Application of web-GIS approach for climate change study

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Georeferenced datasets are currently actively used in numerous applications including modeling, interpretation and forecast of climatic and ecosystem changes for various spatial and temporal scales. Due to inherent heterogeneity of environmental datasets as well as their huge size which might constitute up to tens terabytes for a single dataset at present studies in the area of climate and environmental change require a special software support. A dedicated web-GIS information-computational system for analysis of georeferenced climatological and meteorological data has been created. It is based on OGC standards and involves many modern solutions such as object-oriented programming model, modular composition, and JavaScript libraries based on GeoExt library, ExtJS Framework and OpenLayers software.

The main advantage of the system lies in a possibility to perform mathematical and statistical data analysis, graphical visualization of results with GIS-functionality, and to prepare binary output files with just only a modern graphical web-browser installed on a common desktop computer connected to Internet. Several geophysical datasets represented by two editions of NCEP/NCAR Reanalysis, JMA/CRIEPI JRA-25 Reanalysis, ECMWF ERA-40 Reanalysis, ECMWF ERA Interim Reanalysis, MRI/JMA APHRODITE's Water Resources Project Reanalysis, DWD Global Precipitation Climatology Centre's data, GMAO Modern Era-Retrospective analysis for Research and Applications, meteorological observational data for the territory of the former USSR for the 20th century, results of modeling by global and regional climatological models, and others are available for processing by the system. And this list is extending. Also a functionality to run WRF and "Planet simulator" models was implemented in the system. Due to many preset parameters and limited time and spatial ranges set in the system these models have low computational power requirements and could be used in educational workflow for better understanding of basic climatological and meteorological processes.

The Web-GIS information-computational system for geophysical data analysis provides specialists involved into multidisciplinary research projects with reliable and practical instruments for complex analysis of climate and ecosystems changes on global and regional scales. Using it even unskilled user without specific knowledge can perform computational processing and visualization of large meteorological, climatological and satellite monitoring datasets through unified web-interface in a common graphical web-browser.