

# On climatology of storm cyclones, entering European region of Russia

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# The Goal of study

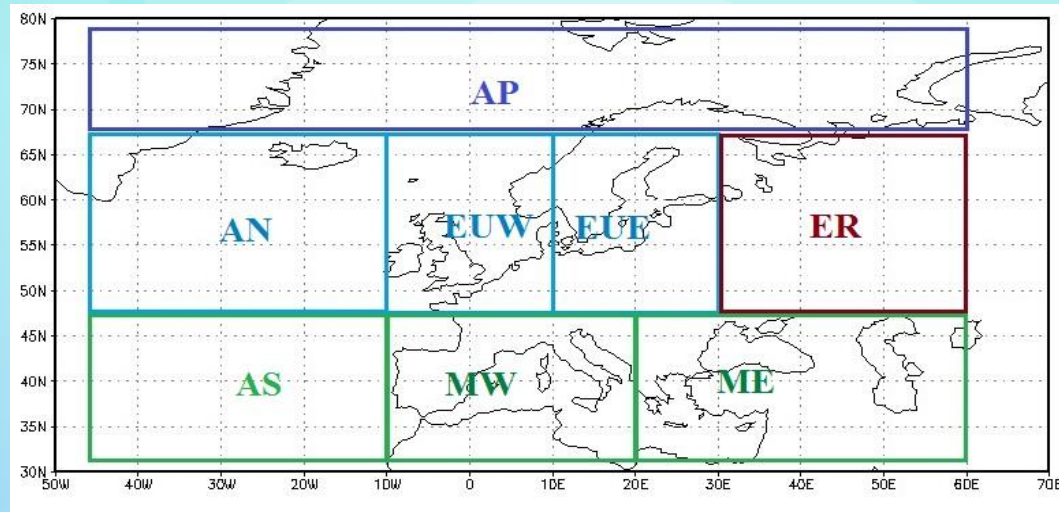
The goal of study is to show:

- **the number of storm tracks** entering European region of Russia (ER) from different genesis regions during winter (October to March) and summer (April to September) seasons for period 1979-2018;
- **cyclone center density** and **severe storm wind density** associated with these cyclones.

## **DATA and Methodology**

- 1.** The storm tracks were calculated based on automated cyclone detection/tracking algorithm based on the 6-hourly sea-level atmospheric pressure (MSLP) data of reanalysis-2 NCAR/NCEP DOE for the period from 1979/01 to 2018/12.
- 2.** The maximum wind speed was selected from an area close to the center of the cyclone with a radius of 5 degrees and was calculated based on 6-hour data on the components of the wind speed on the surface of 925 hPa.
- 3.** Only cyclone trajectories entering European region of Russia (ER) with life of 2 days or more were selected for analysis.
- 4.** All trajectories of cyclones entering ER are divided into groups according to 7 genesis regions (Next slide ).
- 5.** Moderate and severe storm cyclones entering ER were selected for study. Moderate storm cyclones - with wind speed from 17.2 m/s to 24.5 m/s; Severe storms - with wind speed from 24.5m/s and more.

# Genesis regions of cyclones entering European part of Russia (ER). Parameters of study



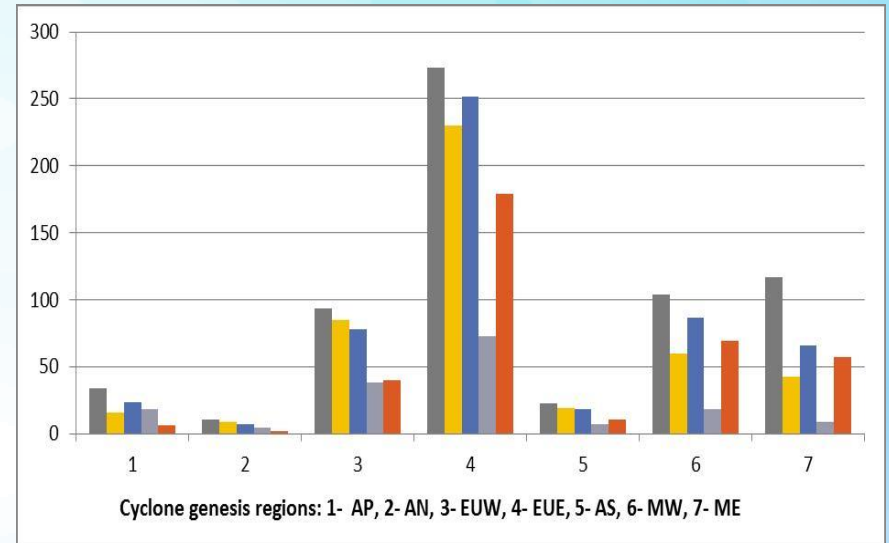
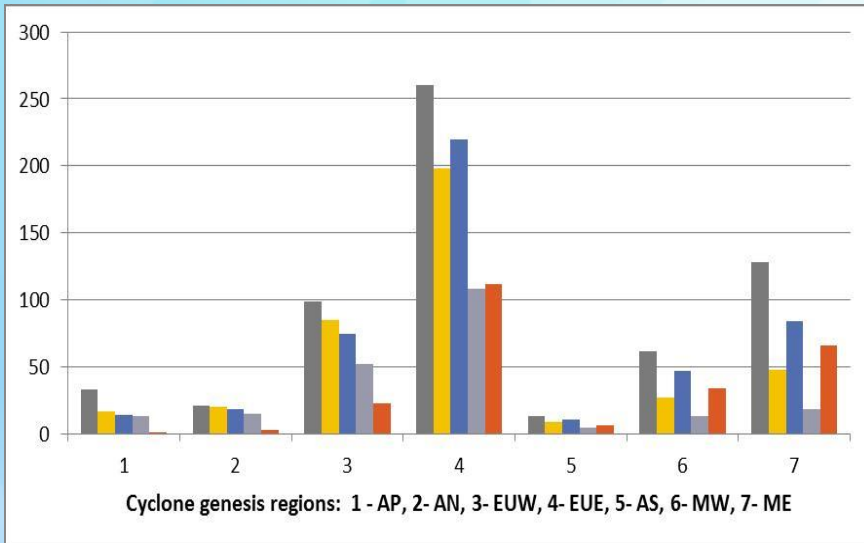
**For every cyclone genesis region, winter (October to March) and summer (April to September) seasons were calculated :**

- the number of all cyclone tracks entering ER during seasons;
- the number of cyclone track with extreme depth of pressure (MSLP of 970 hPa or less);
- the number of moderate storm cyclones track with wind velocity 17.2 - 24.5 m/s;
- the number of severe storm cyclones track with wind velocity from 24.5 m/s;
- cyclone density – the number of cyclone centers in points during seasons;
- storm wind density – the number of storm wind events in points during seasons.

# Integral number of cyclone tracks entering ER during winter and summer seasons for period 1979-2018

## October - March

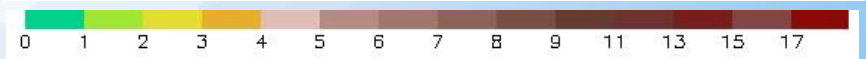
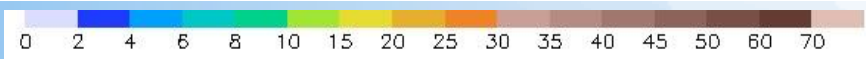
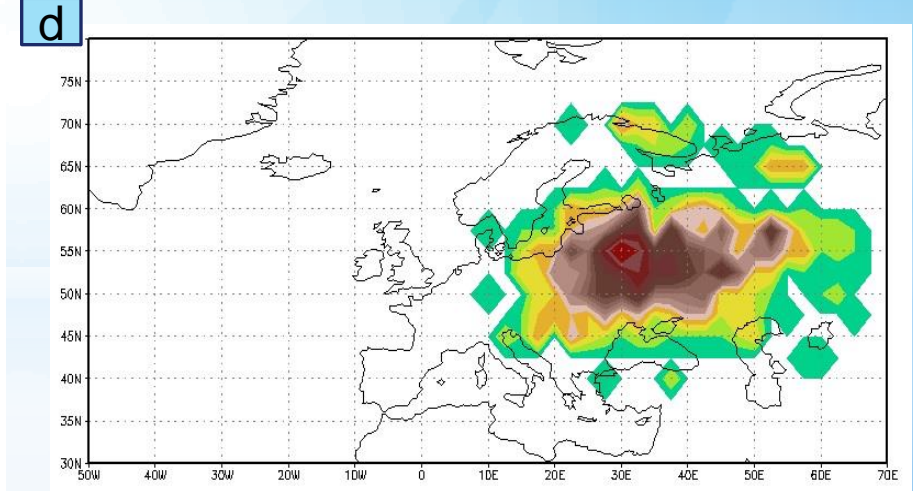
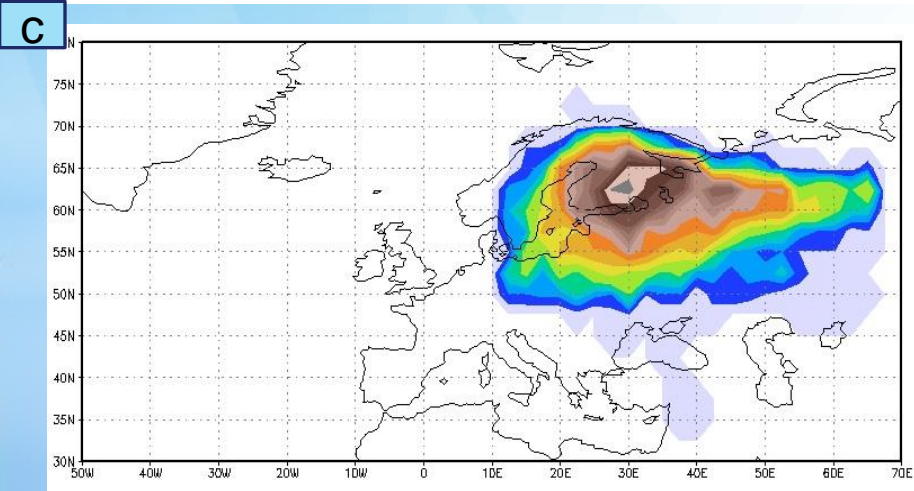
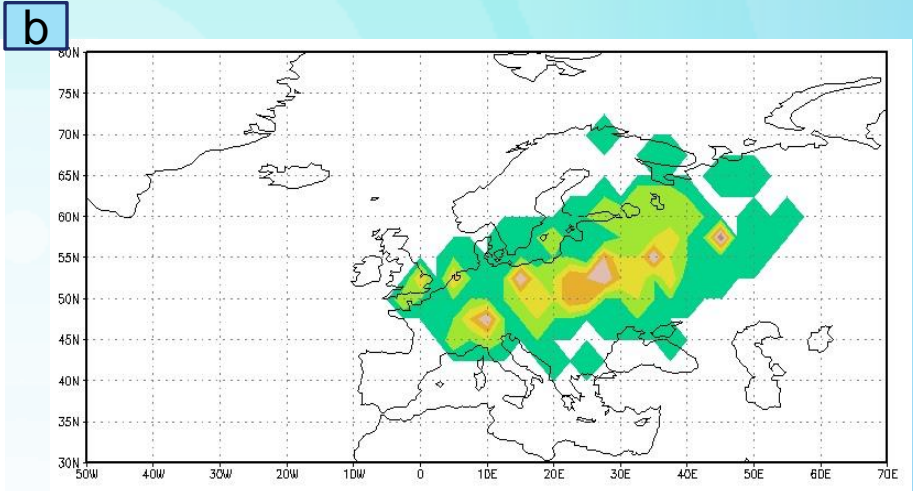
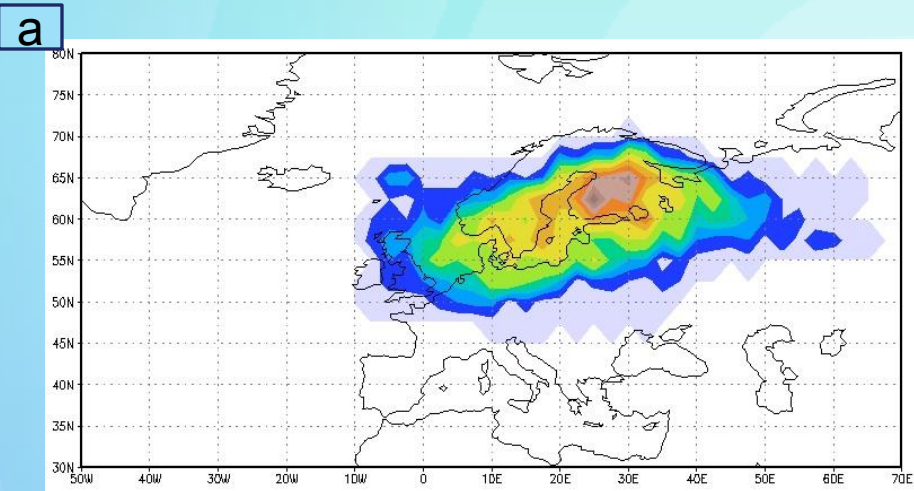
## April - September



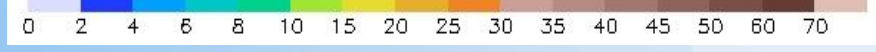
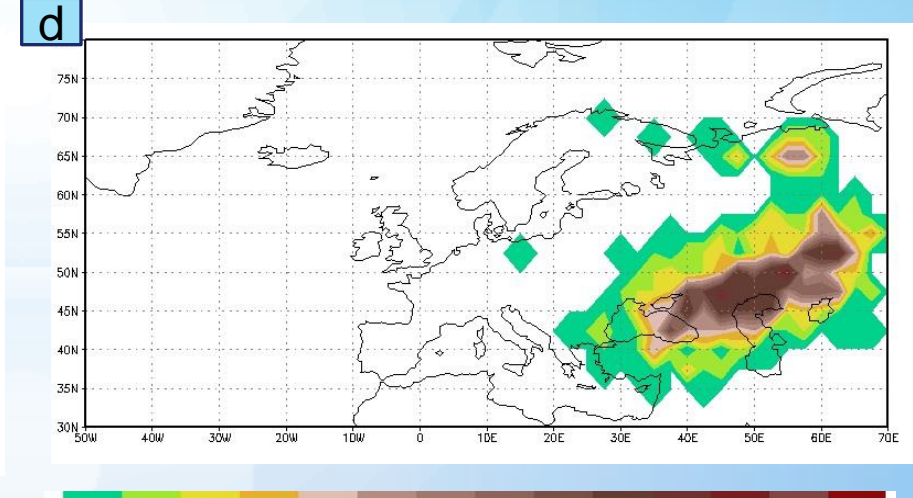
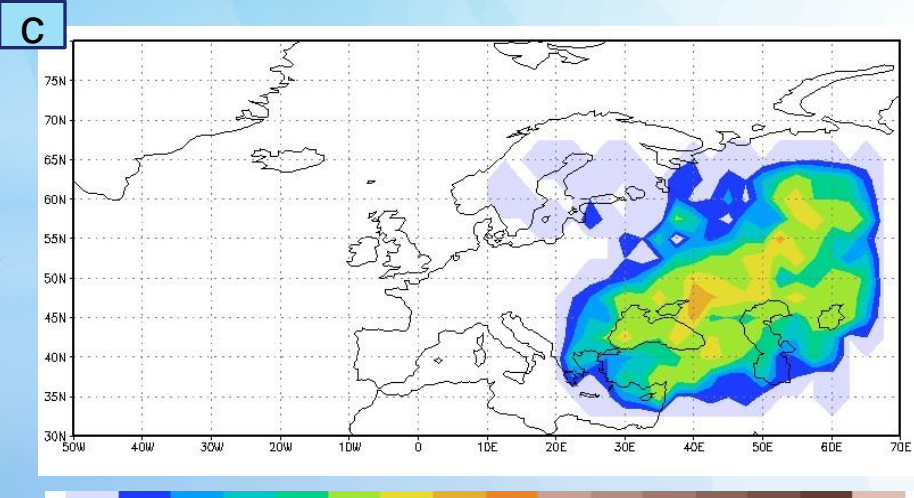
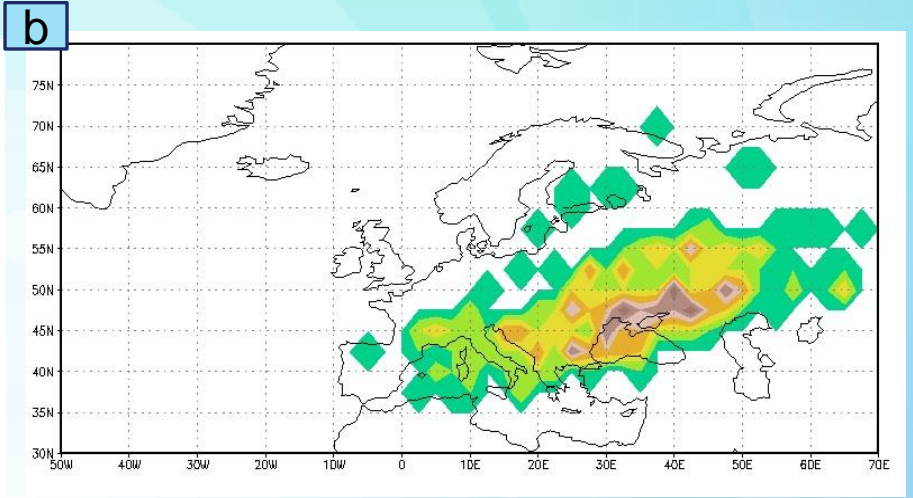
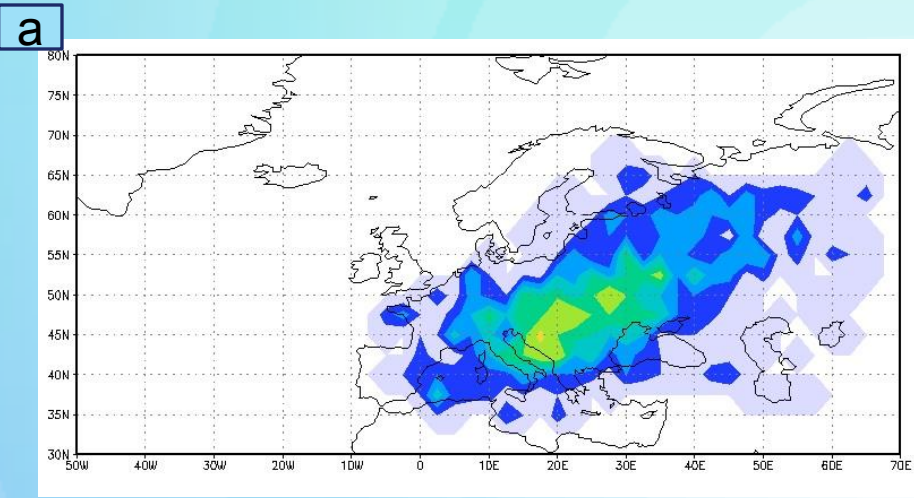
- gray** - all cyclone tracks, entering ER from genesis region
- yellow** - number of cyclone tracks from genesis region with minimum central pressure  $970\text{ gPa}$  or less
- blue** - number of cyclones tracks from genesis region with storm wind velocity from  $17.2\text{ m/s}$  or more
- purple** - number of moderate storm cyclones from genesis region with wind velocity from  $17.2$  to  $24.5\text{ m/s}$
- orange** - number of severe storm cyclones with wind velocity from  $24.5\text{ m/s}$  and more.



# Integral density of severe storm cyclone centers (a, c) entering ER from genesis region EUW (a) и EUE (c), and severe storm wind density (b, d) in these cyclones for winter seasons (October- March), 1979-2018



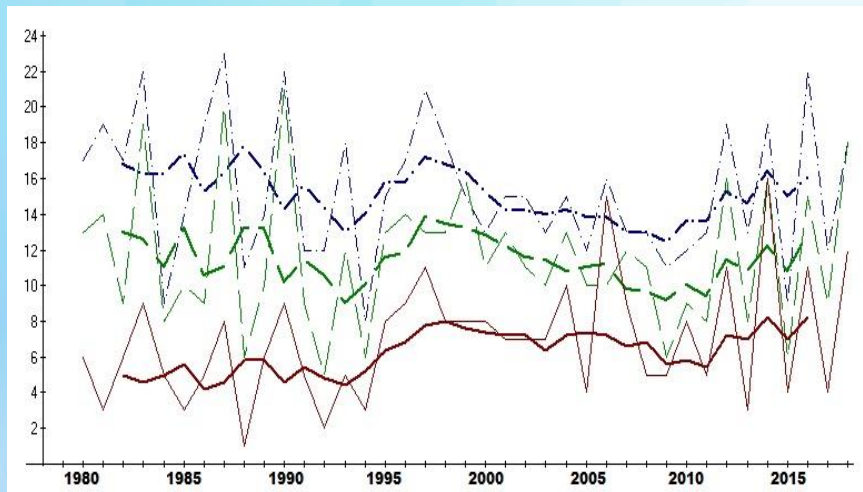
# Integral density of cyclone centers for severe storm (a, c) entering ER from genesis region MW (a) and ME (c), and severe storm wind density (b, d) in these cyclones for winter seasons (October - March), 1979-2018



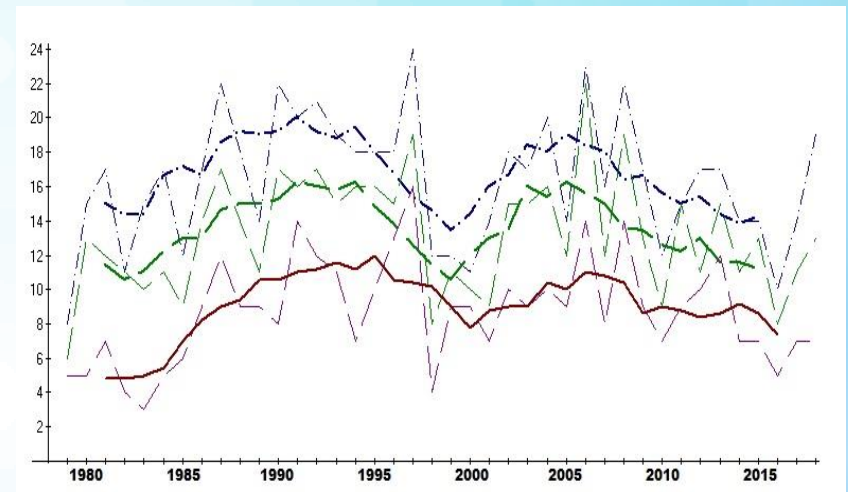


# Interannual variability of number of cyclone tracks entering ER during winter and summer seasons for period 1979-2018: all cyclone (blue), all storms (green), severe storms (brown)

## October - March



## April - September



blue ( - . - ) all cyclone tracks entering ER during season

green ( - - ) number of all storm cyclones with wind velocity from 17.2 m/s

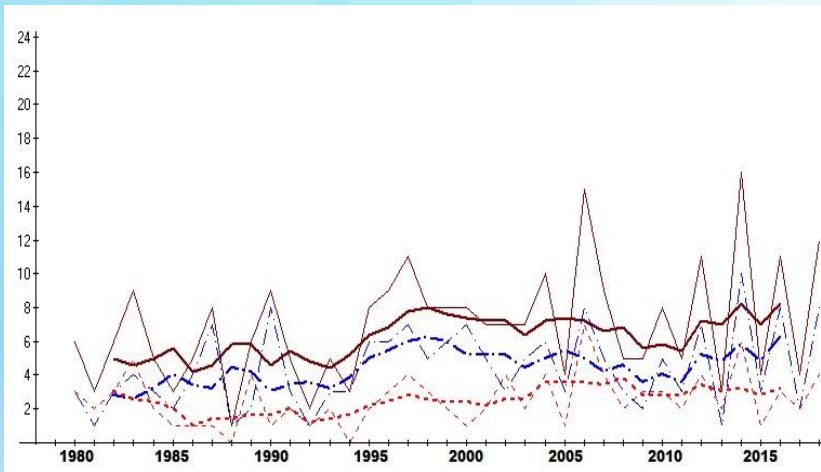
brown ( — ) number of severe storm cyclones with wind velocity from 24.5 m/s

**bold lines** – moving averages over 5 years

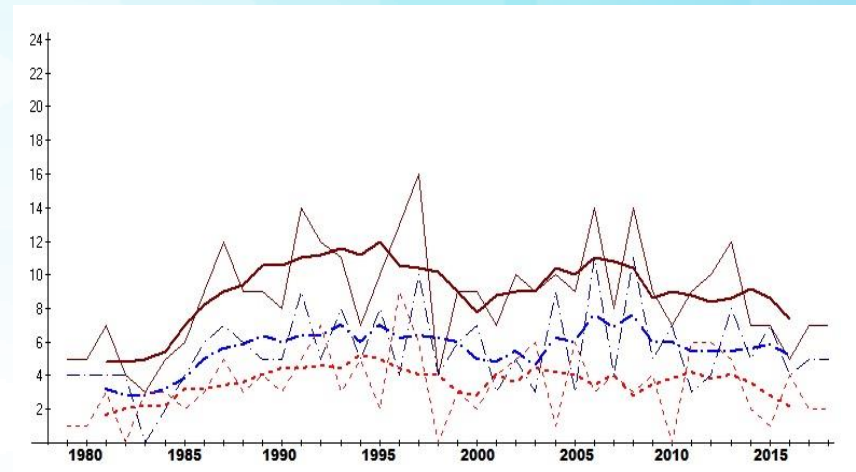


# Interannual variability of number of severe storm cyclone tracks entering ER from North (blue) and South (red) genesis regions during winter and summer seasons for period 1979-2018

October - March



April - September



**brown (—)** number of severe storm cyclones with wind velocity from 24.5 m/s

**blue (-.-)** integral number of severe storm cyclones from genesis regions: **EUW+ EUE+ AE+ AP**

**red (.....)** integral number of severe storm cyclones from genesis regions: **AS+ MW+ ME**

**bold lines** – moving averages over 5 years

# Conclusions

1. Most part of moderate storm cyclones and really all severe storms entering European region of Russia from north storm track regions, North and Baltic Seas, are accompanied by extreme sea level pressure.
2. In Mediterranean cyclones severe storm wind, more 24.5 m/s, was observed not only in cyclones with extreme sea level pressure.
3. The number of storms with severe wind speed and extremely low atmospheric pressure increases in the summer months.
4. The position of storm wind shifted to south from cyclones centers regions. This feature is characteristic for all cyclone genesis groups, both in the winter and summer half of the year.
5. The maximum number of storms entering the ER in summer and winter seasons was observed in years distinguished by active cyclogenesis as in northern, as in southern branches of the storm track in European region.

**Thanks for  
your attention !**