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Extreme events at the coastal zones of Russia: approaches and results

ASSW-2016. ISIRA meeting.

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Importance

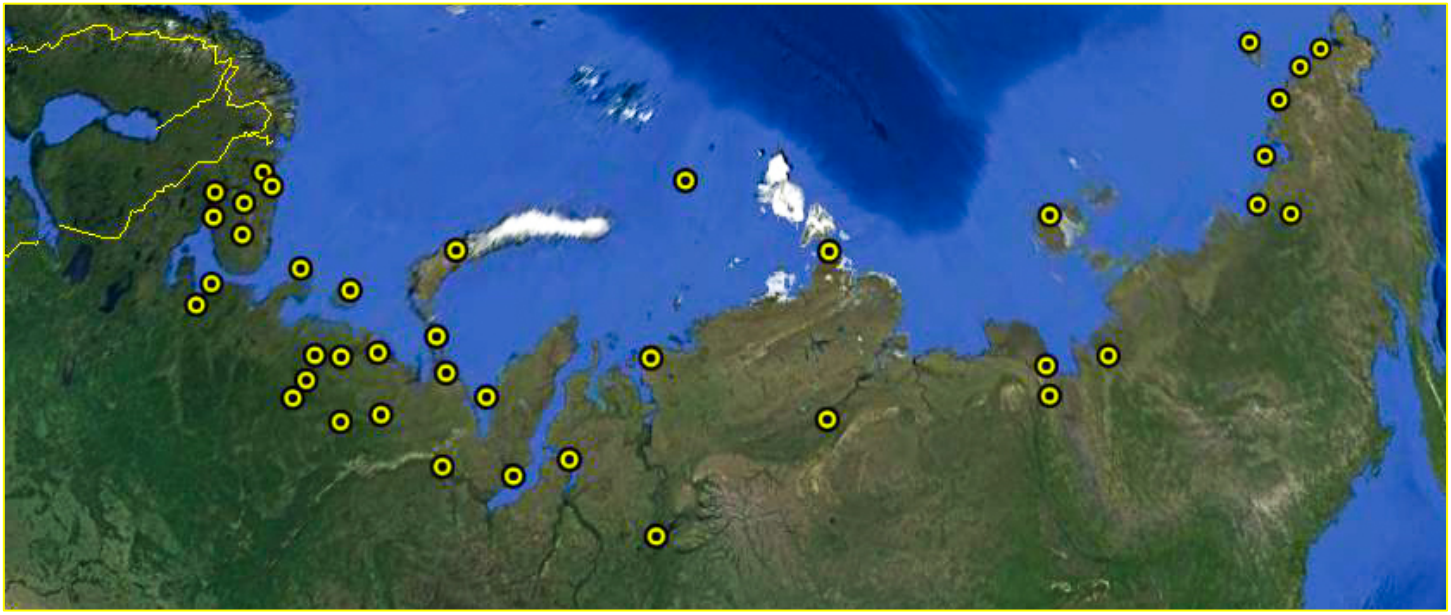
Extreme events (rainfall, extreme wind, etc.) present a natural hazards for population and results in immense losses to economy

Outline

- **Large-scale indicators of extreme rainfall in the coastal zones of European part of Russia. Assessment of their probability in the future climate.**

- **An extreme value analysis of wind speed over the Arctic region.**

Study Area



Yellow dots indicate the observational stations within Arctic zone

Data

- **Archive of meteorological observations** (http://www.meteo.ru/)
- **NCEP/NCAR Reanalysis**
- **Climate models: GFDL-ESM2M, INM-CM4.0**

Problems

- Stochastic nature of rainfall field
- Lack of uniform definition of the term "extreme rainfall"

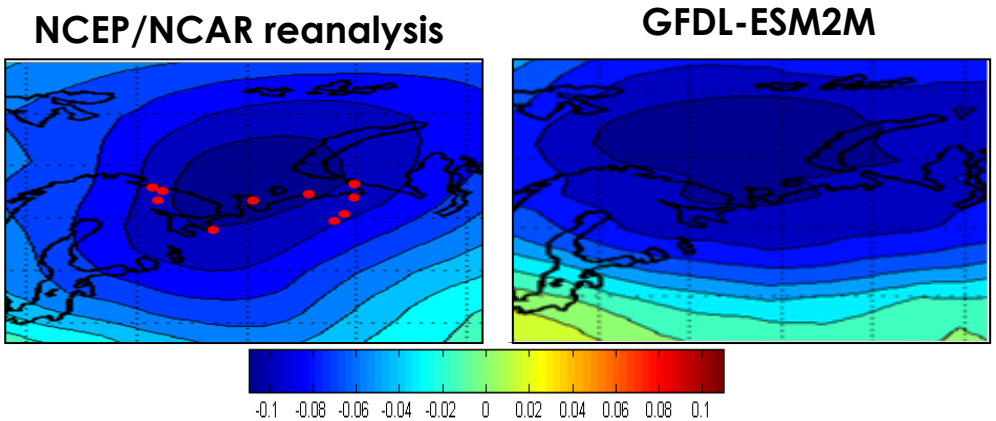
Problem of long-term prediction

Models are fairly bad at simulating of extreme rainfall

Our approach

To select the large-scale indicators (reliably reproduced) associated with extreme precipitation

EOF 1 of MSLP



Results (extreme rainfall)

- ✓ **We expect that on the Russian Arctic coast the probability of extreme precipitation by the end of XXI century:**

Increases during the cold season

Decreases during warm season

Peer-reviewed publications

PUBLISHED

- ❑ **Matveeva, T.,** Gushchina, D., Zolina, O., 2015: Large-scale indicators of extreme rainfall in the coastal natural and economic zones of European Russia. *Russian Meteorology and Hydrology*, 11, 20–32.
- ❑ **Matveeva, T**., Gushchina, D., Koltermann, P., 2013: Factors of catastrophic floods at river mouths of European Russia. *Bulletin of Moscow University. Serie 5: Geography*, 2, 70–77.

Acknowledgments

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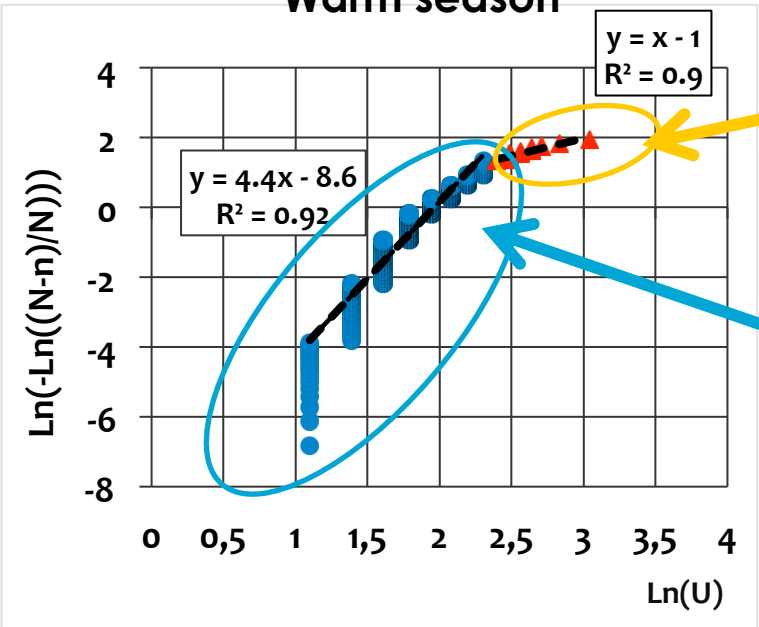
Extreme wind speed. Statistical approach.

Observation data

…

Theoretical data approximation

Okunev Nos Station.
Warm season



Wind speed, m/s
vs
Log-log of Probability

«Dragon-king»

(super extreme wind speed events)

«Black swans»

(power extreme wind speed events)

Problem

No «dragon-kings» in climate model data, i.e. model underestimate super extreme wind speed

Possible solution

Use of mesoscale atmospheric models???

Summary (extreme wind)

- ✓ **New statistical approach to assess extreme wind speed has been found**
- ✓ **Super extreme events are not reproduced by climate model**

Peer-reviewed publications

PUBLISHED

- ❑ Kislov, A., **Matveeva, T.,** Platonov, V., 2015: Extreme wind speed in the Arctic region. *Fund.and Appl. Climatol.*, 2, 20–32.

SUBMITTED

- ❑ Kislov, A., **Matveeva, T.**, Platonov, V., 2016: Wind speed extremes in Arctic area. *Russian Meteorology and Hydrology*, accepted.

Acknowledgement

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Thank you for your attention!

Any questions?

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