



Regional climate extremes in Northern Eurasia associated with atmospheric blockings: Interannual variations and tendencies of change

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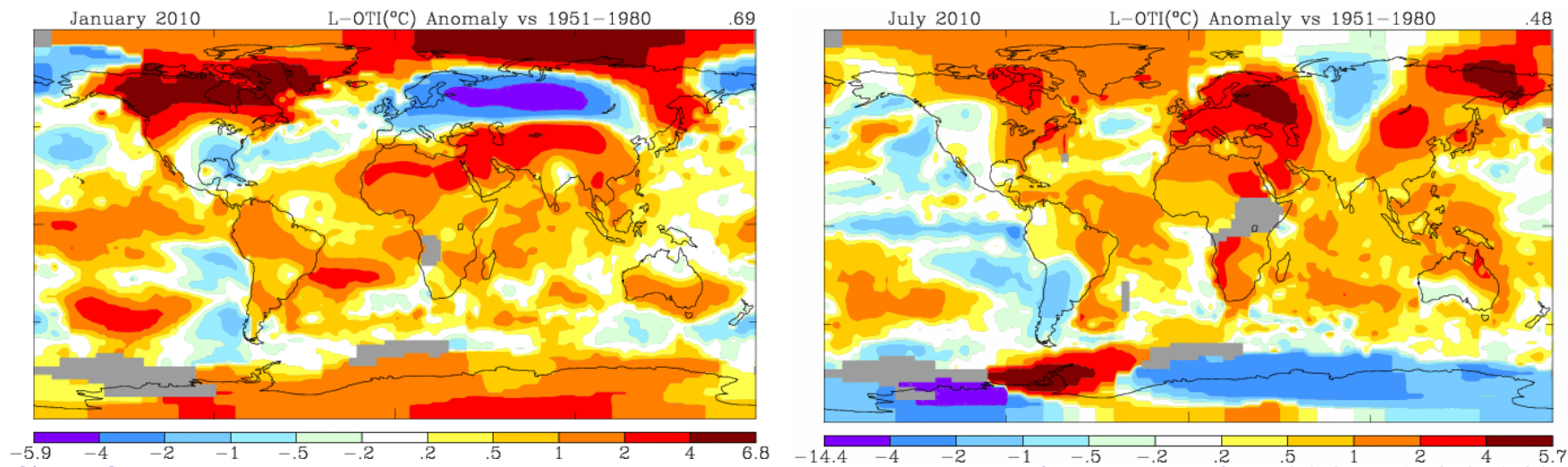
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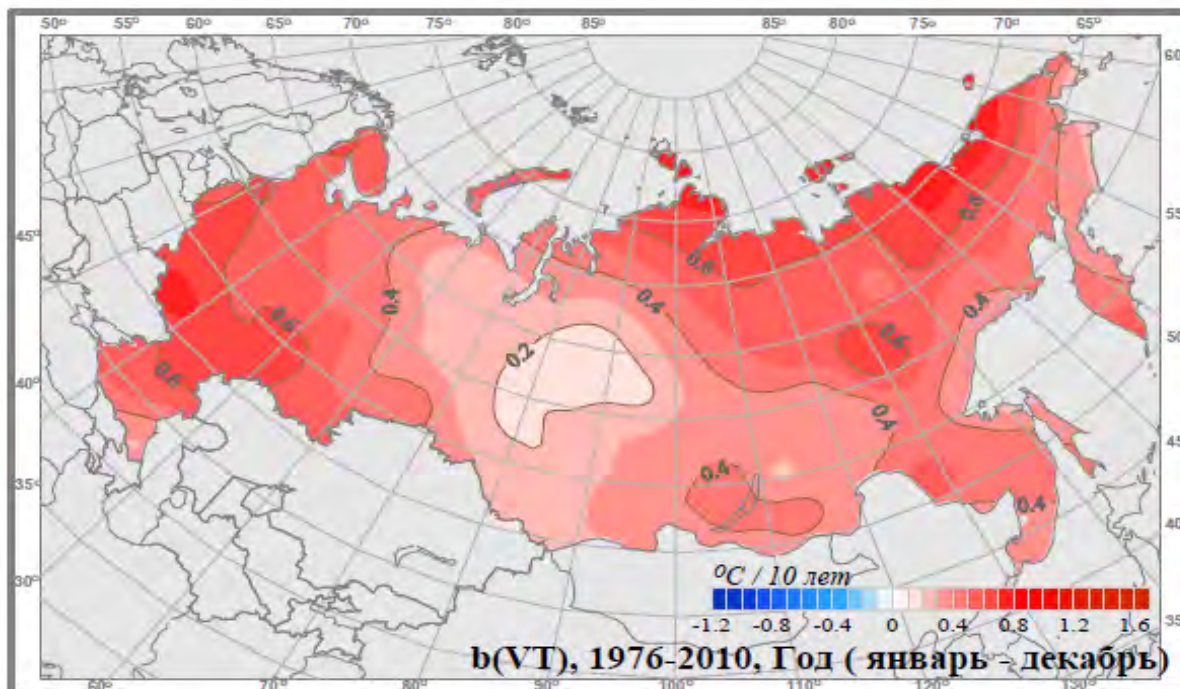
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AGU-2011

Surface temperature anomalies in January-2010 and July-2010 (relative to 1951-1980) by GISS data



Surface temperature annual-mean trends in Russia (1976-2010)



by Roshydromet data

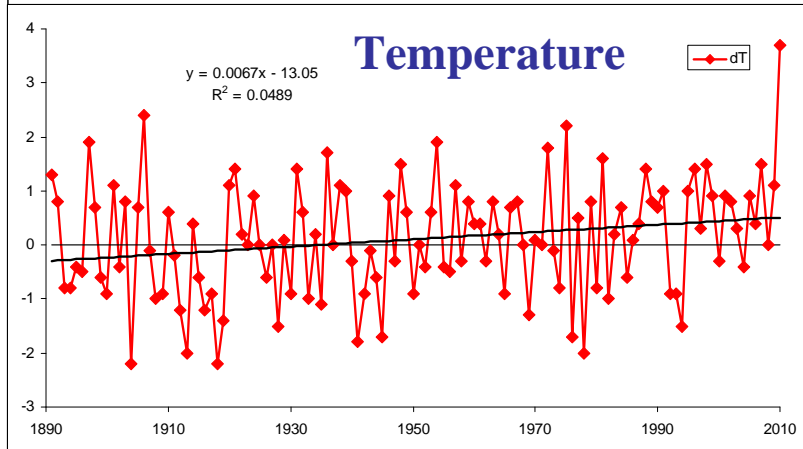
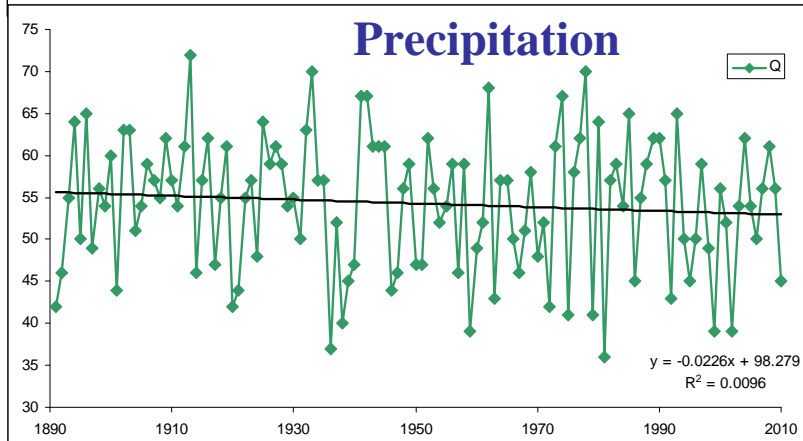
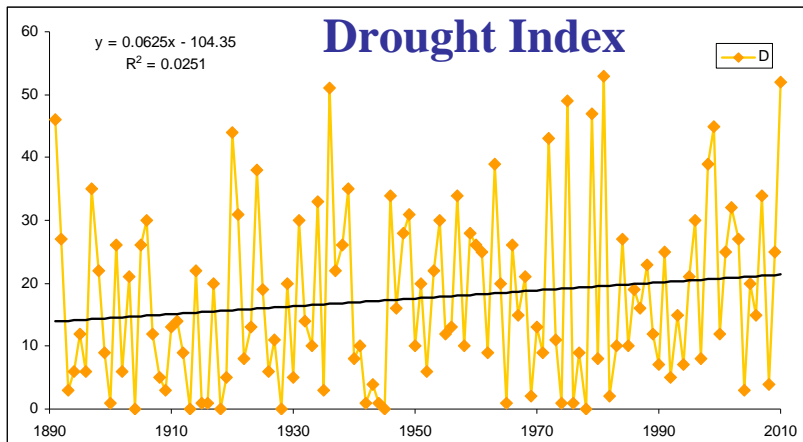
Blocking characteristics (X) from model simulations for different seasons and regions: Ratio X(2CO₂) to X(1CO₂)

Euro-Atlantic region	January-March	April-June
Number	1.2	1.5
Duration	1.1	0.9
Intensity	1.0	0.8
Size	1.0	1.0
Blocking days	1.3	1.4
Total action	1.2	1.1

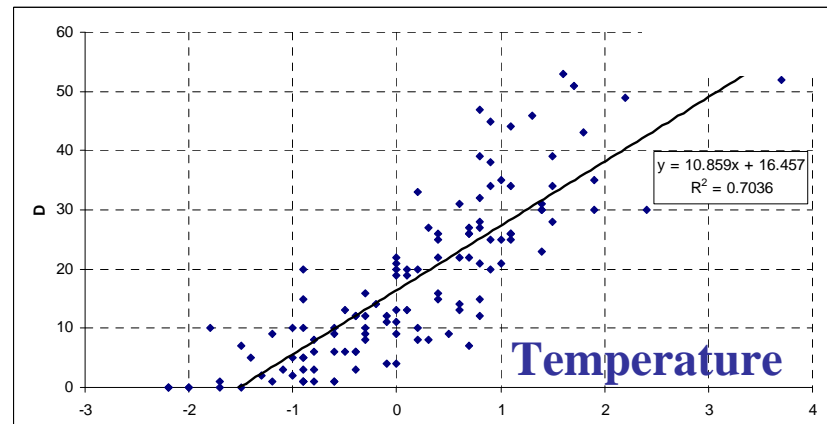
NH continents	January March	April-June
Number	1.4	4.0
Duration	1.4	1.2
Intensity	1.2	1.1
Size	1.3	0.9
Blocking days	2.0	4.8
Total action	4.1	4.6

(Lupo, Oglesby and Mokhov, 1997; Mokhov, 2006)

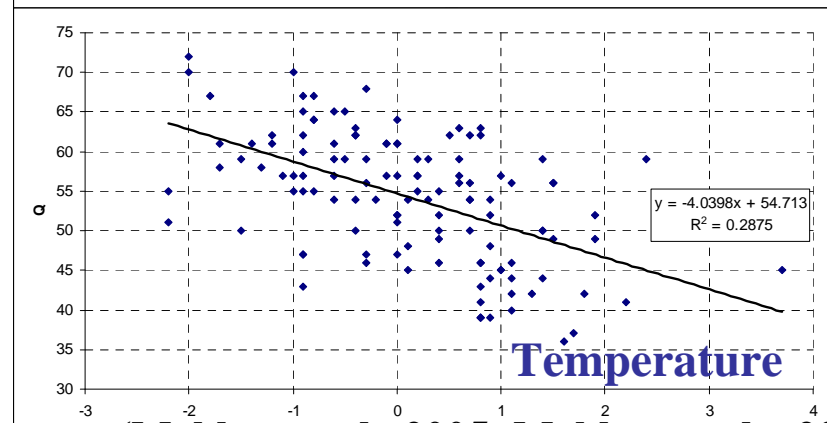
Interannual variations in May-July for European part of Russia (1891-2010)



Drought Index

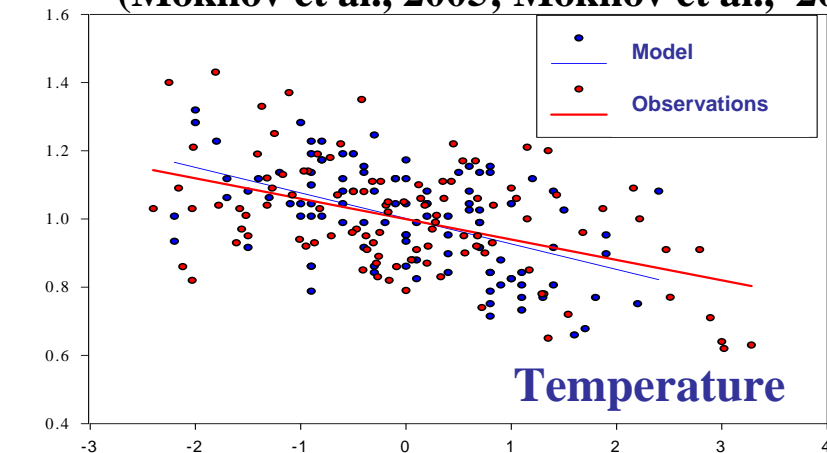


Precipitation

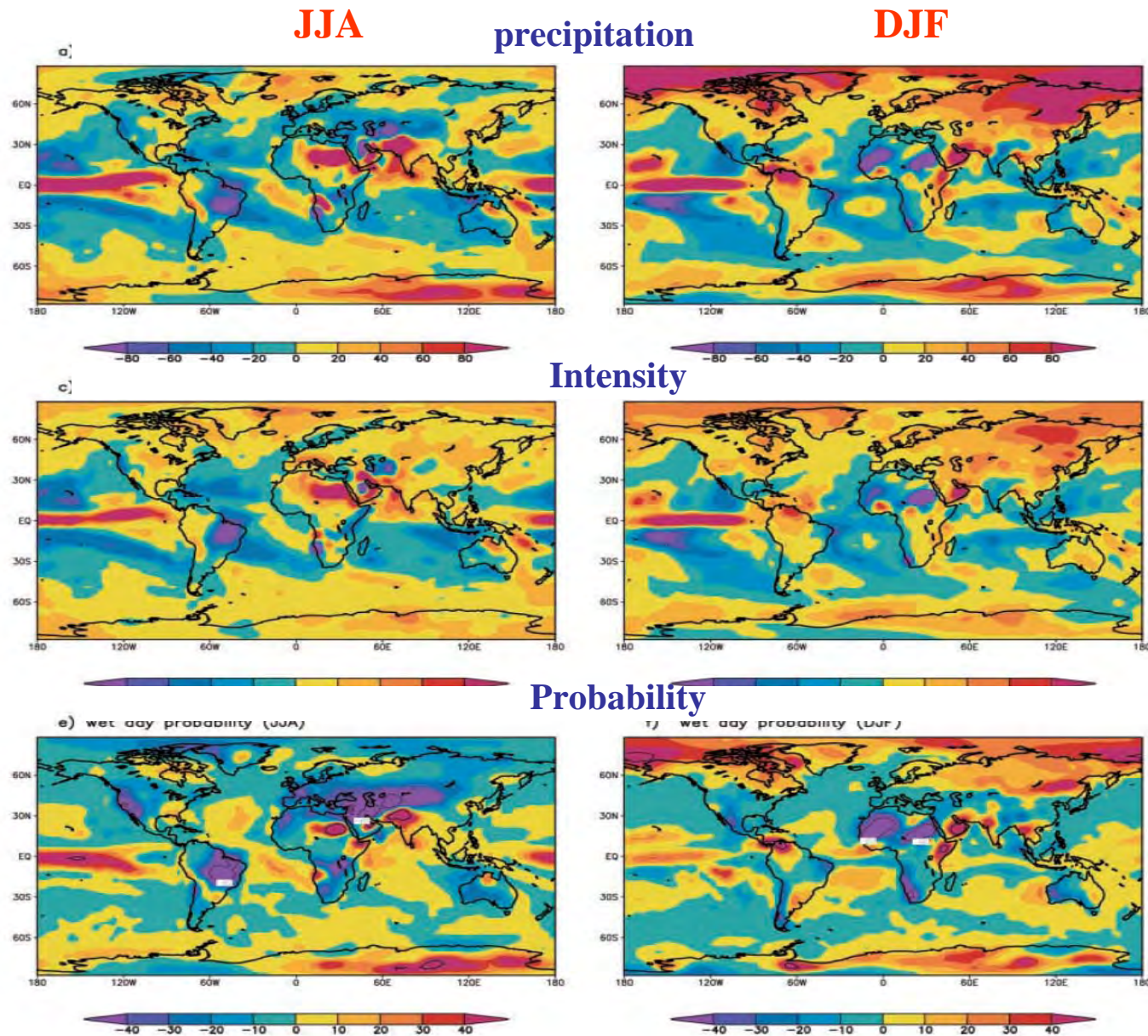


(Mokhov et al., 2005; Mokhov et al., 2011)

Precipitation

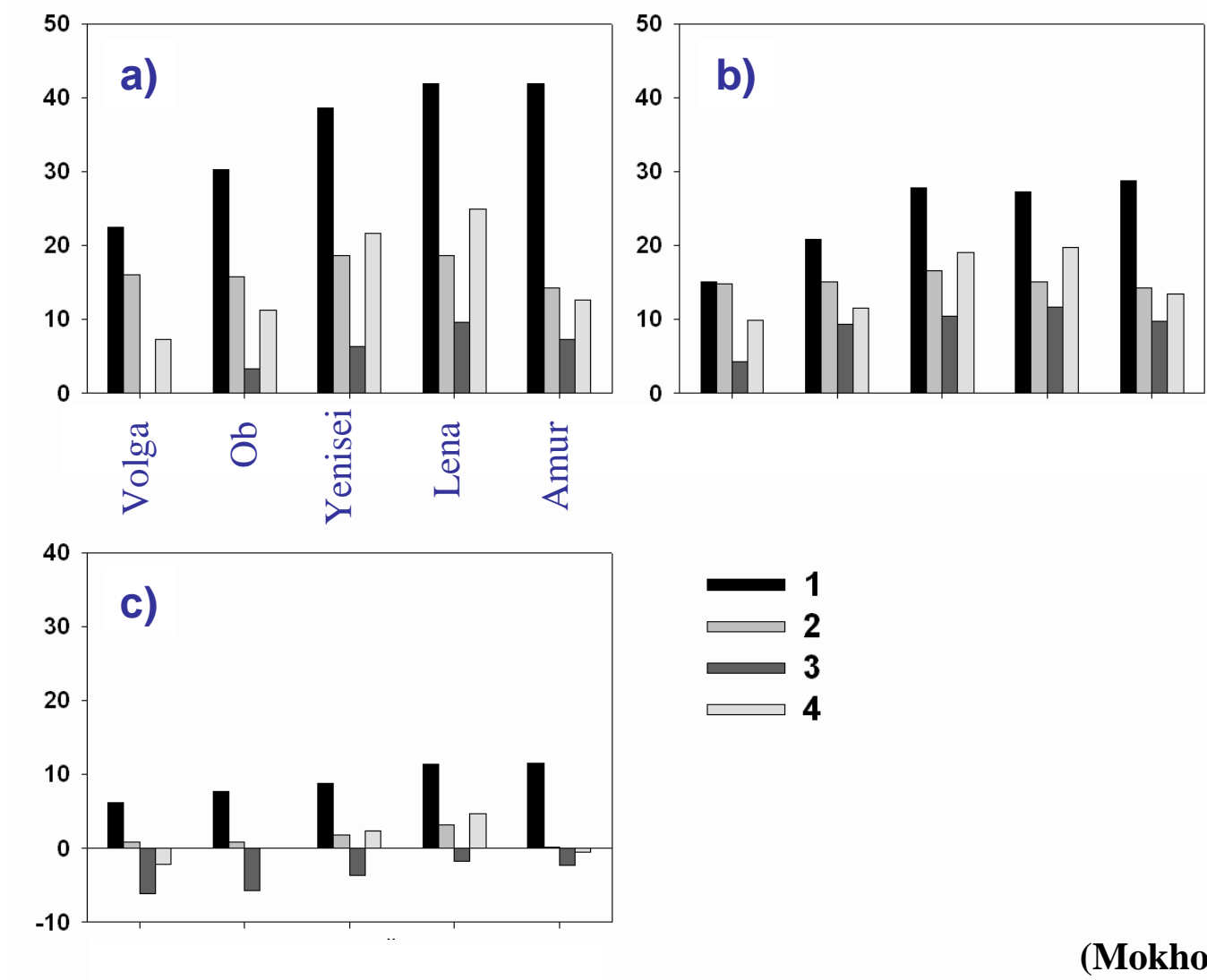


Relative trends (%/100 yrs) in **JJA** (left column) and **DJF** (right column) precipitation (upper panels), precipitation intensity (middle panels) and wet day probability (bottom panels) by simulations for the 21st century with anthropogenic scenario



(Semenov, Bengtsson, 2002)

Changes (%) in seasonal precipitation characteristics of precipitation between 2081-2100 and 1981-2000 from multi-model simulations (CMIP3) with SRES-A1B scenario for different river basins in the Northern Eurasia: a) total amount, b) intensity and c) probability (1 – Winter, 2 – Spring, 3 – Summer, 4 - Fall).

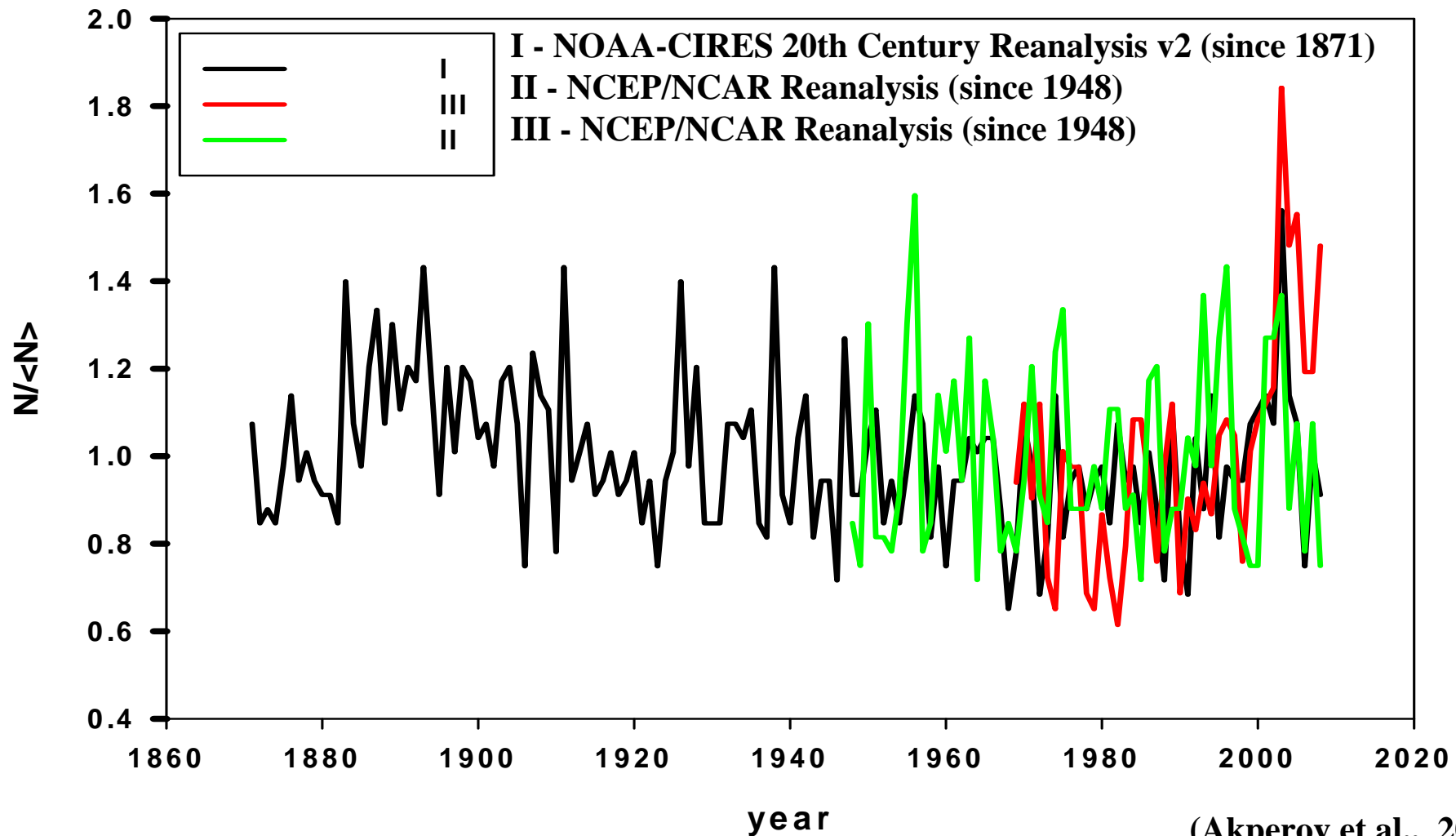


(Mokhov, Khon, 2007)

Methods of blockings identification

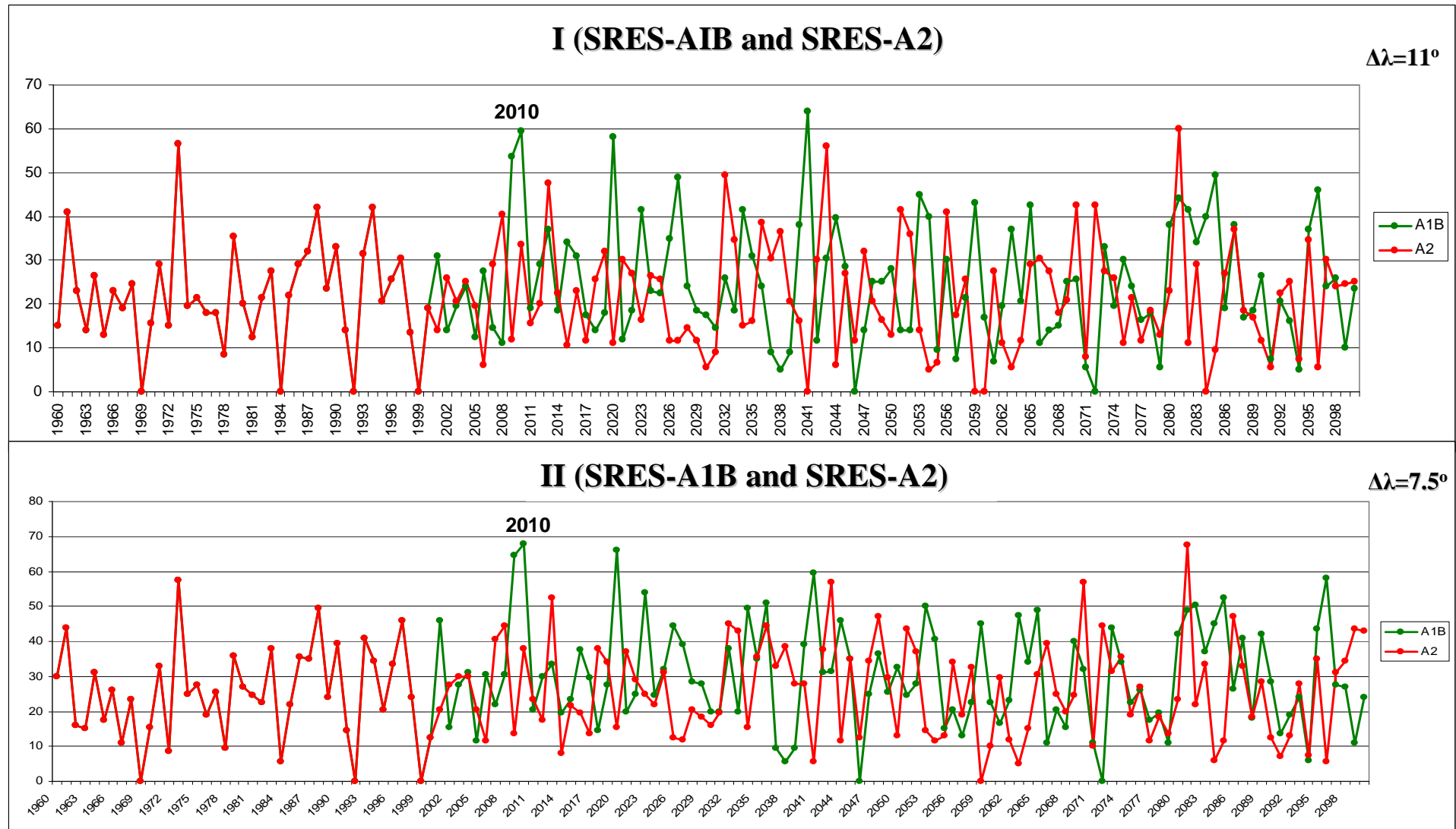
- **Method I** – modified Lejenas-Okland index.
 $LO = Z_{42.5}^0 - Z_{60.0}^0$
 $(LO(1-10^0) + LO(1) + LO(1+10^0))/3 < 0$
Z-500 hPa geopotential height
- **Method II** – [<http://solberg.snr.missouri.edu/gcc/>].
- **Method III** – The anticyclone area is defined as closed isobar at 500 hPa; Lifetime - more than 5 days.
- **Datasets:** 500 hPa geopotential data (6 hour resolution) from the NCEP/NCAR Reanalysis (1948-2010) and NOAA-CIRES 20th Century Reanalysis v2 (1871-2008)
Data for blockings characteristics (1969 - 2010)
[<http://solberg.snr.missouri.edu/gcc/>].

Interannual variations of blokings number in the Northern Hemisphere obtained with the use of different methods for their detection (II and III) and from different reanalyses data (I, II, III) (normalized on mean values for 1961-1990)



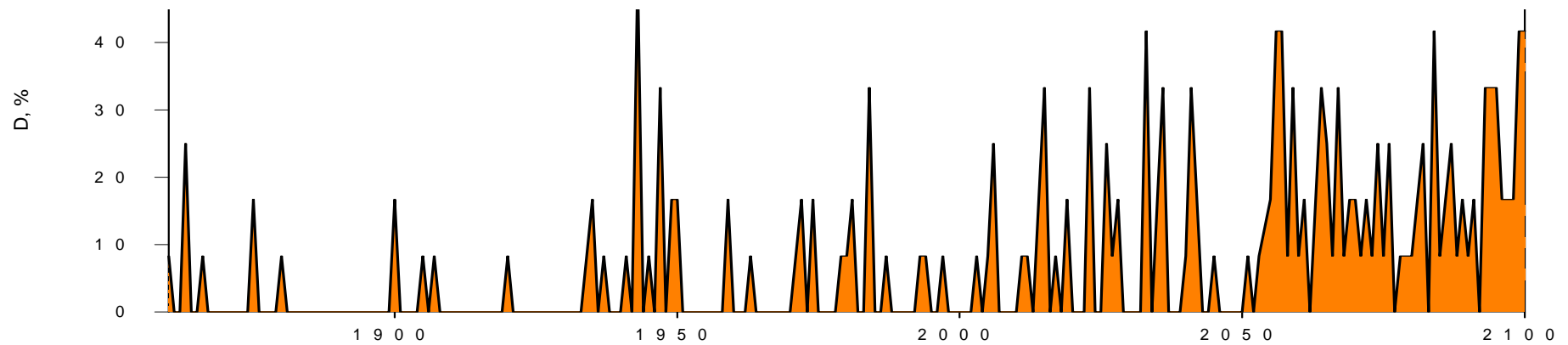
(Akperov et al., 2010)

Blocking-days variations in **summer** over Euro-Atlantic region from model IPSL CM4 simulations (CMIP3) with different SRES scenarios (A1B and A2) and with different modifications (I and II) of blocking identification method



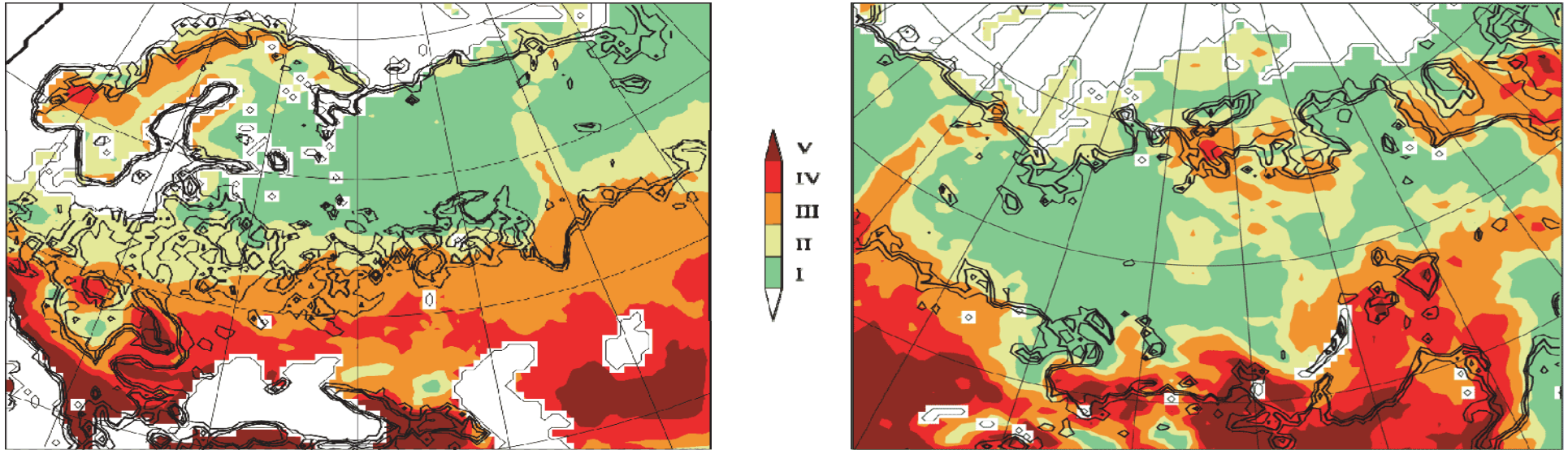
(Mokhov et al., 2010; Mokhov et al., 2011)

Interannual variation of drought index (D,%) in May-July in the European part of Russia using model simulations for the anthropogenic scenario SRES-A2 for the XXI century

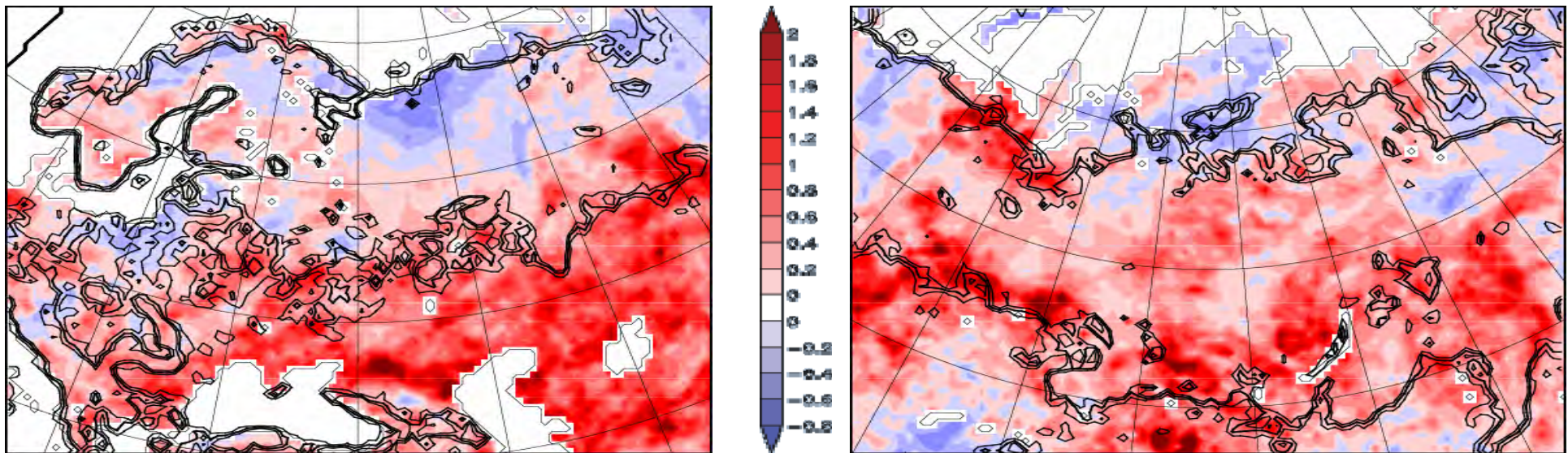


(Mokhov et al., 2005)

Forest Fire Risk (Nesterov Index) in Summer from Simulations with MGO Regional Climate Model



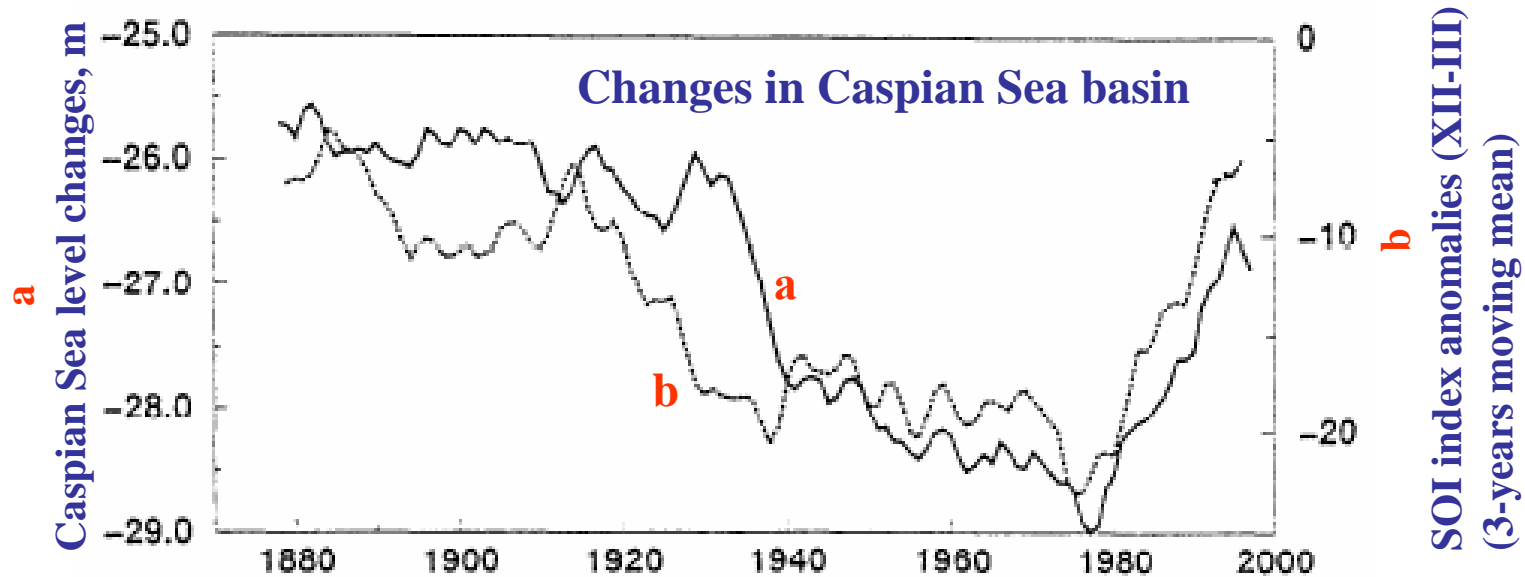
(1991-2000)



Relative changes between (1991-2000) and (2091-2100) (SRES-A2 scenario)

(Mokhov, Chernokulsky and Shkolnik, 2006, 2010)

Regional effects associated with El-Nino phenomena



(Arpe, Bengtsson, Golitsyn, Mokhov, Semenov, Sporyshev, 2000)

Anomalies in the blocking-days number and total blockings action in Euro-Atlantic region in El-Nino/La-Nina years (like 2010)

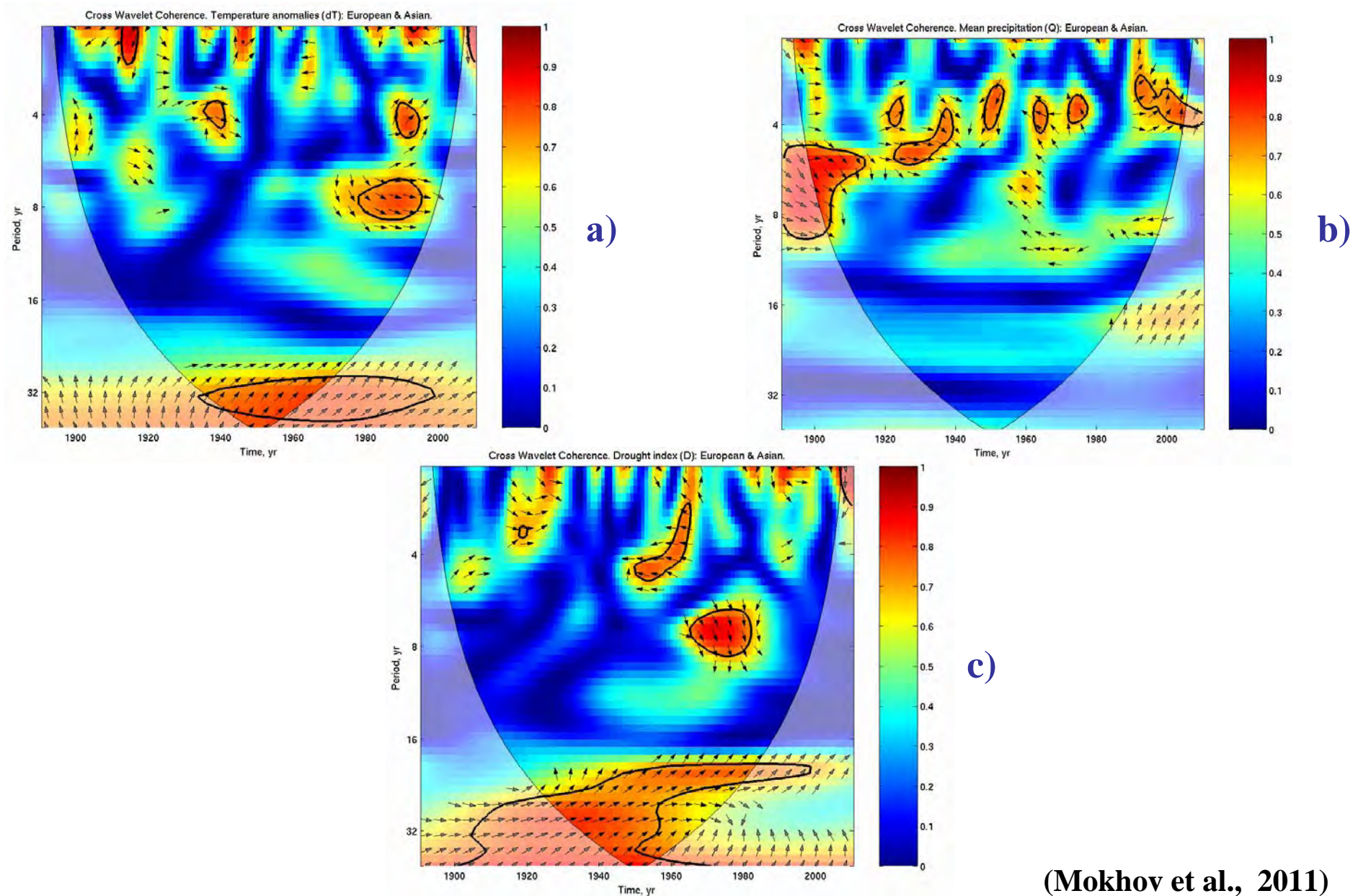
Euro-Atlantic region	El-Nino years	La-Nina years
Blocking days	1.07	1.06

(Wiedenmann, Lupo, Mokhov and Tikhonova, 2002)

Euro-Atlantic region	El-Nino years	La-Nina years
Total blockings action	1.02-1.04	1.15-1.19

(Mokhov, 2006)

Coherency of climate variations in European and West Asian Russian regions in May-July: a) temperature, b) precipitation, c) drought index



(Mokhov et al., 2011)

Thank you for attention