Mechanisms of squall formation in the Moscow region on May 29, 2017

Kuksova N.E., Toropov P.A.

Purpose: study of the mechanism of squally wind amplification in Moscow on May 29, 2017

Tasks:

- analysis of storm conditions based on station and remote observational data, as well as reanalysis data.
- assessment of the event reproduction based on numerical experiments using the WRF-ARW mesoscale non-hydrostatic model.
- formulation of a hypothesis about the physical mechanisms of the phenomenon.

Materials and methods

SODAR«MODOS»

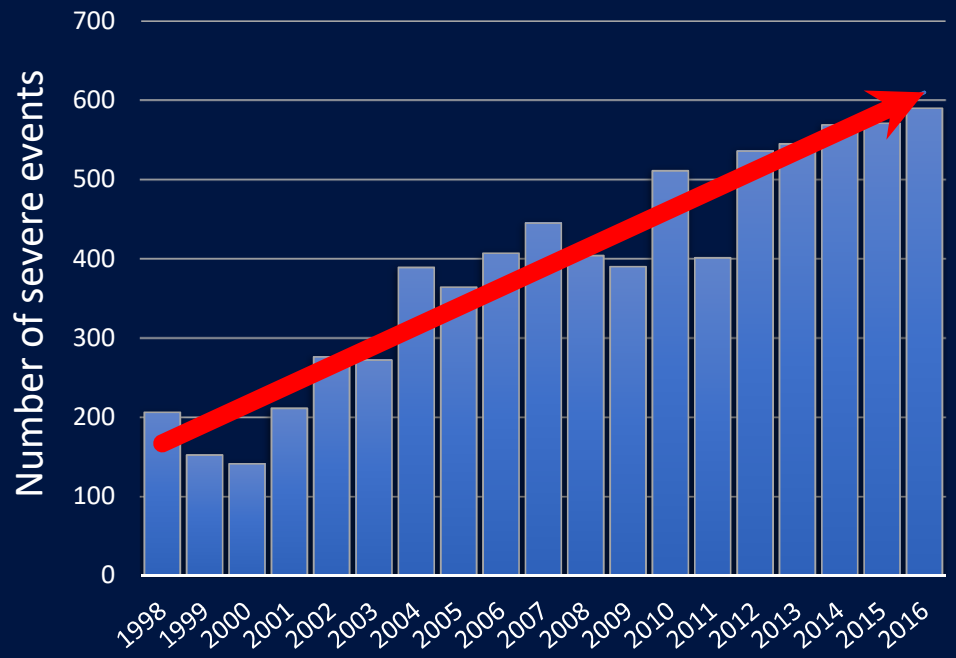
AMK Vaisala MAWS-301

DMRL-C

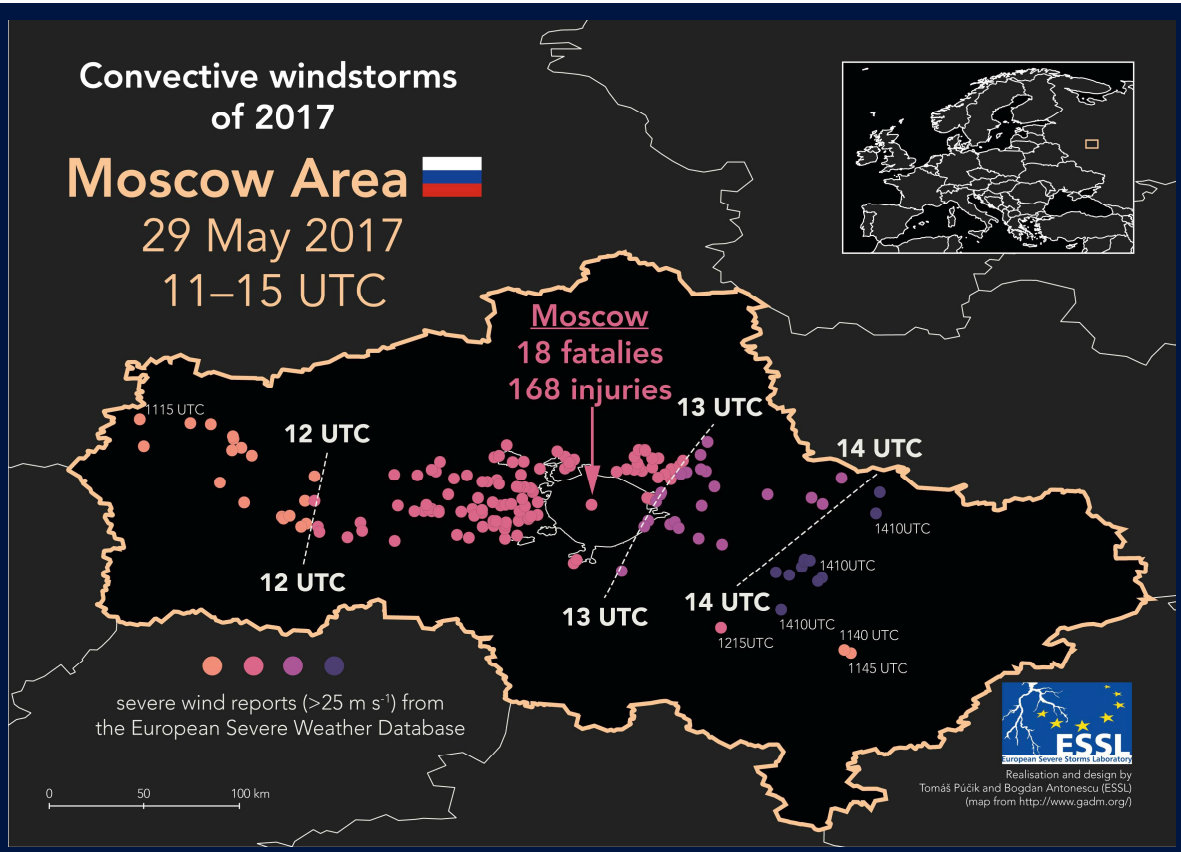
MTP-5 plofier

Satellite METEOSAT-10

Severe meteorological events

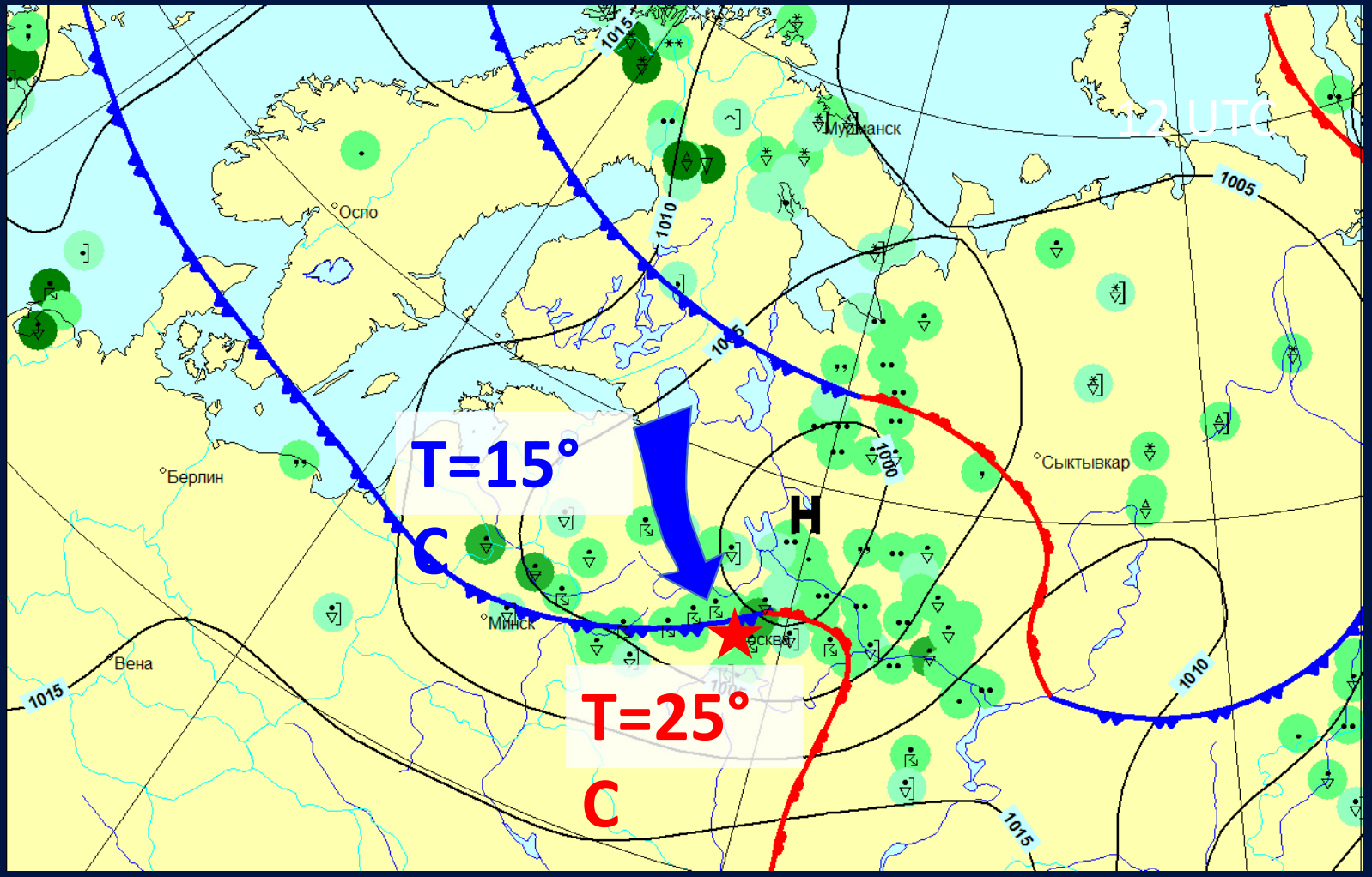


(Report on climate features in the territory of the Russian Federation for 2016. Roshydromet, 2017)

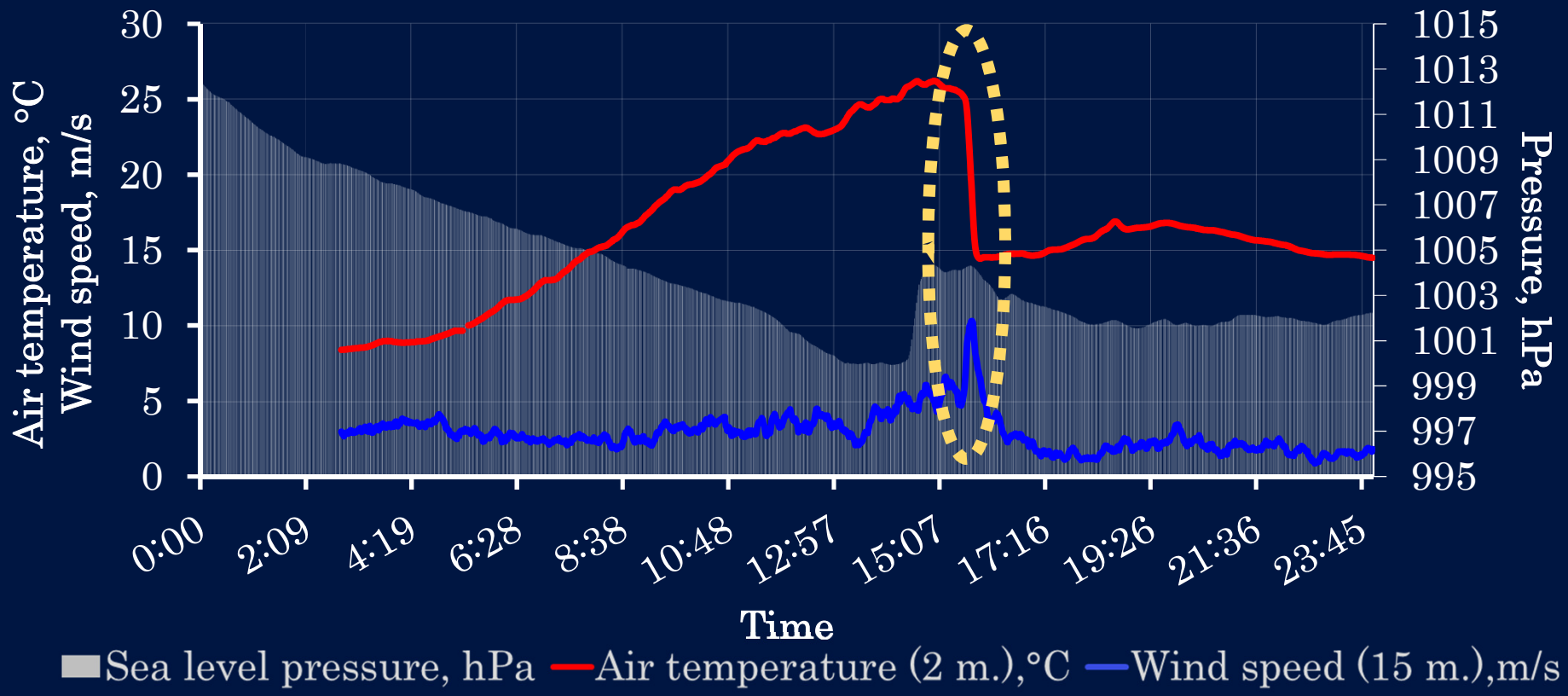


https://www.essl.org/cms/convective-windstorms-in-2017-episode-1-29-may/

Frontal analysis at sea level pressure



Characteristics observed by the meteorological observatory of MSU

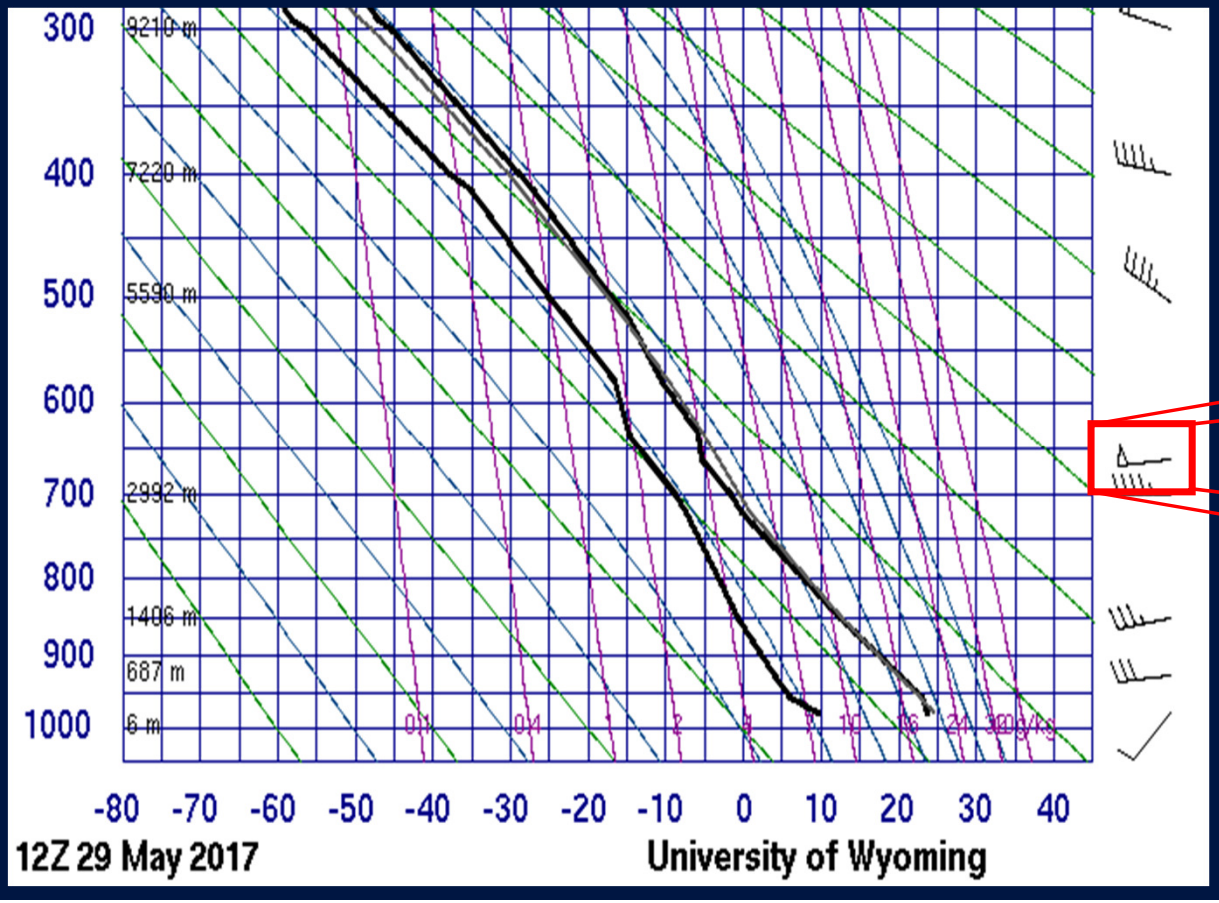


Causes of extreme wind gusts

Low level jet

Strong dynamic instability

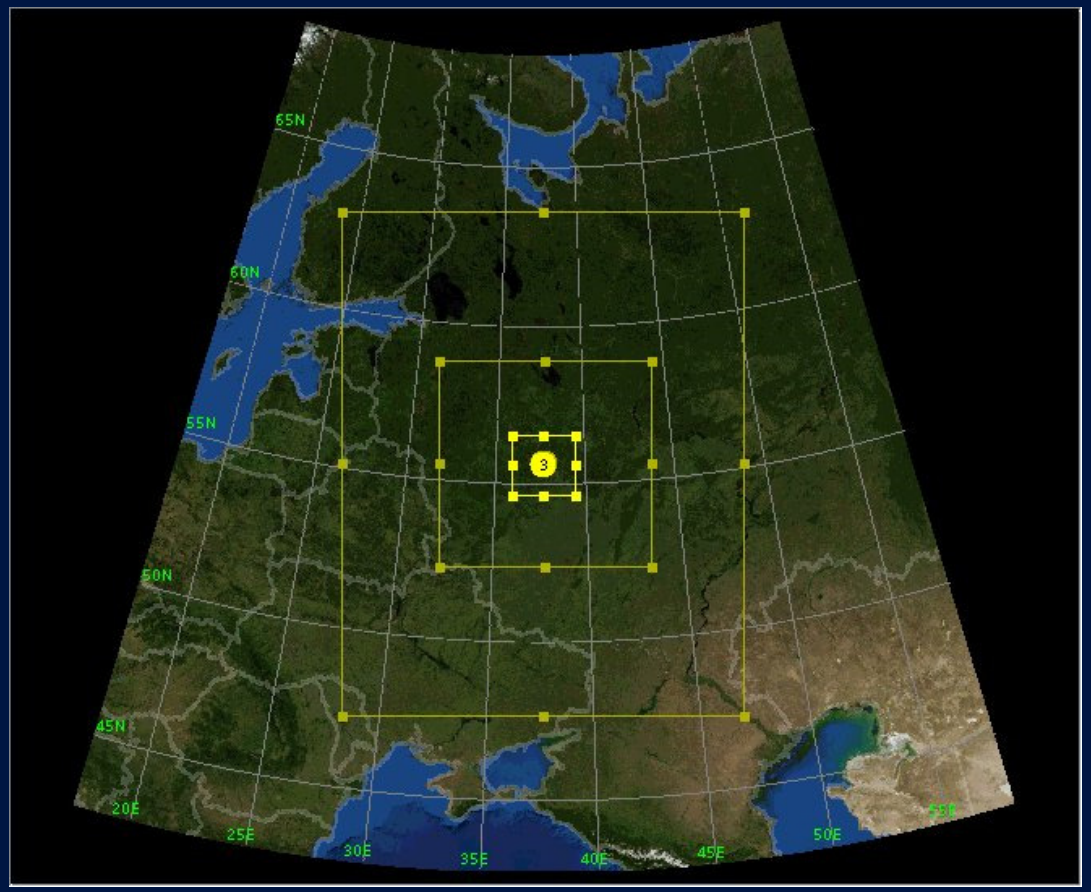
	Reanalysis	Critical value
Wind shear	0.0027 1/s	> 0.0013 1/s



25 m/s

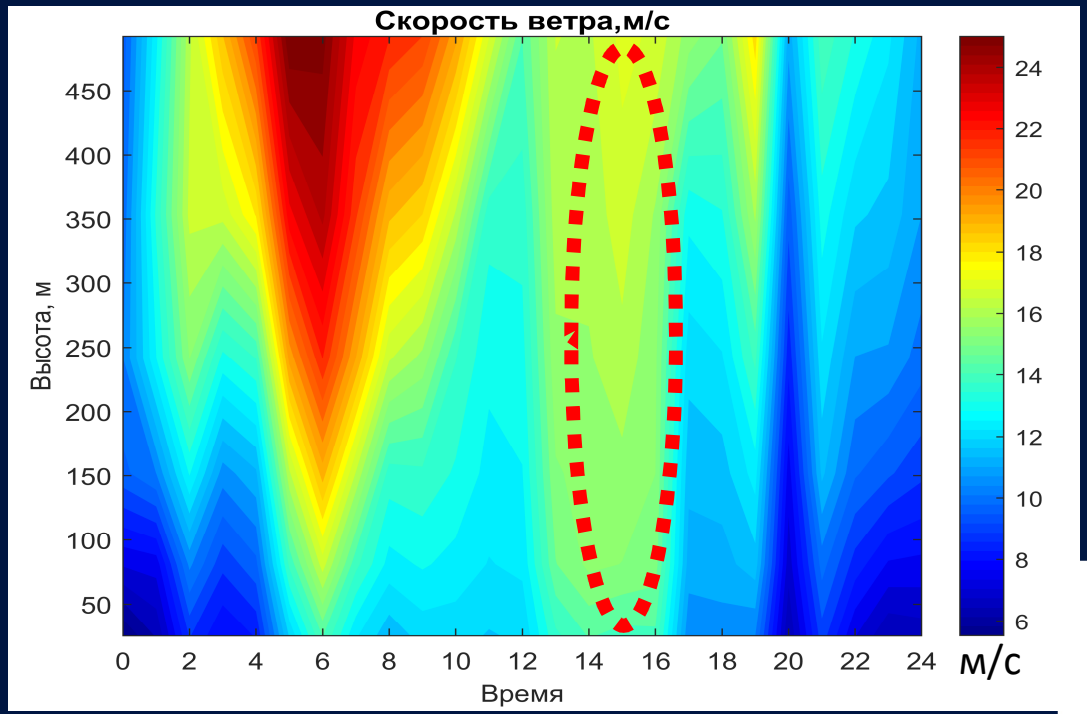
Low level jet

Mesoscale nonhydrostatic model WRF-ARW



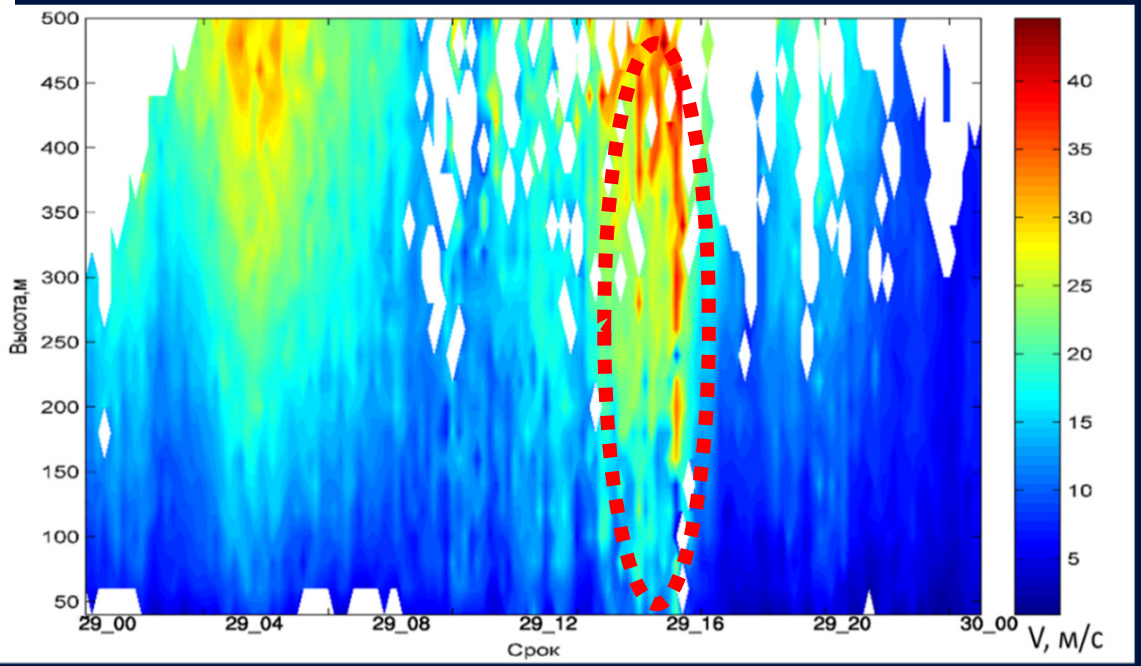
3 domains
Grid spacing: 10, 5, 1 km
Initial and boundary conditions: reanalysis ERA-Interim 0.75 °

Wind speed



Modeling

Observation (SODAR «MODOS»)



Conclusions:

1. The event occurred as a result of:

- lowering the low level jet due to intense dynamic instability of the atmosphere
- downward flow on the active cold atmospheric front

2. As a result of mesoscale modeling, it was revealed that the model reproduced well the space-time structure of this phenomenon, with the exception of the temperature effect

Thanks for your attention!