Web-GIS application for analysis of georeferenced data

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Why?

- Multidisciplinary, spatially distributed research process

- Different formats of datasets

- Spatially distributed datasets of huge size

- Special knowledge to access, search and process data is required

- Risk of possible using of unverified algorithms and data

Approach

- Distributed archives of geophysical data (NetCDF/HDF5/ GRIB)...

- ... accompanied by metadata

- Extensible modular computational core as a back-end

- Rich data processing capabilities

- High quality graphical output accompanied by raw data and metadata in SDF (OGC, ISO 19115)

- Internet accessible, user-friendly GUI, GIS functionality

Software framework
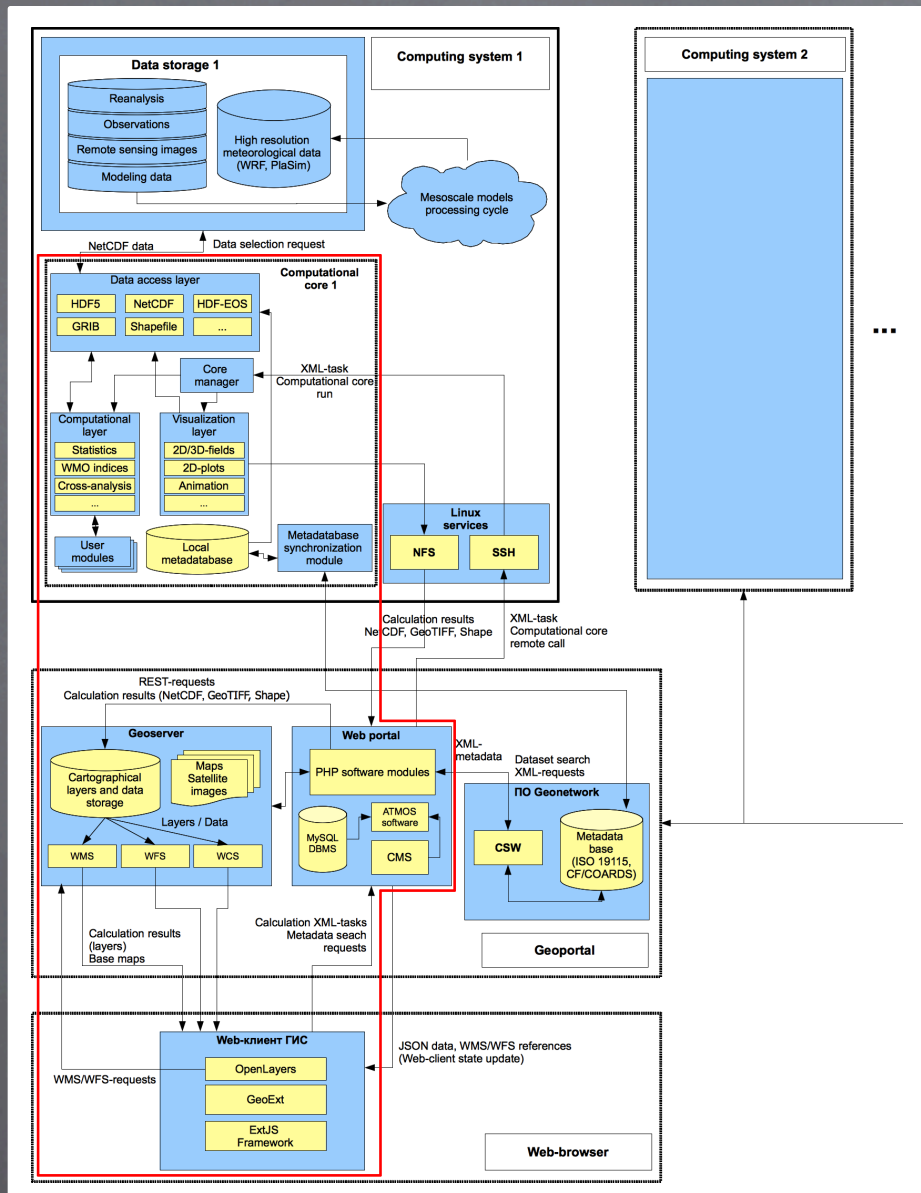
- WEB-GIS GUI

- Web-portal

- Modular Computational Core (MCC)

- (Data archives)

Web portal
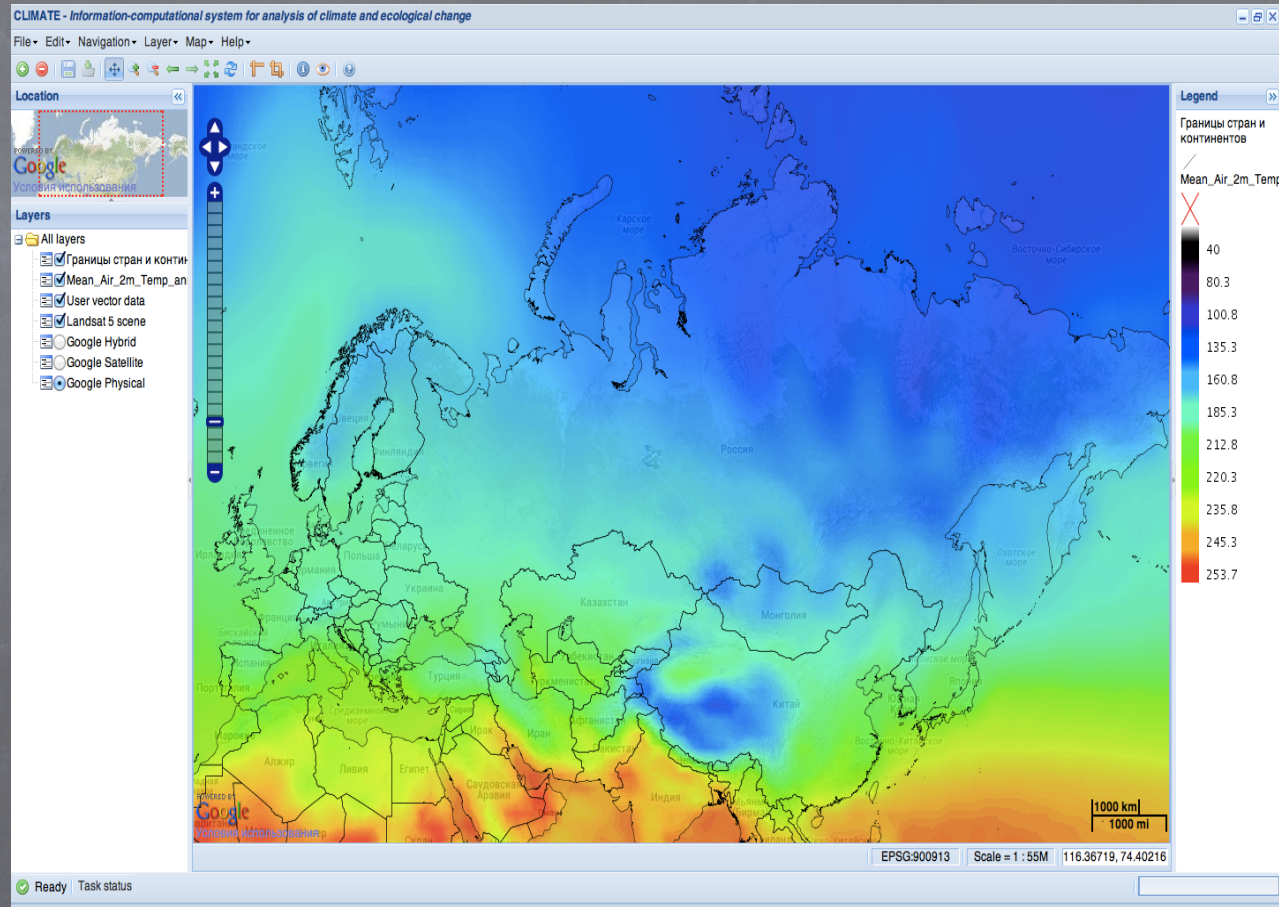(web-GIS engine, a bridge between GUI and MCC)

- Authorization

- Database integration

- Localization

- Content management system

- Geodata manipulation and access (OGC Standards)

- PHP-controllers, JavaScript libraries, DHTML

Web-GIS GUI

(user interface)

Libs: ExtJS, OpenLayers, GeoExt

- Interactive map

- Menu bar, tool bar, status bar

- Layers list

- Legend panel

- Context menu

GIS functionality
(currently implemented)

Provided by: GeoServer and OpenLayers software

- Map scaling, layers manipulations

- Region of interest selection, zoom, pan-and-scan

- Processing results, maps and satellite products can be used as a background

- WMS/WFS requests support

Modular Computational Core
(modules management, produces output for web-portal)

- Language: GNU Data Language (GDL), Python

- Structure: object-oriented, modular, extensible

- Input data formats: netCDF, HDF5, ESRI Shapefile

- Graphical output: Encapsulated PostScript, GeoTIFF

- Raw data output: netCDF, ESRI Shapefile

- Provides: API for data access and visualization, pipelined modules execution

Computational modules
(geophysical data processing)

- Minimum/maximum, range, average values, standard deviation, variance, RMS...

- Climate change indices: number of frost days, growing season length, number of icing days, monthly maximum/minimum of daily maximum/minimum temperature, number of summer days, number of tropical nights...

... more than 20 mathematical and statistical methods

Data archives
(currently used by the system)

| Dataset	Source organization	Time coverage	Spatial resolution
NCEP/NCAR Reanalysis	NCEP/NCAR	1951 – 2001	2.5°×2.5°, 17 vertical levels
NCEP/DOE AMIP II Reanalysis	NCEP/DOE	1979 – 2003	2.5°×2.5°, 17 vertical levels
ERA-40 Reanalysis	ECMWF	1957 – 2004	2.5°×2.5°, 23 vertical levels
JRA-25 Reanalysis	JMA/CRIEPI	1979 – 2009	2.5°×2.5°, 23 vertical levels
NOAA-CIRES 20th Century Global Reanalysis Version II	NOAA/OAR/ESRL PSD	1869 – 2011	2.0°×2.0°; 24 vertical levels
APHRODITE Reanalysis	RIHN-MRI/JMA	1951 - 2007	0.25°×0.25°, precipitations only
Merra Reanalysis	ECMWF	1979 - 2000	0.67°×0.5°, 42 vertical levels
GPCC Reanalysis	GPCC	1901 - 2009	0.5°×0.5°, precipitations only
PlaSim dataset	IMCES SB RAS	2000 - 2100	2.5°×2.5°
Meteostations	RIHMI-WDC	1910 – 2011	600 stations for Russia and CIS

Examples
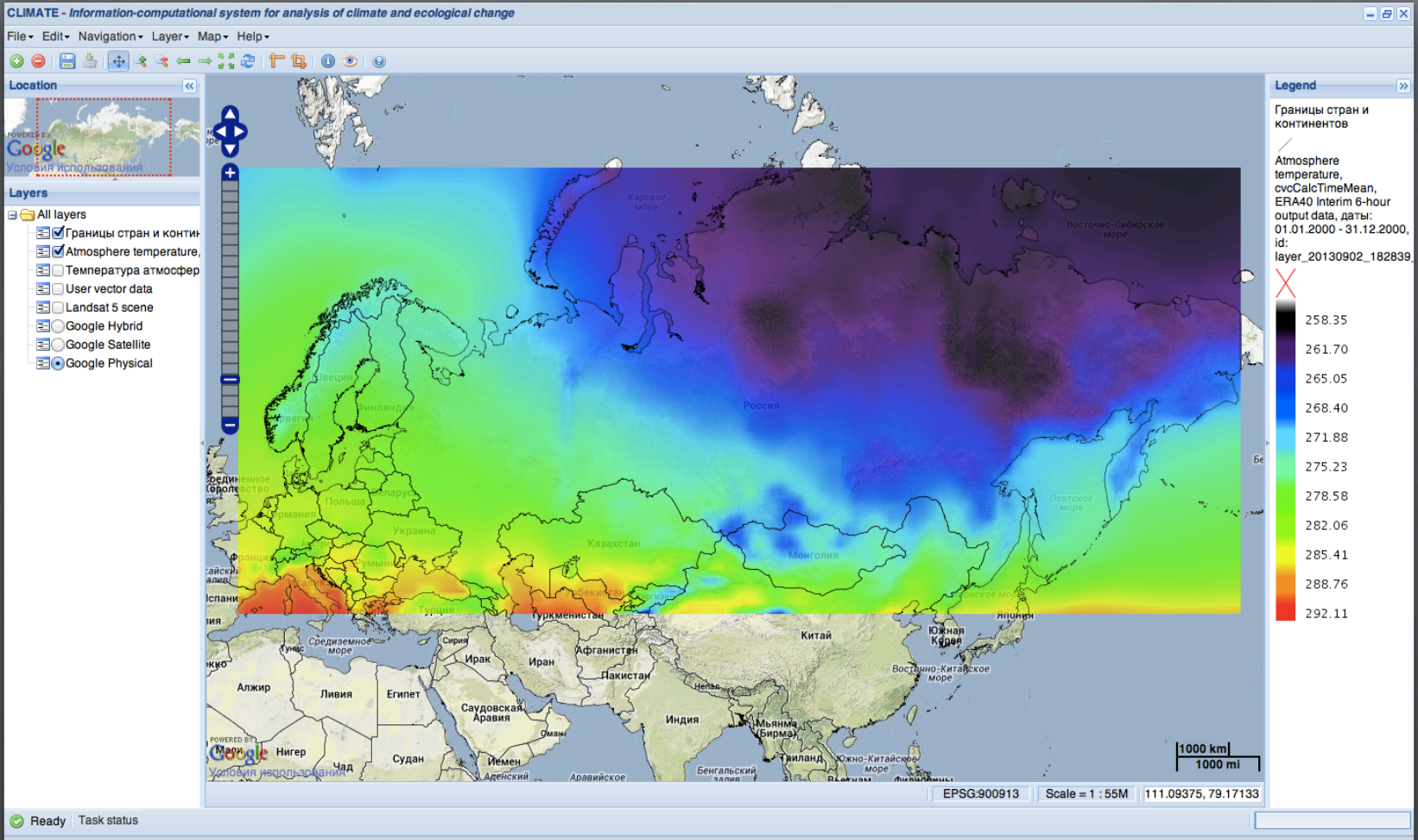
Temperature at 2m, ERA Interim, average for 2000
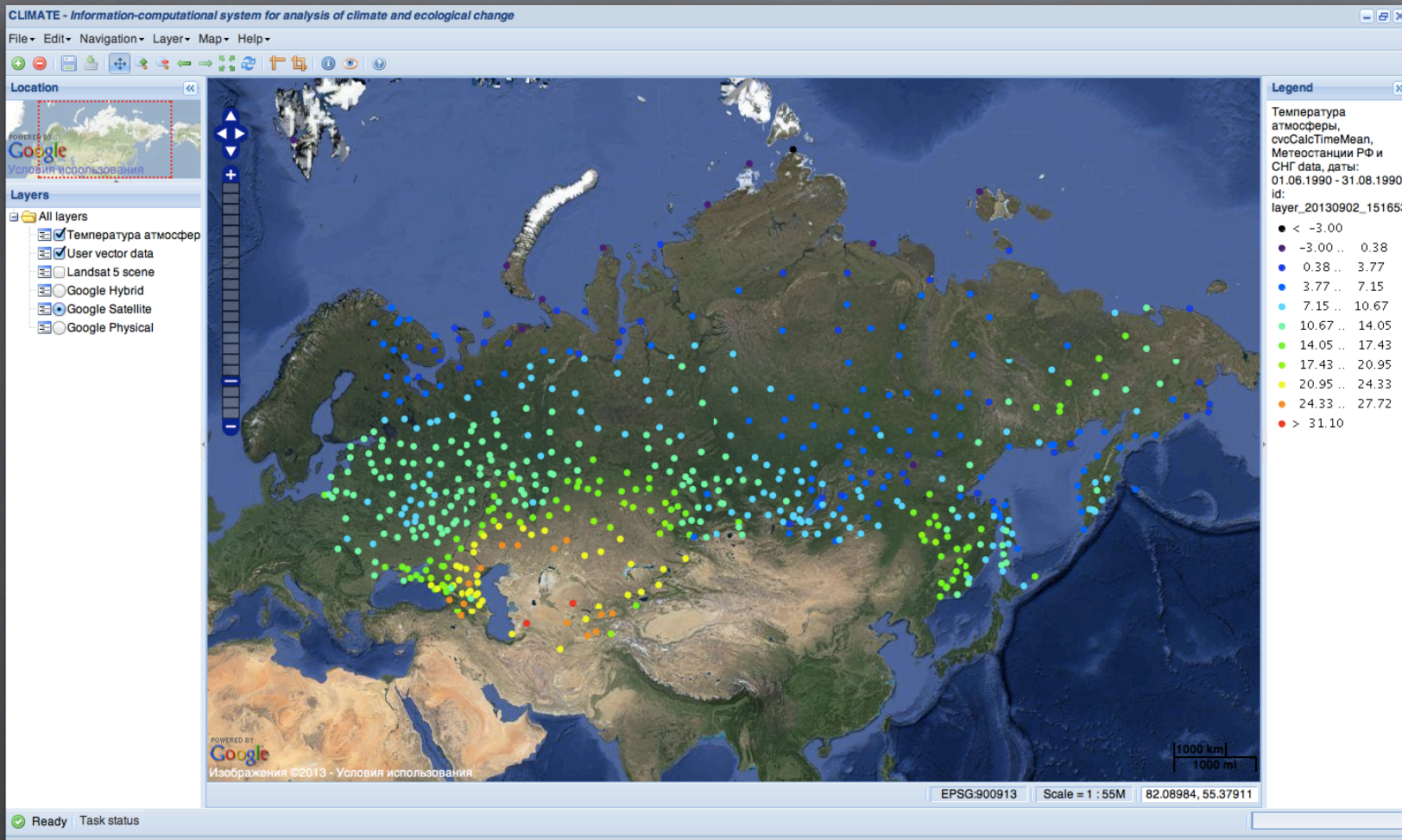
Examples
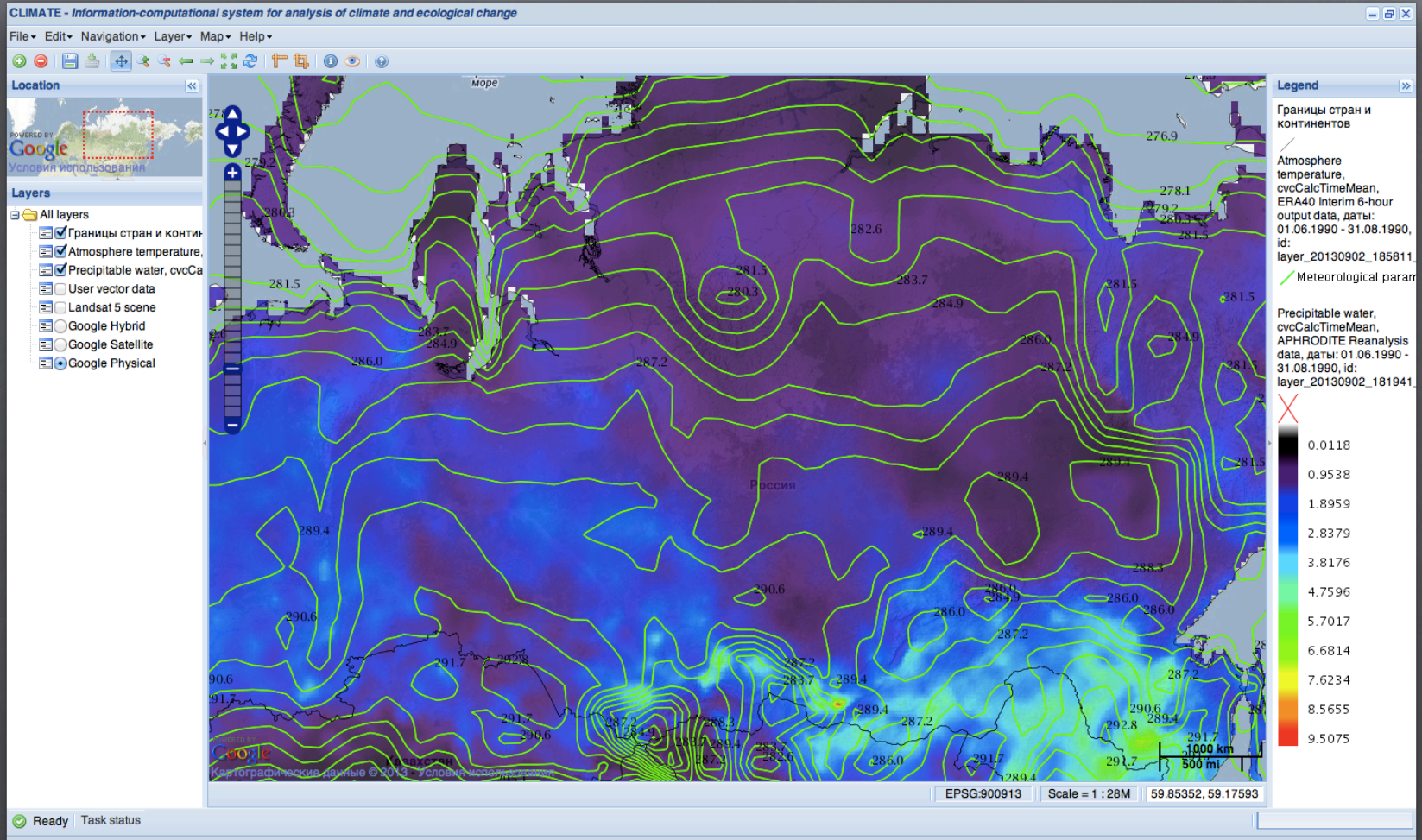
Shaded - Precipitations, APHRODITE's project, average for summer 1990
Contour – Temperature at 2m, ERA Interim, average for summer 1990

Examples

Surface temperature, meteostations, average for summer 1990

Examples

(limited models capabilities, for educational purpose only)

Model "Planet Simulator"

Model "WRF"

Examples

PlaSim modeling results, convective precipitations, climatic projection for 2090 – 2100
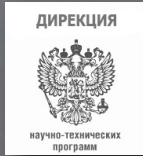
Future plans

- More datasets: remote sensing, models, user data

- More processing modules, user modules support

- Supply graphical results with metadata files

- Metadata search

- Extend and improve GUI

- Web services and SDI

Acknowledgements
(this work is partially supported by)

Thank you for your attention!