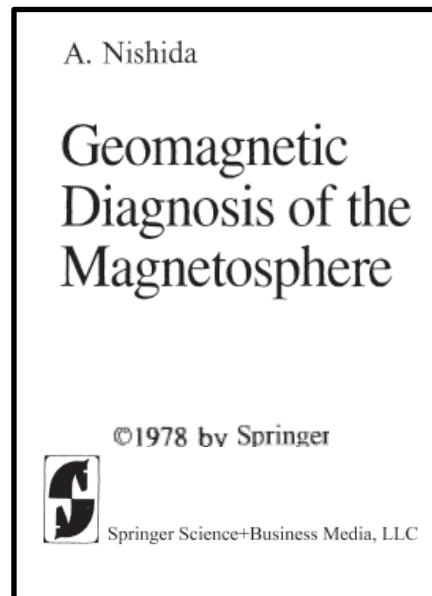




受賞理由

宇宙空間物理学, 特に地球磁気圏の構造とダイナミクスについて顕著な貢献をした功績により



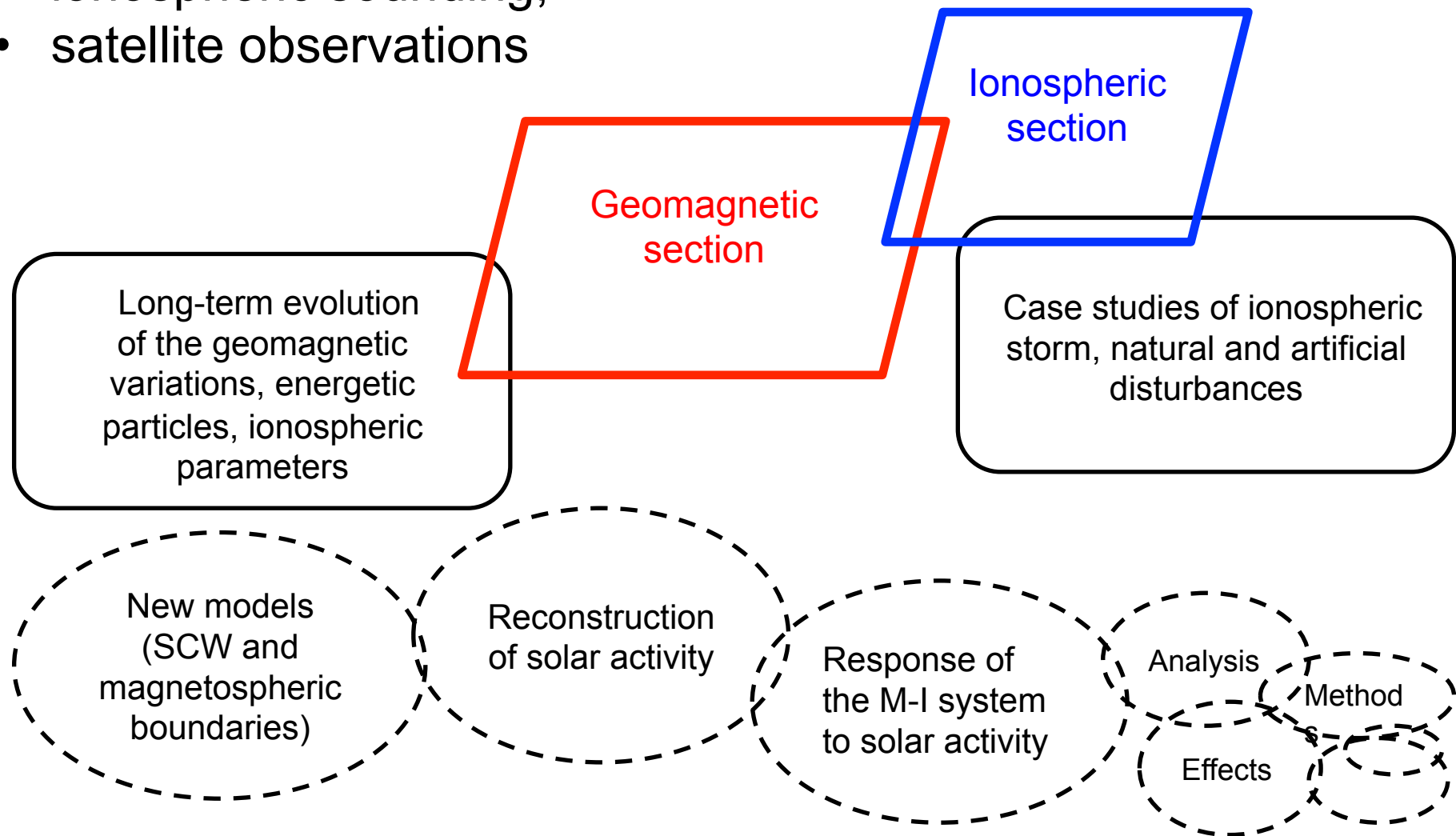
# Geophysical and geomagnetic diagnosis of the Sun and near-Earth space

IAGA-2015 A37 symposium  
Reported Review

R. Lukianova  
and A37 contributors

Symposium covered a wide range of topics on the analysis of

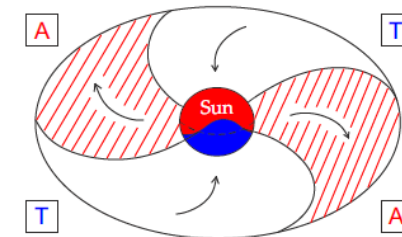
- ground-based magnetometer data,
- ionospheric sounding,
- satellite observations



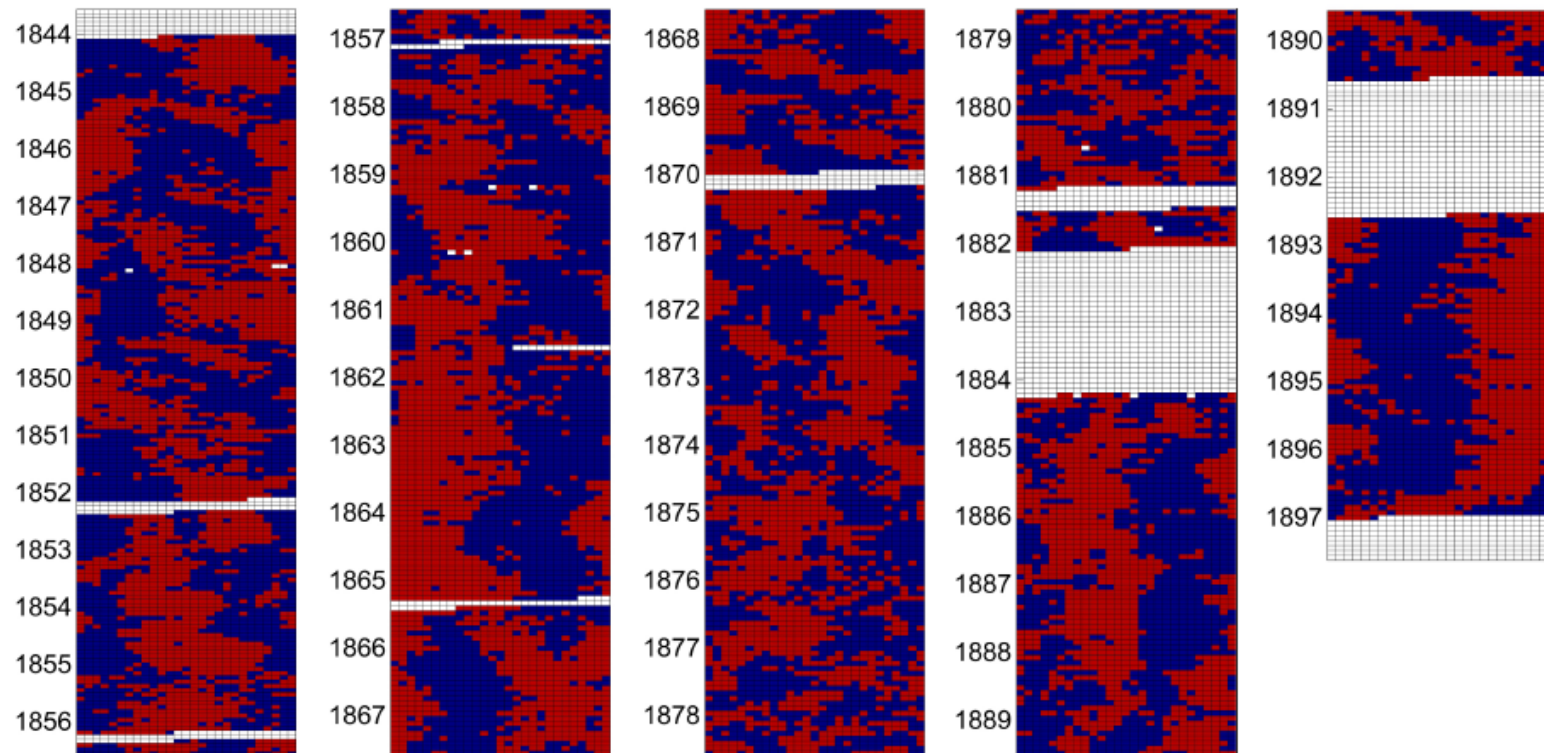
# Reconstruction of solar activity – space climate change

IMF polarities back to 1844 using  
the subauroral geomagnetic observations  
HEL and STP

IMF sector structure (ecliptic plane)



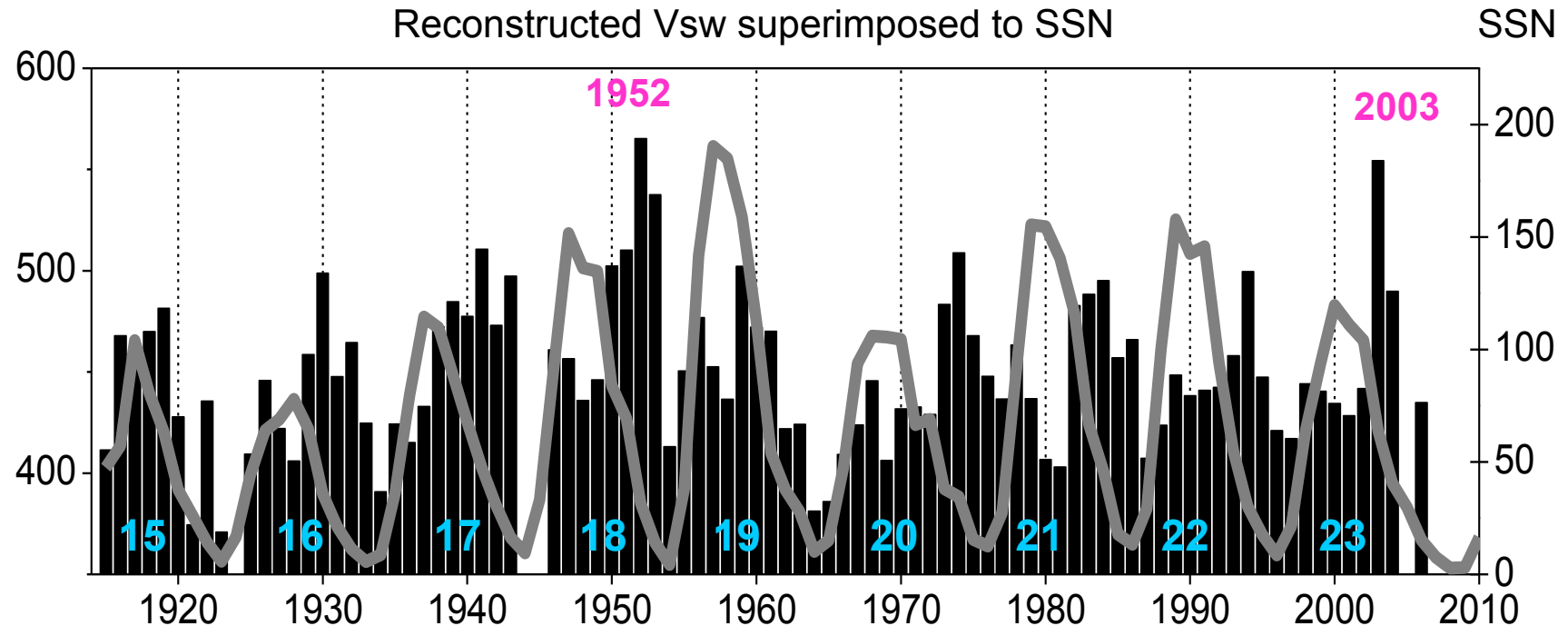
**Results. Bartels 27-day display of the IMF sector structure**



Inferred IMF sector structure is divided here into five panels according to five solar activity cycles in 1844-1897 period. Away sectors are marked by red and towards by blue. Empty cells with no geomagnetic data are marked by white. Recurrences are clearly dominate in the diagrams.

# Solar wind speed back to 1914 using the polar cap and auroral geomagnetic observations

Obs. Godhavn & Sodankyla



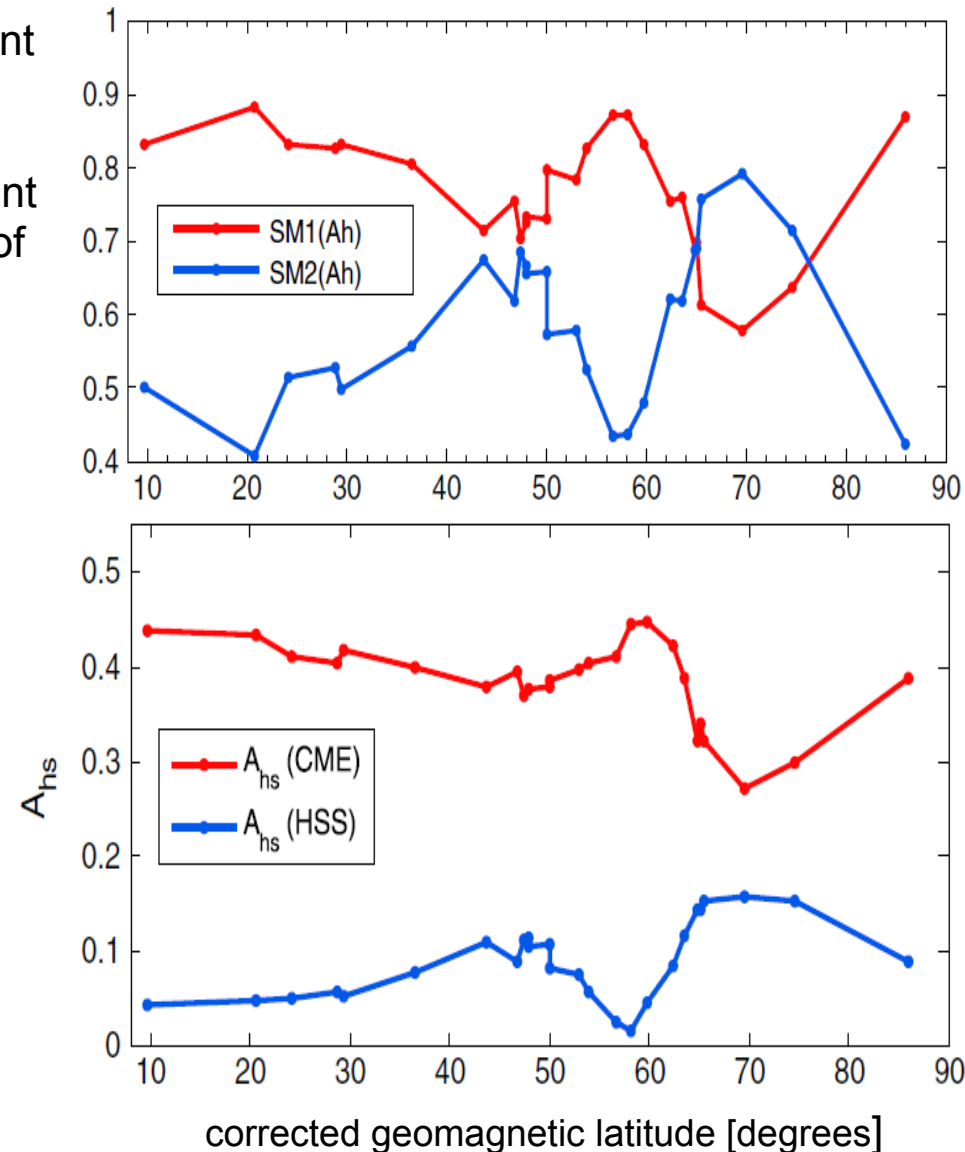
- The largest peaks (extreme HSSs) are in 1952 and 2003. Lower peaks are at each declining branch of SC. HSSs are associated with the solar coronal holes (CH).
- The SC 19, which marks the sunspot maximum period of the GMM, was preceded by exceptionally strong solar polar fields during the previous sunspot minimum. This gives support for the validity of solar dynamo theory.
- In SC 23 only one but huge CH occurred.

# Contributions of CMEs and HSSs to geomagnetic activity

- Application of principal component analysis (PCA) and independent component analysis (ICA) to geomagnetic indices from different latitudes to separate the effects of CMEs and HSSs
- Spatial modes

HSS related geomagnetic activity is the most strong at auroral latitudes

CME related activity is strongest at low and subauroral latitudes



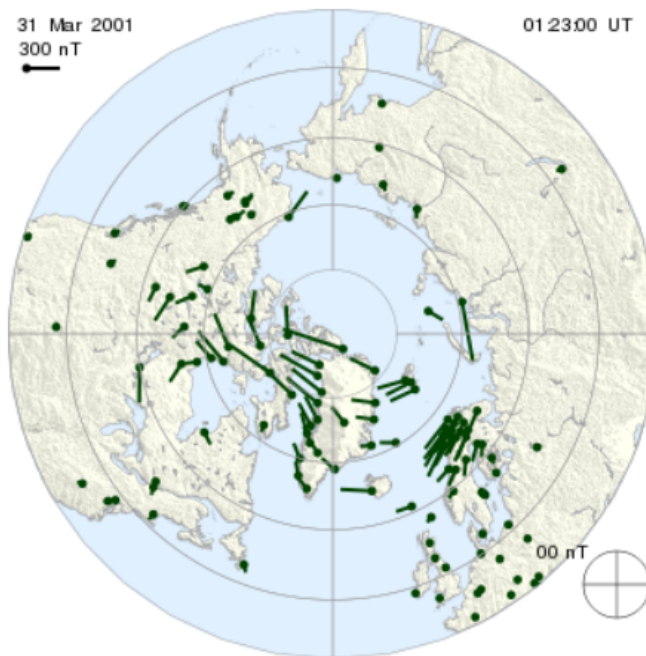
# The Large-Scale Current System During Substorms from the SuperMag



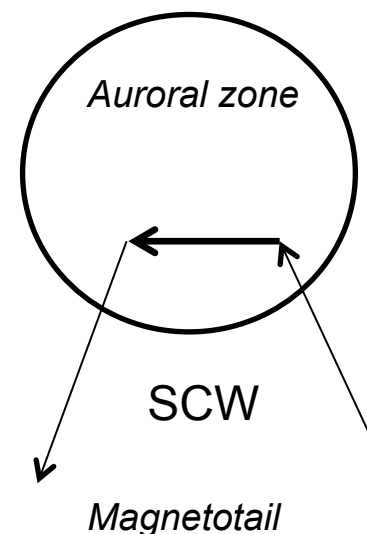
Data of >100 ground magnetometers make it possible to reveal that SCW actually substorm consists of 2 wedge type systems:

a bulge current wedge in the pre-midnight region, and  
an oval current wedge in the post-midnight region.

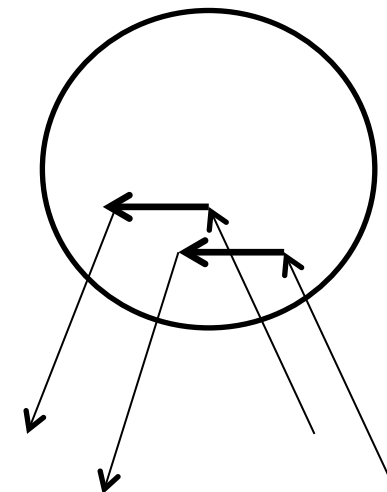
The two wedge systems are shifted in latitude but overlap in local time in the midnight region. *New physics of the magnetotail current disruption and SCW formation.*



Old model

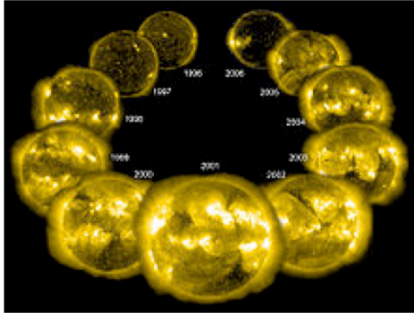


New model

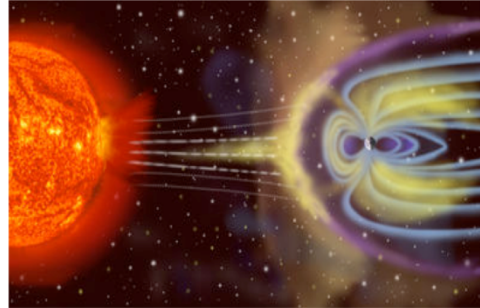




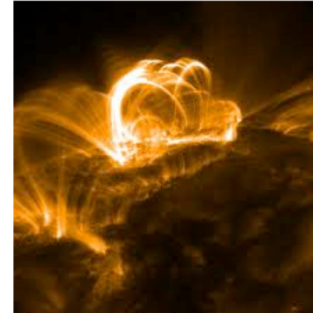
Solar cycle



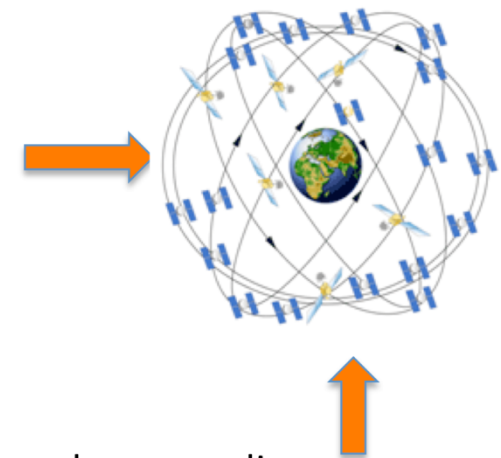
Geomagnetic storms



Solar flares



GNSS



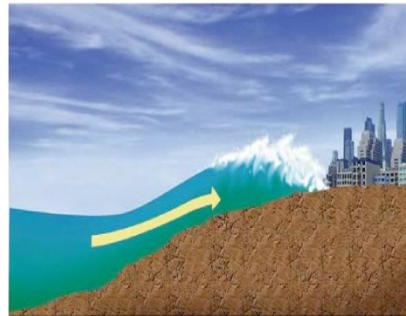
Influence from above – solar-terrestrial/magnetosphere/ionosphere coupling

## IONOSPHERE

Influence from below – lithosphere/atmosphere/ionosphere coupling



Earthquakes



Tsunamis



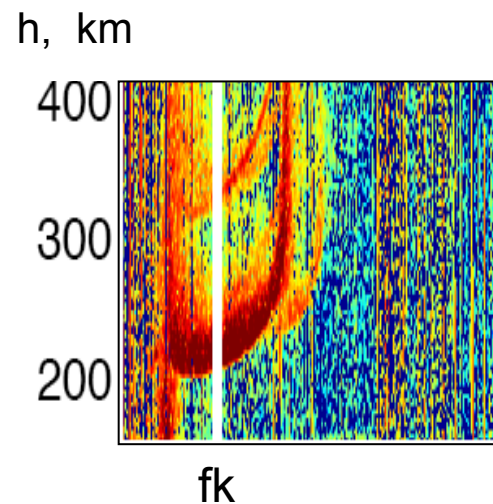
Volcano eruptions



Rocket launches

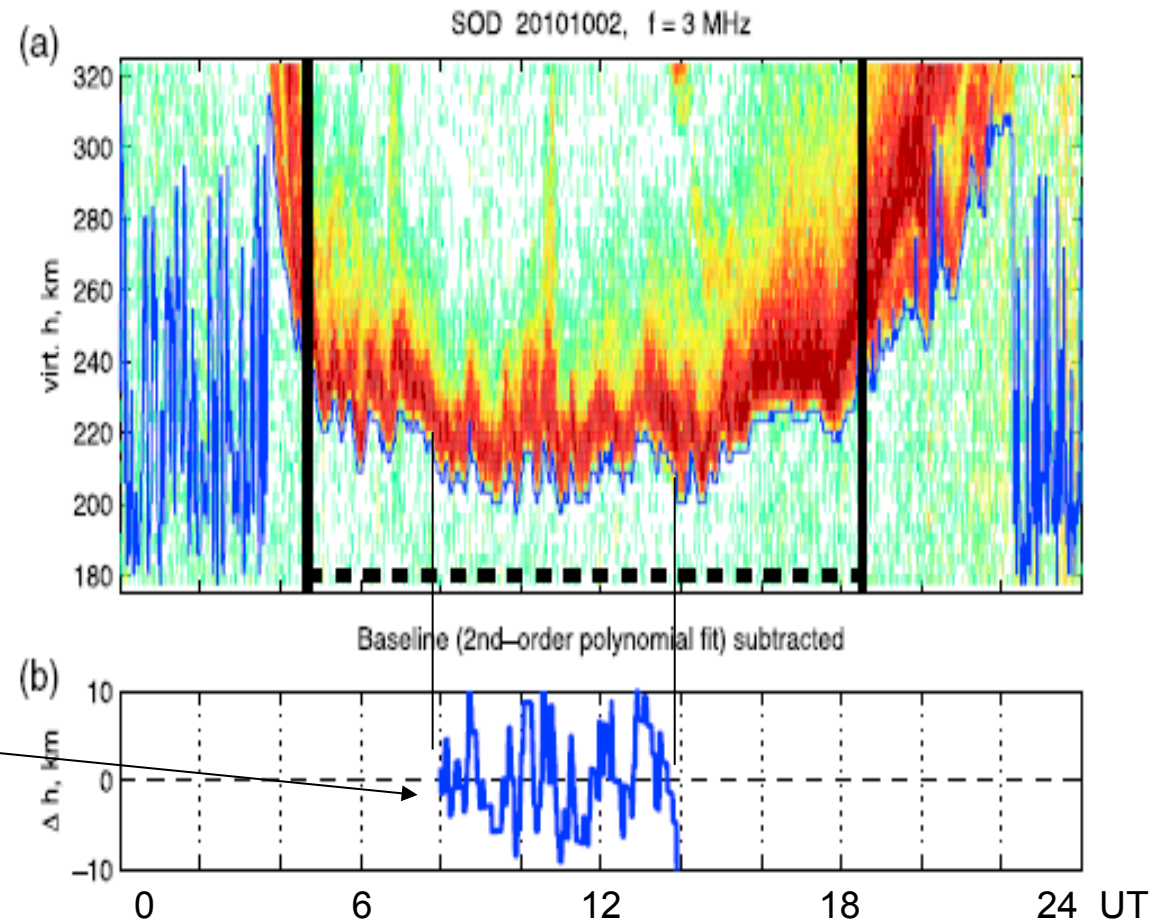
# Traveling ionospheric disturbances (TID) and atmospheric gravity waves from the rapid-run ionosonde observations

Vertical pixel column at frequency  $f_k$   
is extracted from  
each 1-min ionogram



$\Delta h_{F2} \sim$  AGW amplitude

## Height-Time-Intensity Diagram



AGW at the ionospheric height is a signature of the lower atmosphere-ionosphere coupling and energy transfer



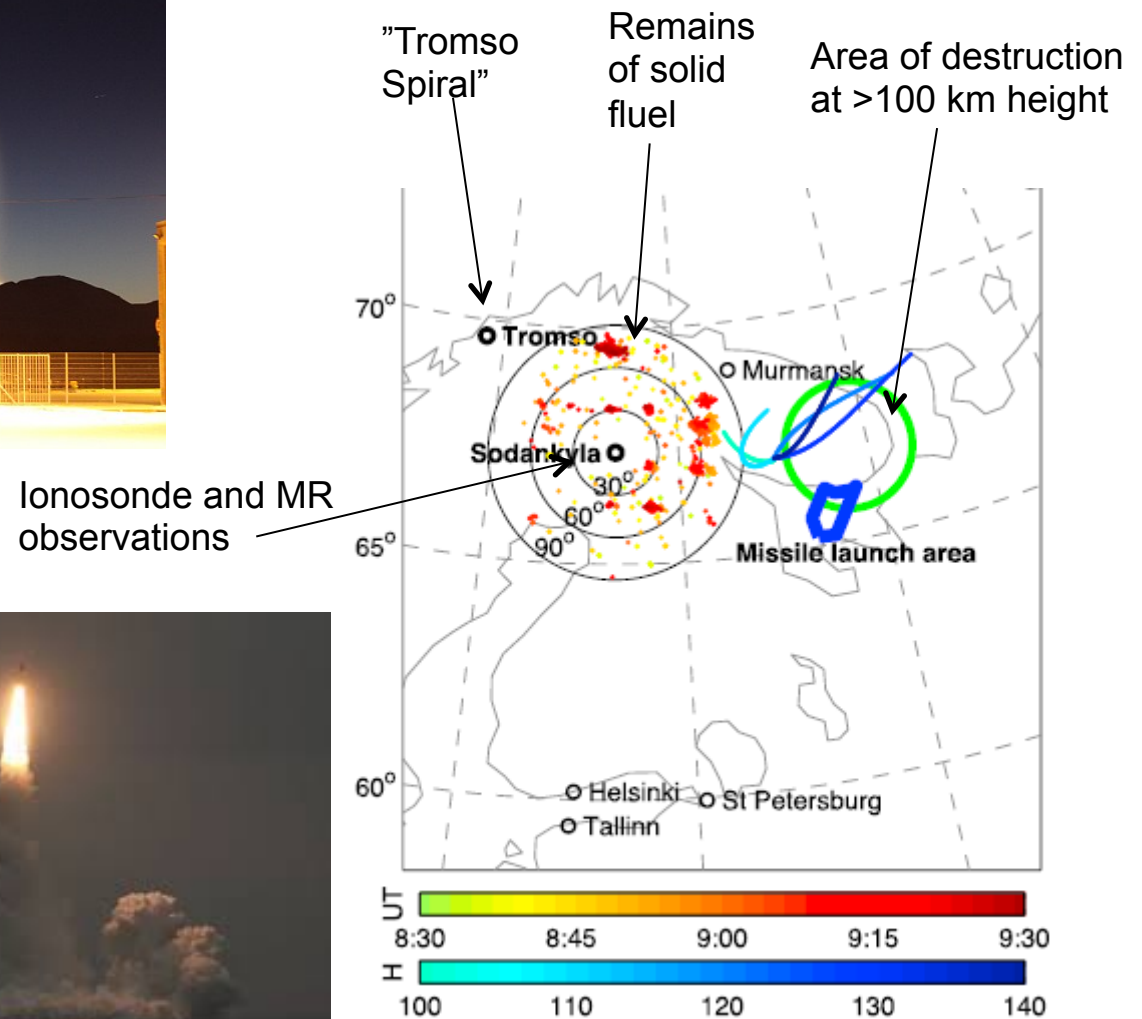
# Ionospheric effects of the destruction of Russian missile “Bulava”



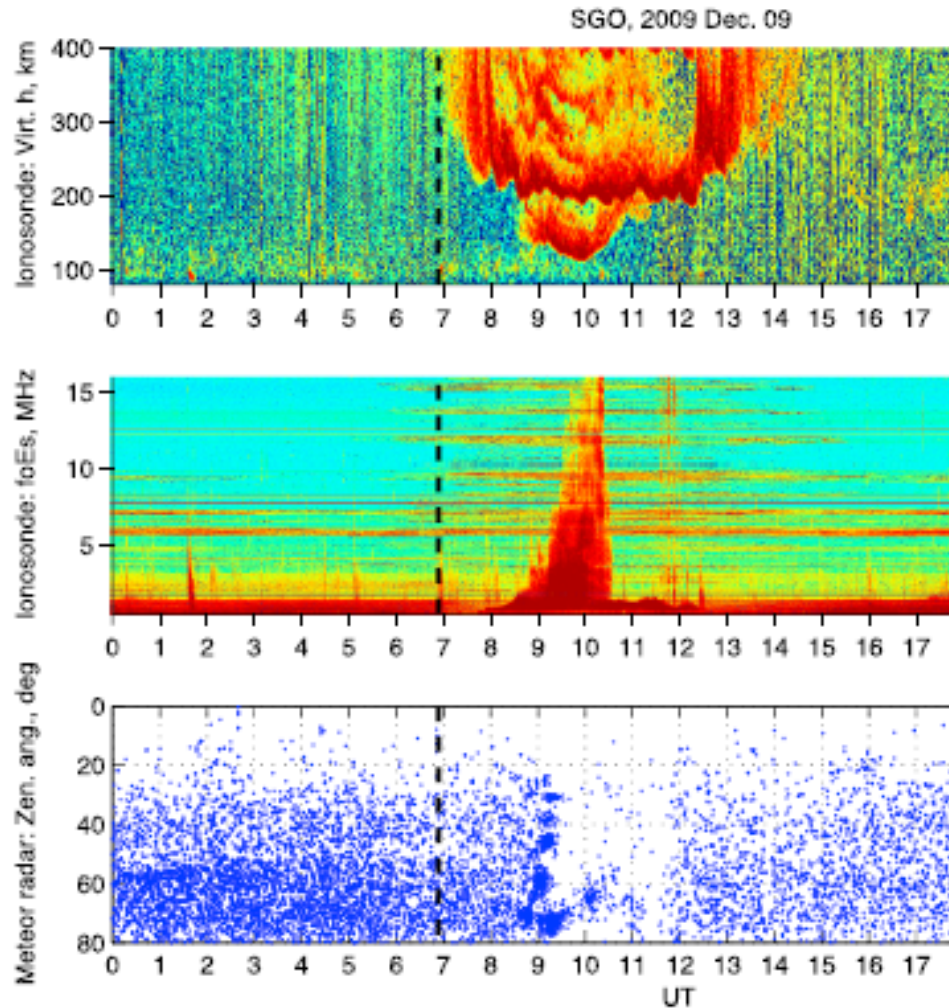
Failed launch of  
the 36 metric  
tons ballistic  
rocket



## Configuration of the event



# Ionosphere over Northern Scandinavia



Reflections at all frequencies up to the maximal 16MHz

Unusually dense and long-lived Es layer

Disappearance of the meteor echos because of the metallic layer above 100 km height

No similar effect of such extreme ionization during the whole period of observations. The effect is due to unusually far-distance transportation of the remains due to the ionospheric turbulence and formation of the heavy ion clusters.

# Concluding remarks

A number of new original results have been presented.

There were a lot of people (besides the presenters) in the audience coming to listen to the presentations.

Too broad topics covered

but that's what was interesting

# Thank you!