



Development of geoinformation web-system for processing and analysis of large archives of spatially distributed data

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Problems

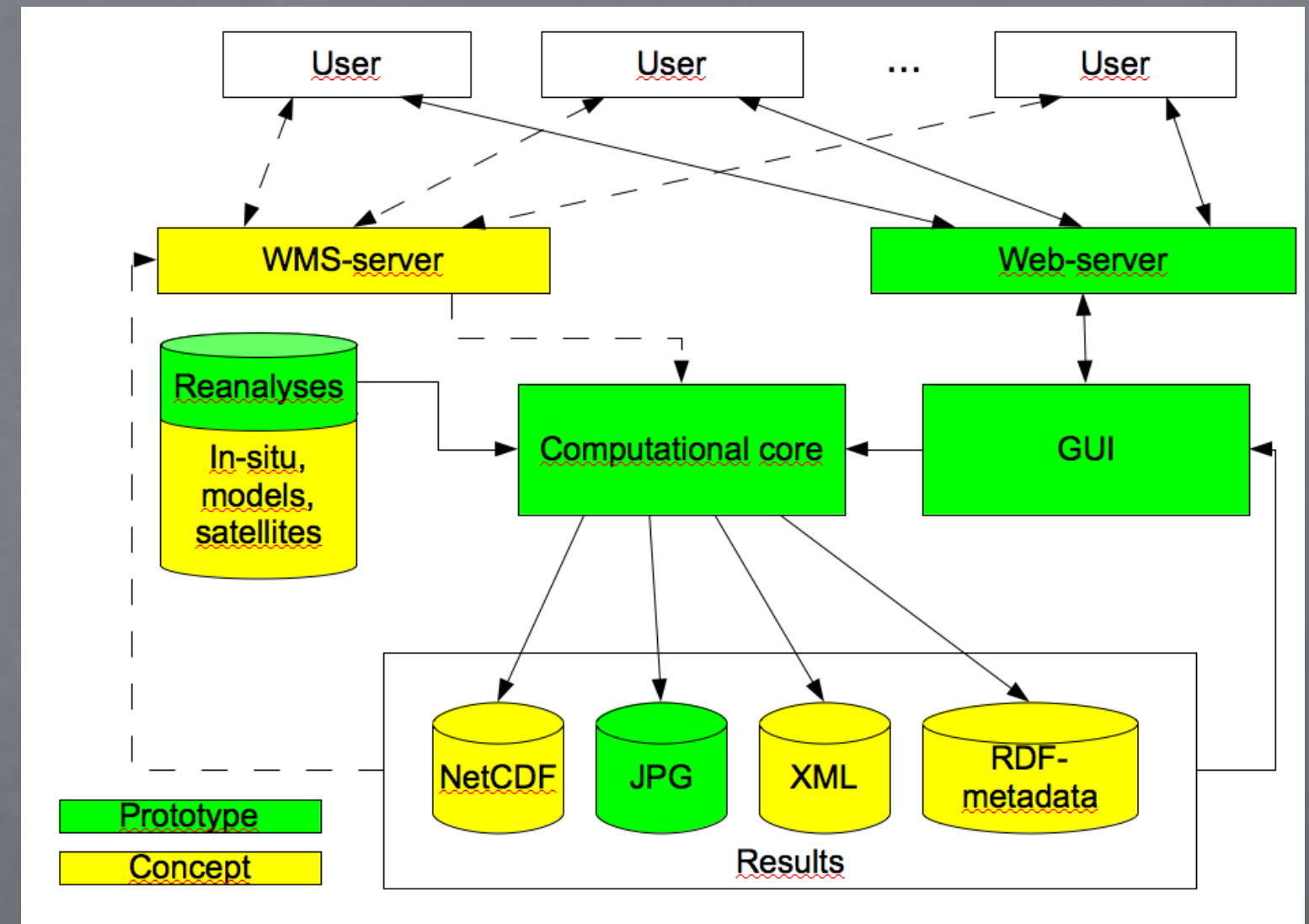
- Multidisciplinary, spatially distributed research process
- Spatially distributed datasets of huge size
- Different formats of datasets
- Special knowledge to access, search and process data is required
- Risk of possible using of unverified algorithms and data

Possible solution

- To gather data archives on high-performance storage
- To organize data and provide high-speed access
- To develop algorithms for searching and accessing the data
- To develop verified algorithms for data processing
- To provide unified, world-scale access with user-friendly interface

Prototype

- ATMOS-based web-interface
- HTML+PHP+GrADS
- Basic statistics, climate change indices approved by WMO
- Datasets: NCEP/NCAR Reanalysis 1 and Reanalysis 2, ECMWF ERA-40, JMA-CRIEPI JRA-25



Prototype

The screenshot shows the home page of the ENVIRO-RISKS website. The browser window title is "Climate model / NCEP/DOE Reanalysis AMIP II - Mozilla Firefox". The address bar shows the URL "http://climate.risks.scert.ru/reanalysis/v2/". The page header features the ENVIRO-RISKS logo and the text "MAN-INDUCED ENVIRONMENTAL RISKS: MONITORING, MANAGEMENT AND REMEDIATION OF MAN-MADE CHANGES IN SIBERIA" and "FP6 EC project". Below the header, there is a navigation menu with "Rus | Eng" and "Test » Reanalysis". A dropdown menu is open, showing "NCEP/DOE Reanalysis AMIP II" selected. The main content area is divided into two sections: "Meteorological parameters" and "Climatic characteristics". The "Meteorological parameters" section lists: Atmosphere temperature, Soil temperature, Precipitable water, Precipitation rate, Water equivalent of accumulated snow depth, Atmosphere pressure, Soil wetness, and Geopotential height. The "Climatic characteristics" section lists: Correlation coefficient for a pair of parameters, Linear regression coefficients between Northern hemisphere average temperature and average temperature of July, and First/Last cold/warm period in the year. The footer contains the text "ENVIRO-RISKS (INCO-CT-2005-013427)".

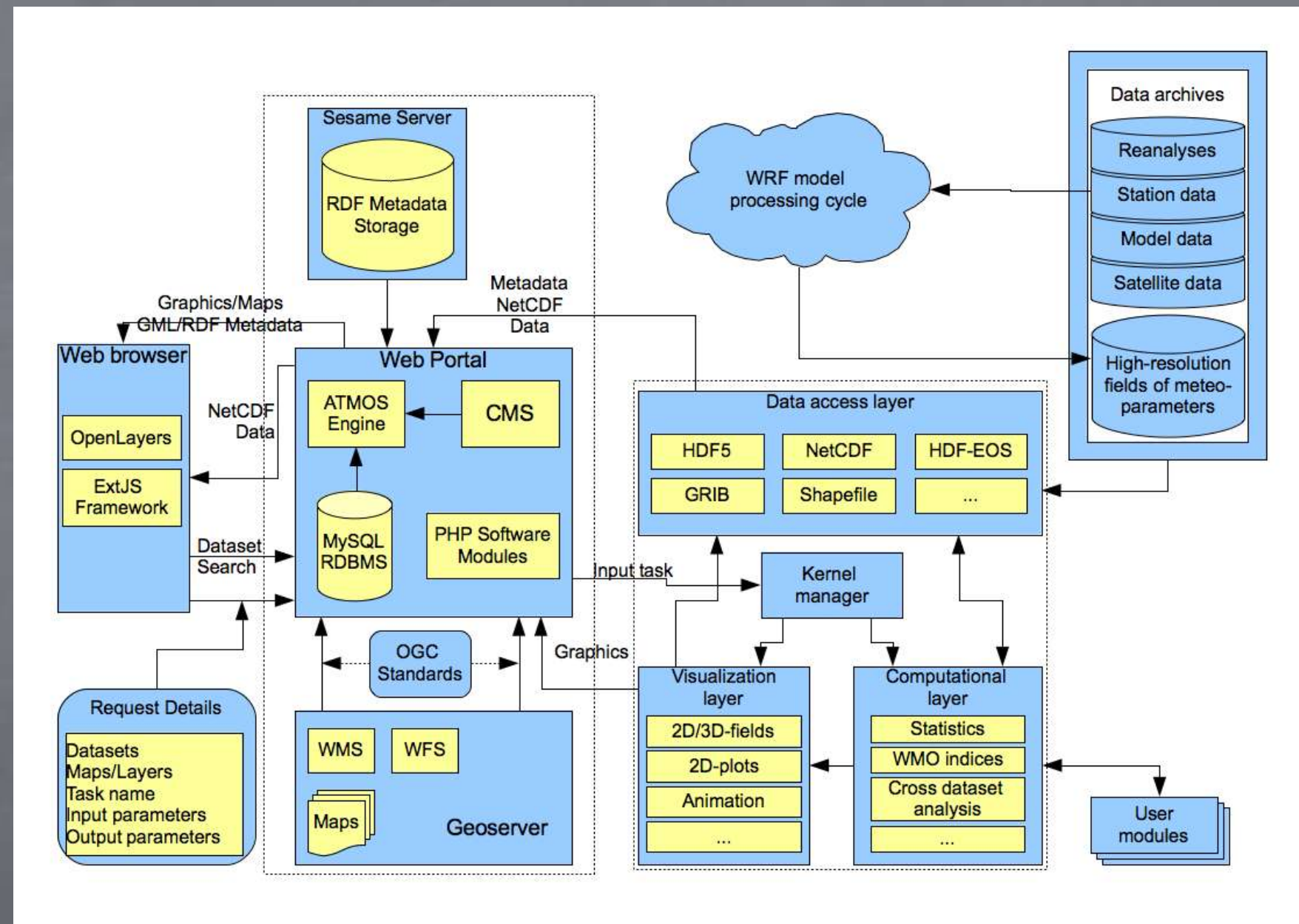
The screenshot shows the ENVIRO-RISKS website displaying a 2m atmosphere temperature map. The browser window title is "Climate model / Mozilla Firefox". The address bar shows the URL "http://climate.risks.scert.ru/reanalysis/era-40/?var=trp_atmosphere". The page header features the ENVIRO-RISKS logo and the text "MAN-INDUCED ENVIRONMENTAL RISKS: MONITORING, MANAGEMENT AND REMEDIATION OF MAN-MADE CHANGES IN SIBERIA" and "FP6 EC project". Below the header, there is a navigation menu with "Rus | Eng" and "Test » Reanalysis". A dropdown menu is open, showing "ECMWF ERA-40 Reanalysis" selected. The main content area displays a map titled "Atmosphere temperature at 2m" showing temperature contours over the Northern Hemisphere. The map is color-coded from red (warm) to purple (cold). A color scale at the bottom of the map ranges from -30 to 29 degrees Celsius. Below the map, there is a legend with the following information: "Meteorological parameter: Atmosphere temperature, degrees, C", "Level: 2m", "Characteristic: Average for season", "Analyzed date/period: Winter, 1967", and "Date/year range: 1967 - 1967".

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Next step: requirements

- Unified set of archives of geophysical data (NetCDF/HDF5)
- Extensible modular computational core, supporting user modules
- Rich data processing capabilities and high quality graphics output accompanied by raw data and metadata in SDF (OGC, ISO 19115)
- Internet accessible, Web-GUI + GIS functionality
- Metadata: search and retrieval

Next step: ICS scheme



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Current state: datasets

- NCEP/NCAR Reanalysis
- NCEP/DOE AMIP II Reanalysis
- ECMWF ERA-40 Reanalysis
- JMA/CRIEPI JRA-25 Reanalysis,
- NOAA-CIRES XX Century Global Reanalysis v.1
- Georeferenced maps and shapes: land-cover, NDVI, Google maps...



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Current state: computational core

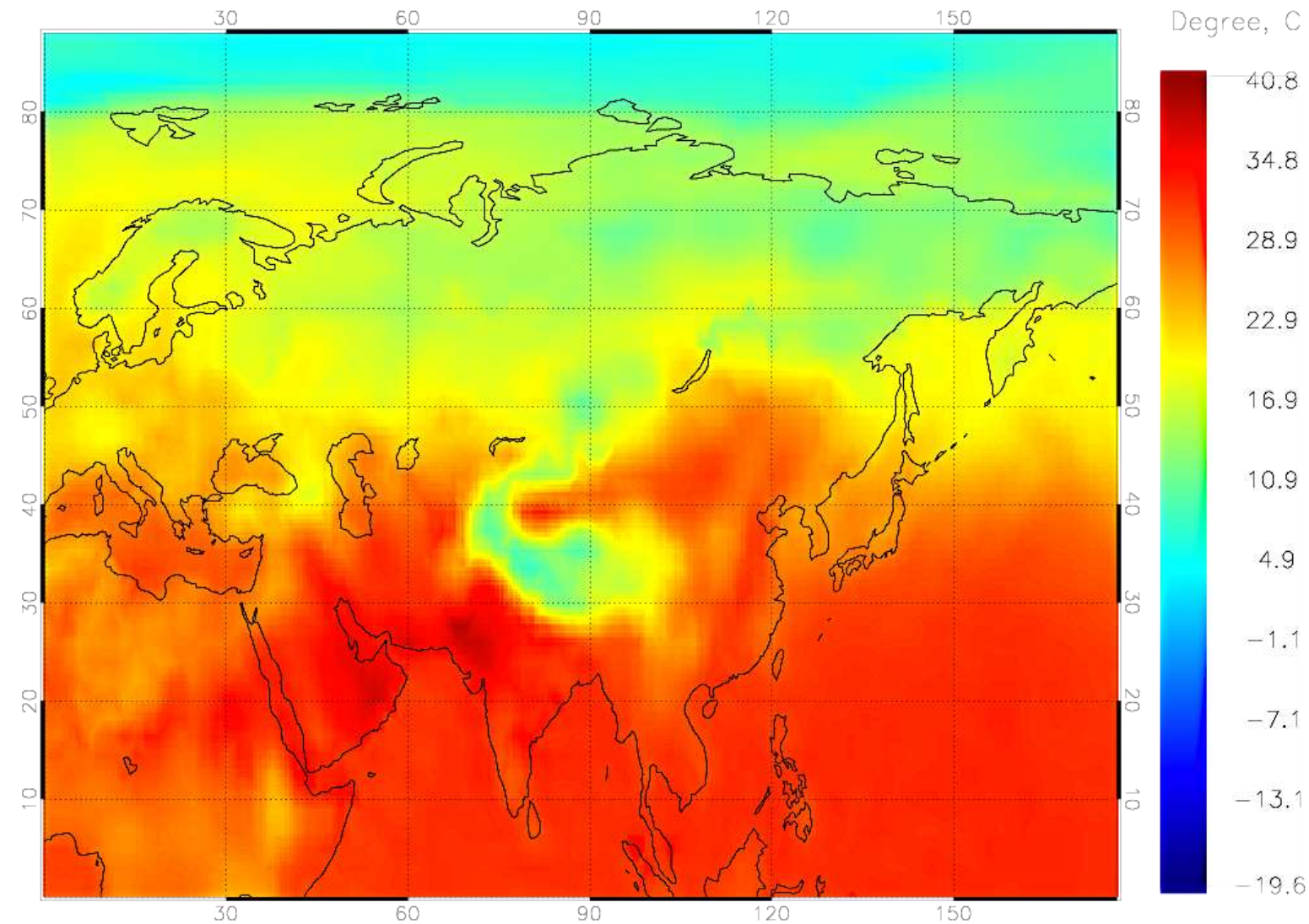
- Language: ITTVIS IDL 7.1, object-oriented approach
- Structure: modular, extensible, supports user modules
- Reads: GRIB1, NetCDF (COARDS and WRF output), HDF5
- Graphics: Encapsulated PostScript, GeoTIFF, ESRI Shapefile
- Provides: data access, processing and visualization of results

Current state: processing modules

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

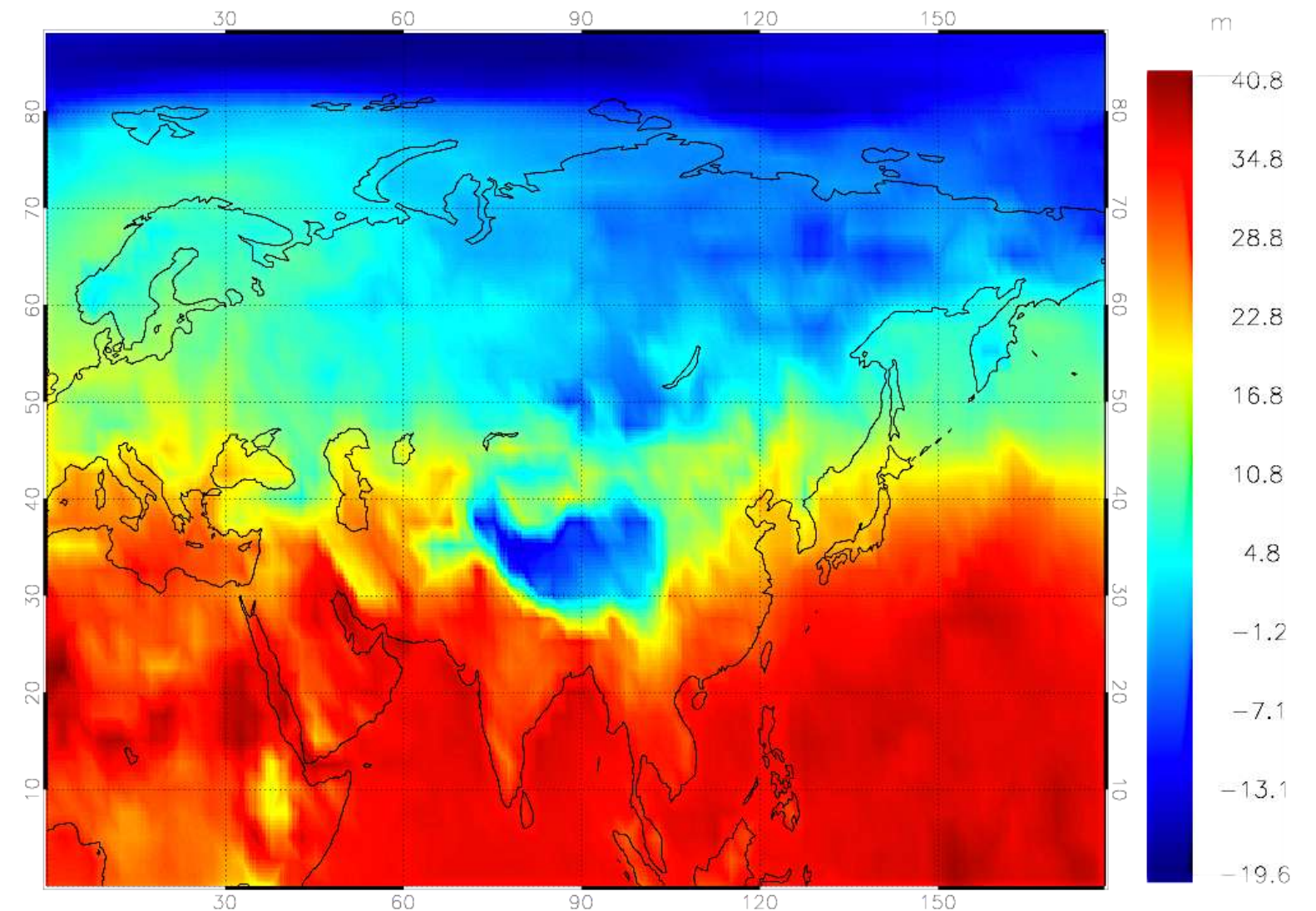
Current state: graphics output

WMO indices: Monthly maximum of daily minimum temperature, October, 1980



NCEP/DOE AMIP 2 Reanalysis

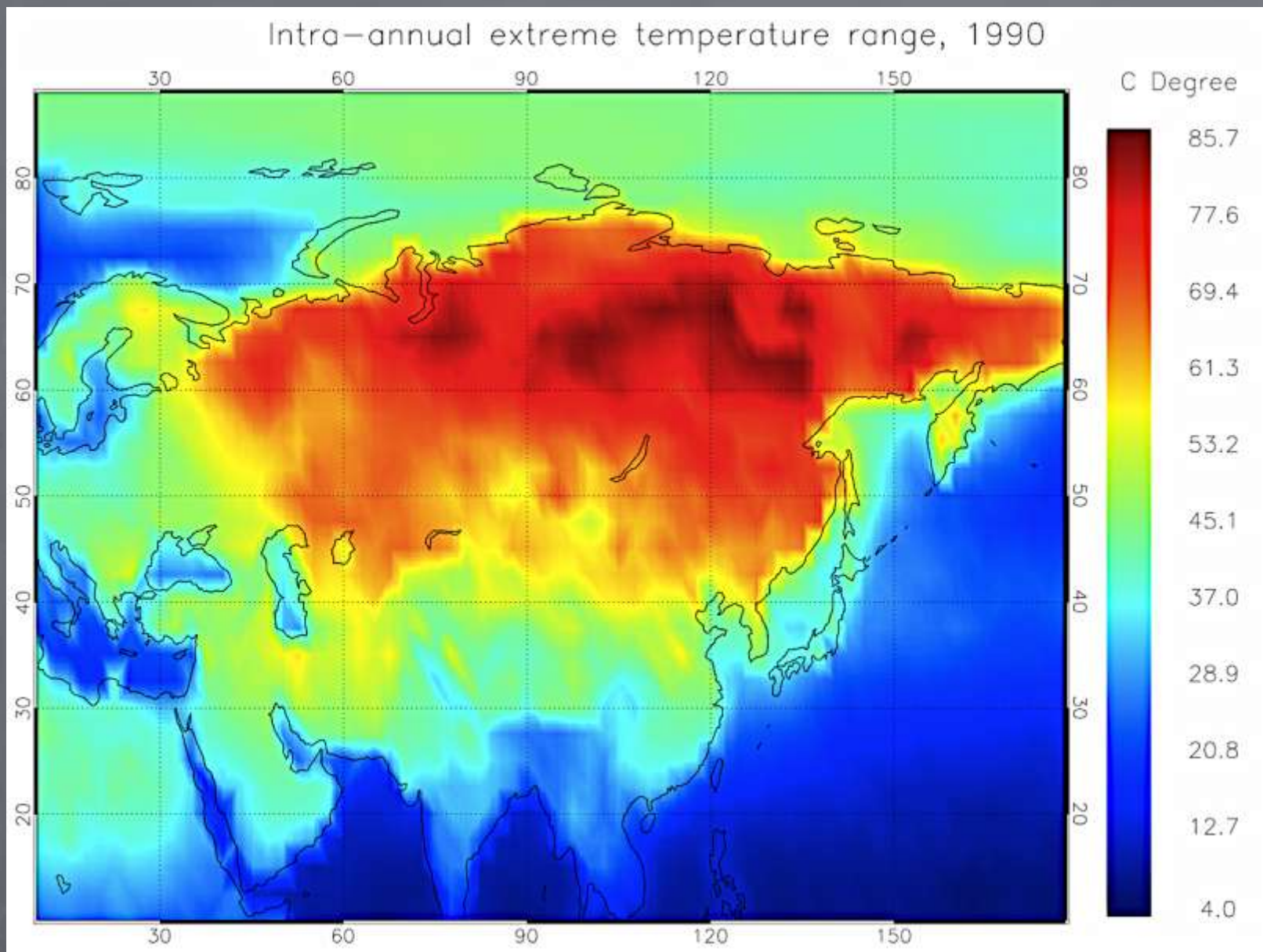
Monthly maximum of daily minimum temperature, October, 1980



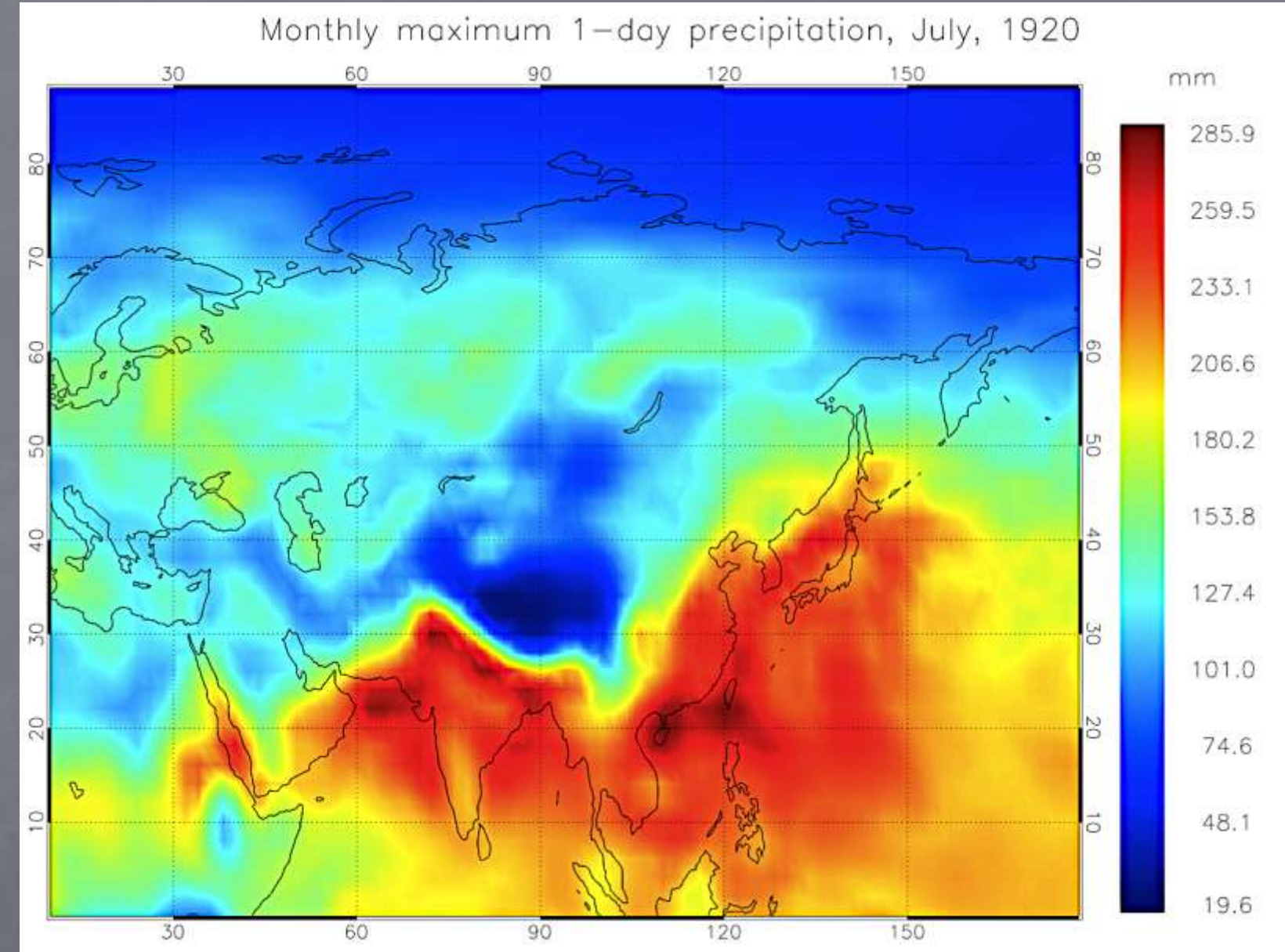
ECMWF ERA-40 Reanalysis

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Current state: graphics output



ECMWF ERA-40 Reanalysis



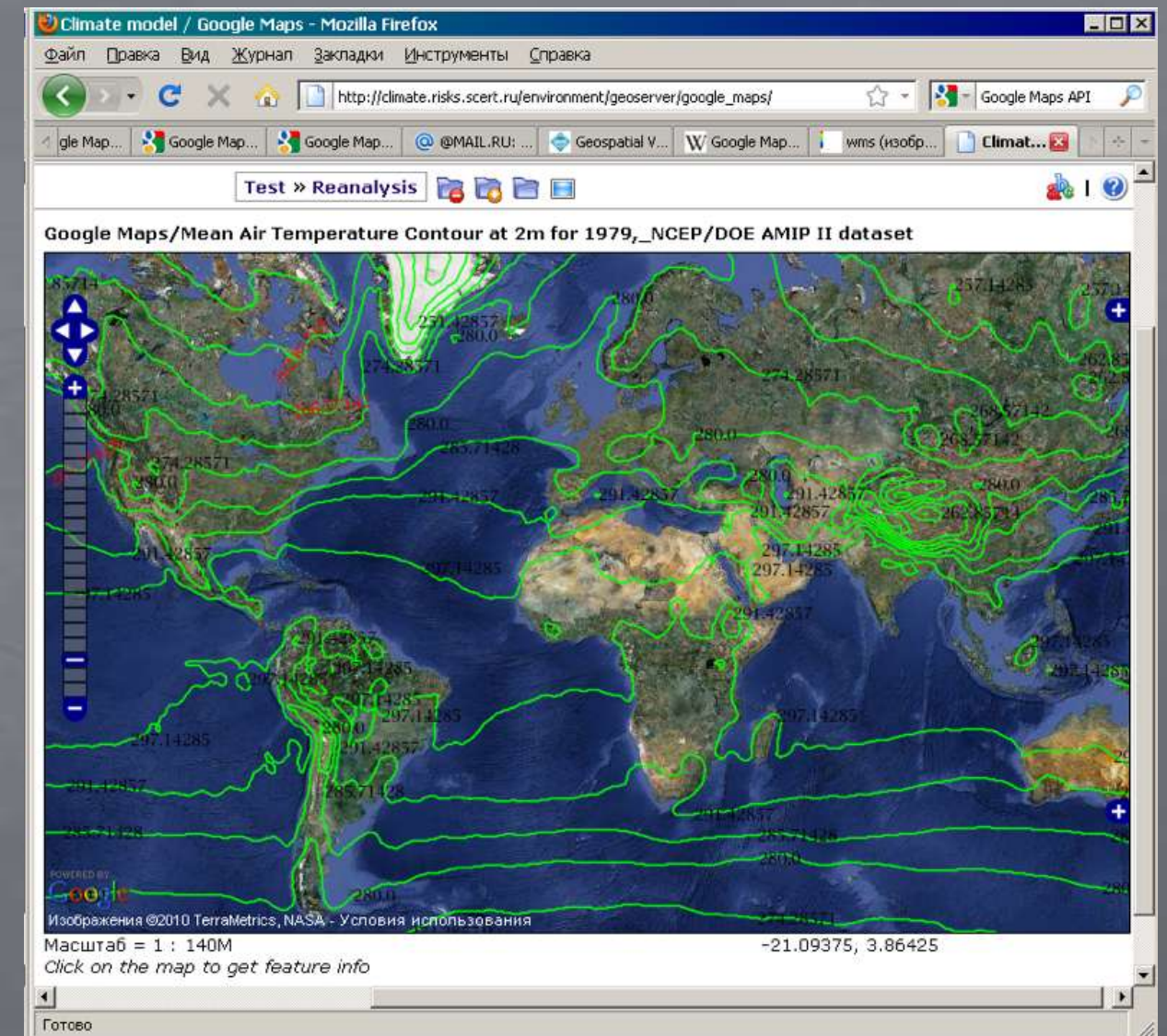
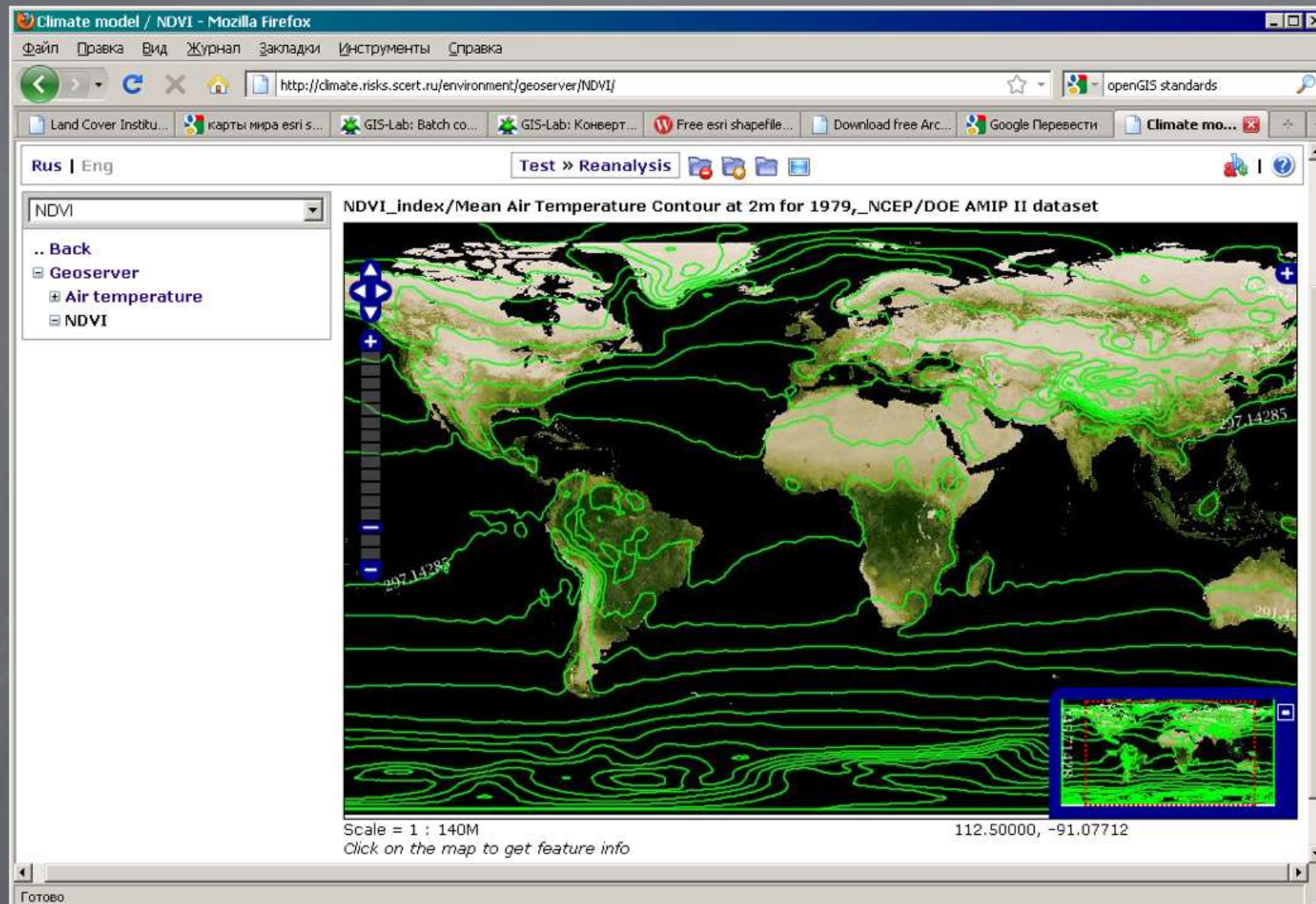
NOAA-CIRES XX Century Global Reanalysis v.1

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Current state: GIS-functionality

- Scaling, layers (satellite images and products as a background)
- Region of interest selection, pan-and-scan
- WMS-requests
- GeoServer and OpenLayers software

Current state: mapping examples



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Future plans

- More datasets: meteostations, satellites, models, user data
- More processing modules, user modules support
- Supply graphical results with metadata
- To develop a new engine for Web-GUI (DHTML+PHP+JavaScript+ExtJS)
- Semantic Web

Thank you for your attention!

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