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Modeling of regional meteorological fields with high spatial resolution for West Siberia

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As well known, global climate changes are inhomogeneous that is most clearly pronounced in the northern regions of the Earth. To study these inhomogeneities and trends, it is necessary to analyze climate changes in the century in the specific region. Now data of different reanalyses (USA, Europe, Japan), as well as observational data from weather stations, are used for such an analysis. Modeling data validity is mostly determined by amount of assimilated measurement data and by weather station network density. For example, for the 2nd edition of USA reanalysis, data of only 300 weather stations of Russian Federation have been used, where most stations are located in European part of the country. Comparison of meteorological fields obtained using reanalysis to measurements of Rosgidromet weather stations gives significant discrepancy. Reanalyses spatial resolution does not allow studying local inhomogeneities that inherent to regional climate changes. Therefore to study local climate dynamics in Siberian region, it is necessary to calculate meteorological fields with higher spatial resolution. Modern mesoscale meteorological models that use reanalyses archives and assimilate measurements of weather stations can solve this problem.

We calculated fields of climatic characteristics for West Siberia for the period from 1960 to 2000. The regional weather forecast WRF model (http://www.mmm.ucar.edu/modeling/wrf/index.php) and data assimilation system WRF-VAR (WRFDA) have been installed and debugged on the base of multiprocessor computational complex. Vertical boundary conditions, as well as initial conditions are formed using ERA-40 reanalysis data. NCEP data and USGS map with spatial resolution of 9.25 km are used for the lower boundary, measurements of weather stations, located within calculation area, are used for observation nudging. As a result of the model run, we have meteorological fields, which are reanalysis fields' projections with high spatial resolution (10 km) corrected by weather stations' measurements.

Primary analysis of the data obtained allows us to depict changes of climatic characteristics in local areas not as smoothed disturbances (as in reanalysis fields), but as local inhomogeneities that have specific geographical reference to specific regional ecosystem. Key parameters characterizing the main local climate dynamics trends will be chosen for further analysis and processing.

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