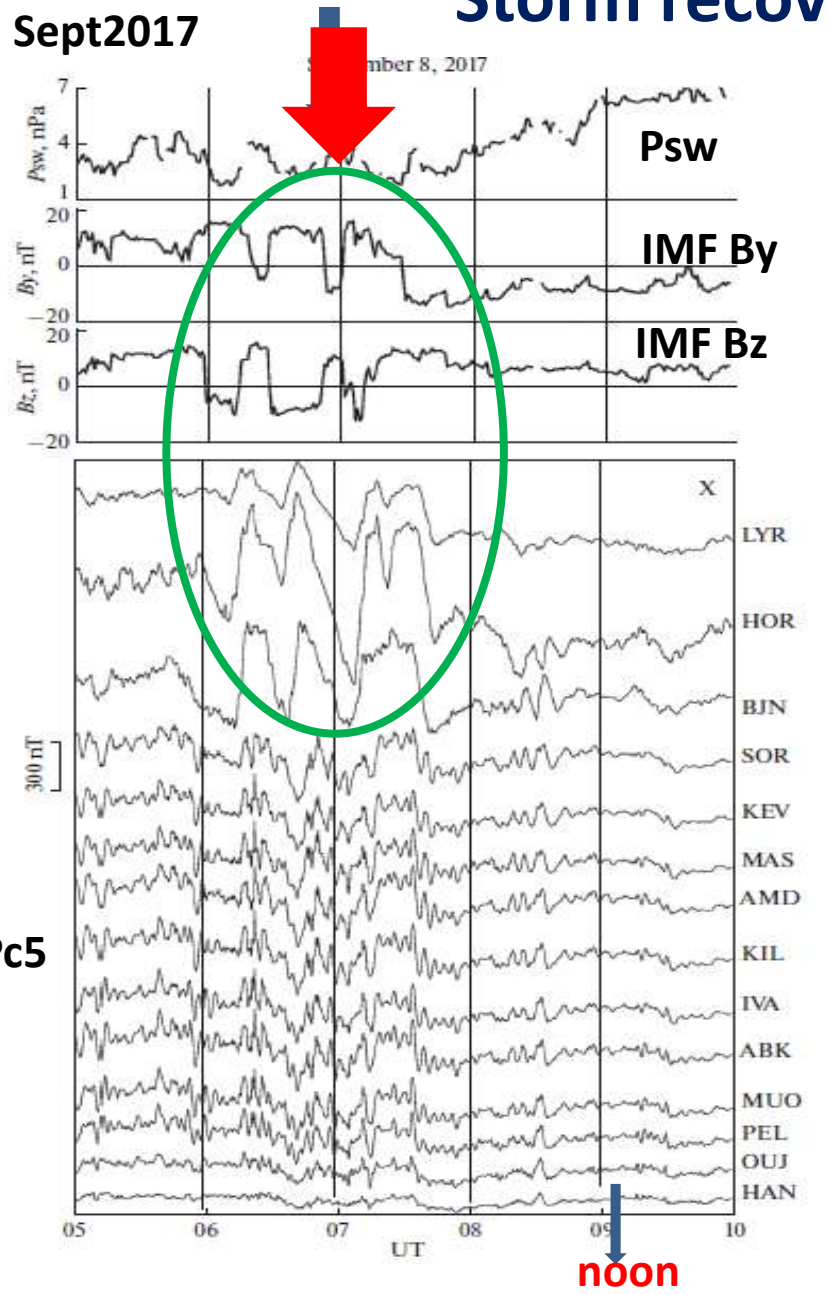




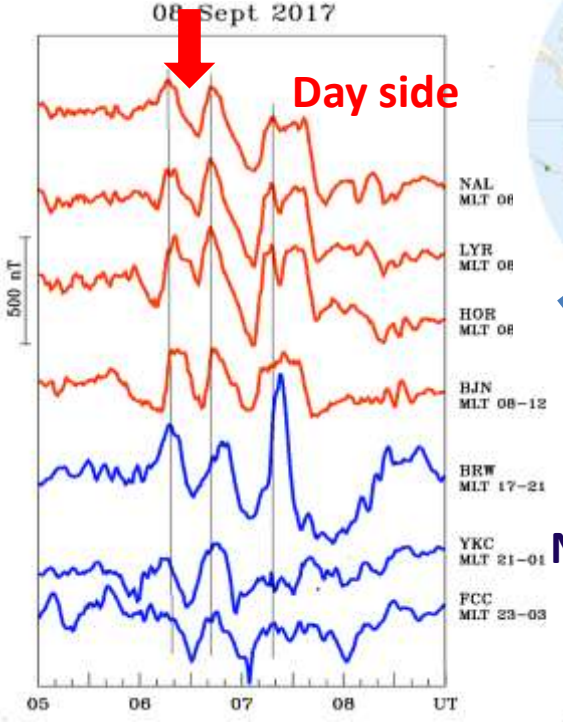
In the storm recovery phase of the both events (marked by red arrows) there were strong IMF Bz fluctuations.

Storm recovery phase

Sept2017



Pc5



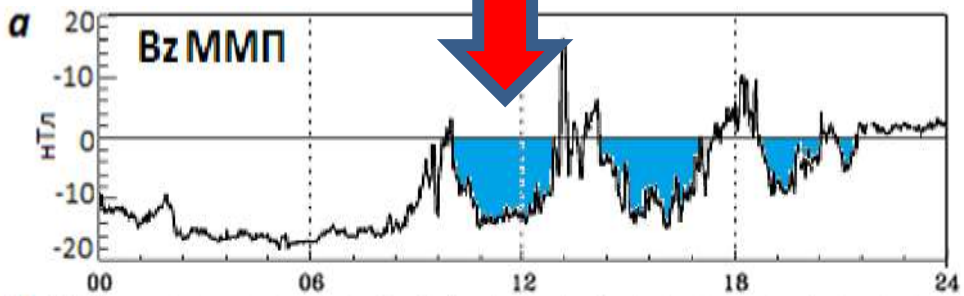
Night side

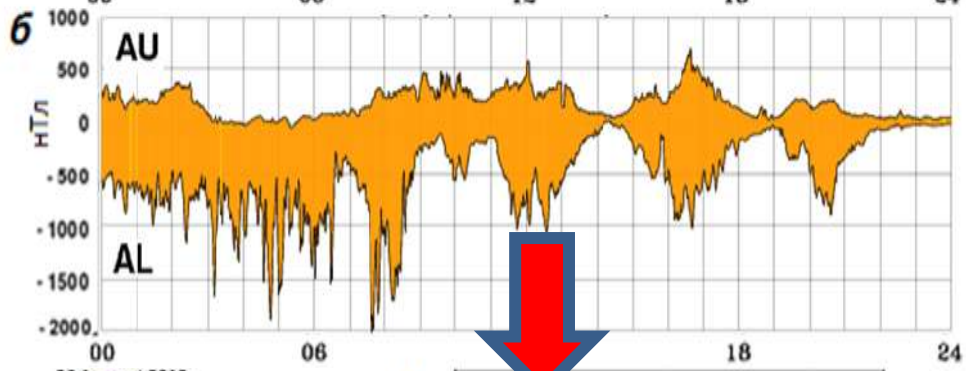
Strong IMF Bz and By 15-30 min fluctuations caused the similar periods polar geomagnetic variations in the global scale, i.e., simultaneously at the day and night sides.

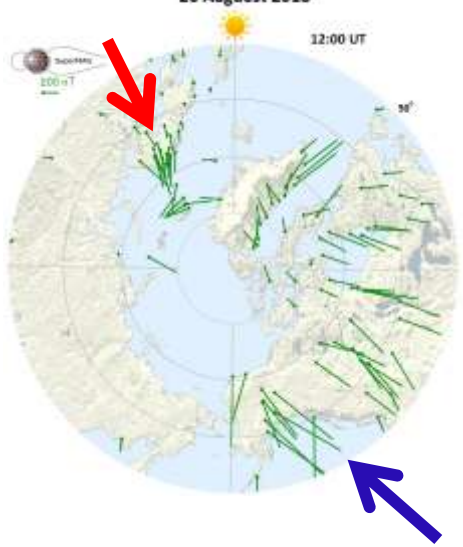
At the dayside auroral latitudes, the typical Pc5 geomagnetic pulsations were observed.

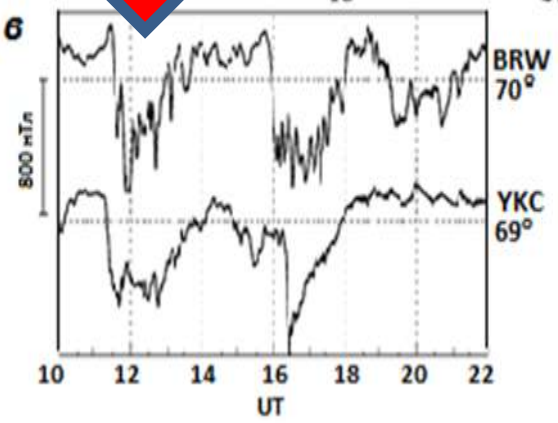
Storm recovery phase

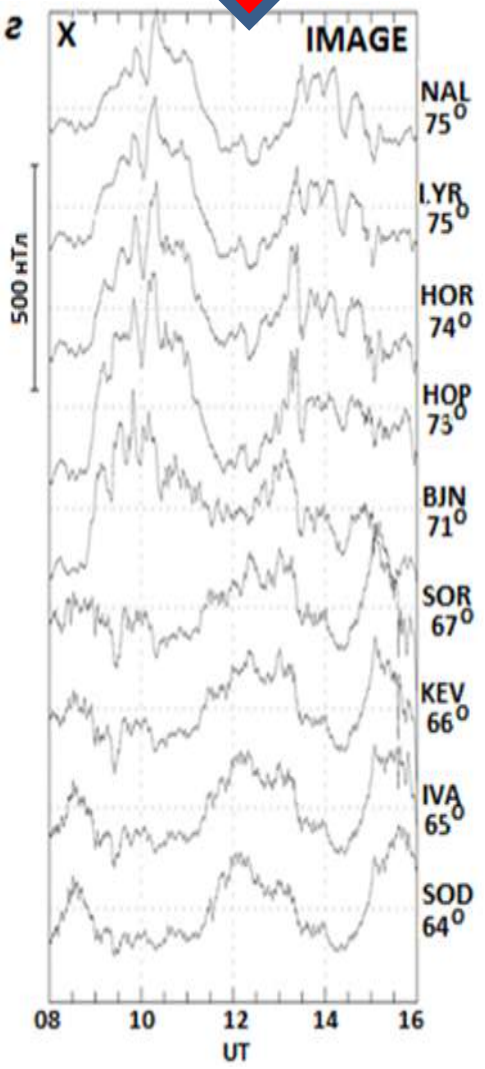
26 august 2018











Night side

Day side

Summary

1. **The comparison of two last sever magnetic storms (Sep2017 and Aug2018) showed that there is no linear relationship between the storm intensity (Dst index) and planetary geomagnetic activity (Ap index). So, the planetary geomagnetic disturbances in the Sep2017 storm were stronger than in the Aug2018 storm despite the fact that the Dst values in the first storm were smaller than in the second one.**

2. **The interplanetary conditions in the Sep2017 storm were stronger (higher solar wind speed, IMF B and negative IMF Bz) than in Aug2018 storm, however, the in the first event, the Dst values and the storm main phase duration were smaller than in the second case, probably, due to shorter time of the negative IMF Bz.**

3. **During the recovery phase of the both storms, there were strong IMF Bz variations. The high-latitude geomagnetic disturbances, caused by these IMF Bz variations, have been observed in the global scale, i.e., simultaneously at the day and night sides.**

Final remark

The solar cycle 24 has not yet reached a minimum and overall the sun activity can still continue, thus, some new additional events may occur.