Development of Web GIS for complex processing and visualization of climate geospatial datasets as an integral part of dedicated Virtual Research Environment

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For comprehensive usage of large geospatial meteorological and climate datasets it is necessary to create a distributed software infrastructure based on the spatial data infrastructure (SDI) approach. Currently, it is generally accepted that the development of client applications as integrated elements of such infrastructure should be based on the usage of modern web and GIS technologies. The paper describes the Web GIS for complex processing and visualization of geospatial (mainly in NetCDF and PostGIS formats) datasets as an integral part of the dedicated Virtual Research Environment for comprehensive study of ongoing and possible future climate change, and analysis of their implications, providing full information and computing support for the study of economic, political and social consequences of global climate change at the global and regional levels.

The Web GIS consists of two basic software parts:

1. Server-side part representing PHP applications of the SDI geoportal and realizing the functionality of interaction with computational core backend, WMS/WFS/WPS cartographical services, as well as implementing an open API for browser-based client software. Being the secondary one, this part provides a limited set of procedures accessible via standard HTTP interface.

2. Front-end part representing Web GIS client developed according to a "single page application" technology based on JavaScript libraries OpenLayers (http://openlayers.org/), ExtJS (https://www.sencha.com/products/extjs), GeoExt (http://geoext.org/). It implements application business logic and provides intuitive user interface similar to the interface of such popular desktop GIS applications, as uDIG, QuantumGIS etc. Boundless/OpenGeo architecture was used as a basis for Web-GIS client development.

According to general INSPIRE requirements to data visualization Web GIS provides such standard functionality as data overview, image navigation, scrolling, scaling and graphical overlay, displaying map legends and corresponding metadata information. The specialized Web GIS client contains three basic tires:

• Tier of NetCDF metadata in JSON format

• Middleware tier of JavaScript objects implementing methods to work with:

o NetCDF metadata

o XML file of selected calculations configuration (XML task)

o WMS/WFS/WPS cartographical services

• Graphical user interface tier representing JavaScript objects realizing general application business logic

Web-GIS developed provides computational processing services launching to support solving tasks in the area of environmental monitoring, as well as presenting calculation results in the form of WMS/WFS cartographical layers in raster (PNG, JPG, GeoTIFF), vector (KML, GML, Shape), and binary (NetCDF) formats. It has shown its effectiveness in the process of solving real climate change research problems and disseminating investigation results in cartographical formats.