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Selection of a dataset to characterize climate dynamics in Siberia

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Many recent researches on climate dynamics have shown that the most significant climate changes occur in northern regions. Siberia is one of such regions, which, in virtue of its role in global carbon balance, also influences on dynamics of global climate processes. Climate changes observed in this region, that are accompanied by substantial temperature differences, intense floods induced by both snow melting and other precipitation, require detailed study of characteristics of regional climate variability, in particular, surface air temperature behavior. To this end one needs reliable series of data that could be obtained from weather stations measurements and as a result of meteorological models run. Unfortunately, sparse network of weather stations in Siberia does not allow retrieving, using simple interpolation methods, meteorological fields from measurements with required spatial resolution. Therefore, one has to relay on the following Reanalyses archives: NCEP/DOE AMIP II (1979 - 2003), JMA/CRIEPI JRA-25 (1979 - 2009), ECMWF ERA-40 (1958 – 2001) and ECMWF ERA INTERIM (1989 – 2009).

To determine Reanalysis dataset most suitable for Siberian climate description we compare those with relevant meteorological observations. Series of air temperature at 62 weather stations (NOAA NCDC Synoptic Network) over period from 1958 to 2009 were used as the reference to estimate correctness of the modeling results. The weather stations selected present complete set of daily air temperature values over the period under study.

Chi-square and Wilcoxon criteria have been applied to validate homogeneity of modeling and observation series. Calculations were made using information-computational web-GIS system intended for processing and analysis of spatially-distributed environmental data. Analysis shows that ECMWF ERA-40 Reanalysis dataset is homogeneous with the weather station observations with an error probability of 5%, while NCEP/DOE AMIP II and JMA/CRIEPI JRA-25 Reanalysis datasets are homogeneous with the weather station observations with an error probability of 10%. Thus, ECMWF ERA-40 Reanalysis dataset is the most reliable for description of air temperature behavior in Siberia and should be used to analyze climatic processes occurring in this region.

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