



Development of virtual research environment for regional climatic and ecological studies and continuous education support

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Volumes of environmental data archives are growing immensely due to recent models, high performance computers and sensors development. It makes impossible their comprehensive analysis in conventional manner on workplace using in house computing facilities, data storage and processing software at hands. One of possible answers to this challenge is creation of virtual research environment (VRE), which should provide a researcher with an integrated access to huge data resources, tools and services across disciplines and user communities and enable researchers to process structured and qualitative data in virtual workspaces. VRE should integrate data, network and computing resources providing interdisciplinary climatic research community with opportunity to get profound understanding of ongoing and possible future climatic changes and their consequences.

Presented are first steps and plans for development of VRE prototype element aimed at regional climatic and ecological monitoring and modeling as well as at continuous education and training support. Recently developed experimental software and hardware platform aimed at integrated analysis of heterogeneous georeferenced data "Climate" (<http://climate.scert.ru/>, Gordov et al., 2013; Shulgina et al., 2013; Okladnikov et al., 2013) is used as a VRE element prototype and approach test bench. VRE under development will integrate on the base of geoportal distributed thematic data storage, processing and analysis systems and set of models of complex climatic and environmental processes run on supercomputers. VRE specific tools are aimed at high resolution rendering on-going climatic processes occurring in Northern Eurasia and reliable and found prognoses of their dynamics for selected sets of future mankind activity scenaria.

Currently the VRE element is accessible via developed geoportal at the same link (<http://climate.scert.ru/>) and integrates the WRF and «Planet Simulator» models, basic reanalysis and instrumental measurements data and support profound statistical analysis of stored and modeled on demand data. In particular, one can run the integrated models, preprocess modeling results data, using dedicated modules for numerical processing perform analysis and visualize obtained results. New functionality recently has been added to the statistical analysis tools set aimed at detailed studies of climatic extremes occurring in Northern Asia. The VRE element is also supporting thematic educational courses for students and post-graduate students of the Tomsk State University. In particular, it allow students to perform on-line thematic laboratory work cycles on the basics of analysis of current and potential future regional climate change using Siberia territory as an example (Gordova et al, 2013). We plan to expand the integrated models set and add comprehensive surface and Arctic Ocean description.

Developed VRE element "Climate" provides specialists involved into multidisciplinary research projects with reliable and practical instruments for integrated research of climate and ecosystems changes on global and regional scales. With its help even a user without programming skills can process and visualize multidimensional observational and model data through unified web-interface using a common graphical web-browser.

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