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Intercomparison of the Russian Summer Heat Waves of 2010 and 1972

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Gridded monthly and daily data from the NCEP/NCAR reanalysis and some other data sets are used to investigate and inter-compare climatological background and intraseasonal evolution of the two strongest Russian summer heat waves of 2010 and 1972 that impacted significantly the economy and living conditions in European Russia.
Despite the similar impact of the two heat waves, the climatological background for their development was quite different in 2010 and 1972. In particular, sea surface temperature (SST) anomaly patterns in the North Atlantic (which could potentially affect the development of the heat waves) were different, reflecting basin-scale positive SST anomaly in 2010 and so-called tripole pattern in 1972. Structure of the sea level pressure (SLP) anomalies indicating dominant regimes of the atmospheric dynamics, was also different 2010 and 1972. In particular, the summer of 1972 was characterized by the positive phase of the North Atlantic Oscillation (NAO), whereas in 2010 the NAO was in its slightly negative phase.
Intraseasonal evolution of the two Russian summer heat waves was also quite different and characterized by the longer-term air temperature fluctuations in 2010 compared to those in 1972. Furthermore, in contrast to 1972 when no relation to the NAO (and regional atmospheric dynamics in general) on intraseasonal time scale has been revealed, significant positive correlation (0.56) with the NAO index have been found in 2010. Analysis of links between leading EOF modes of regional SLP and air temperature over European Russia has revealed that neither EOF-1, nor EOF-2 has been associated with intraseasonal air temperature variability in 1972, thus indicating relatively minor role of regional atmospheric dynamics in driving this variability. On the contrary, in 2010 regional air temperature variability was mainly driven by the NAO-associated EOF-1 of regional SLP. Hence, present results suggest that in 2010 and 1972 the NAO affected the Russian summer heat waves on the two different (intraseasonal and interannual respectively) time scales.