



# UERRA Visualization

WEBSERVICES @ KNMI – UERRA GA 2016, TOULOUSE, FR

ADAGUC WEB-BASED VISUALIZATION

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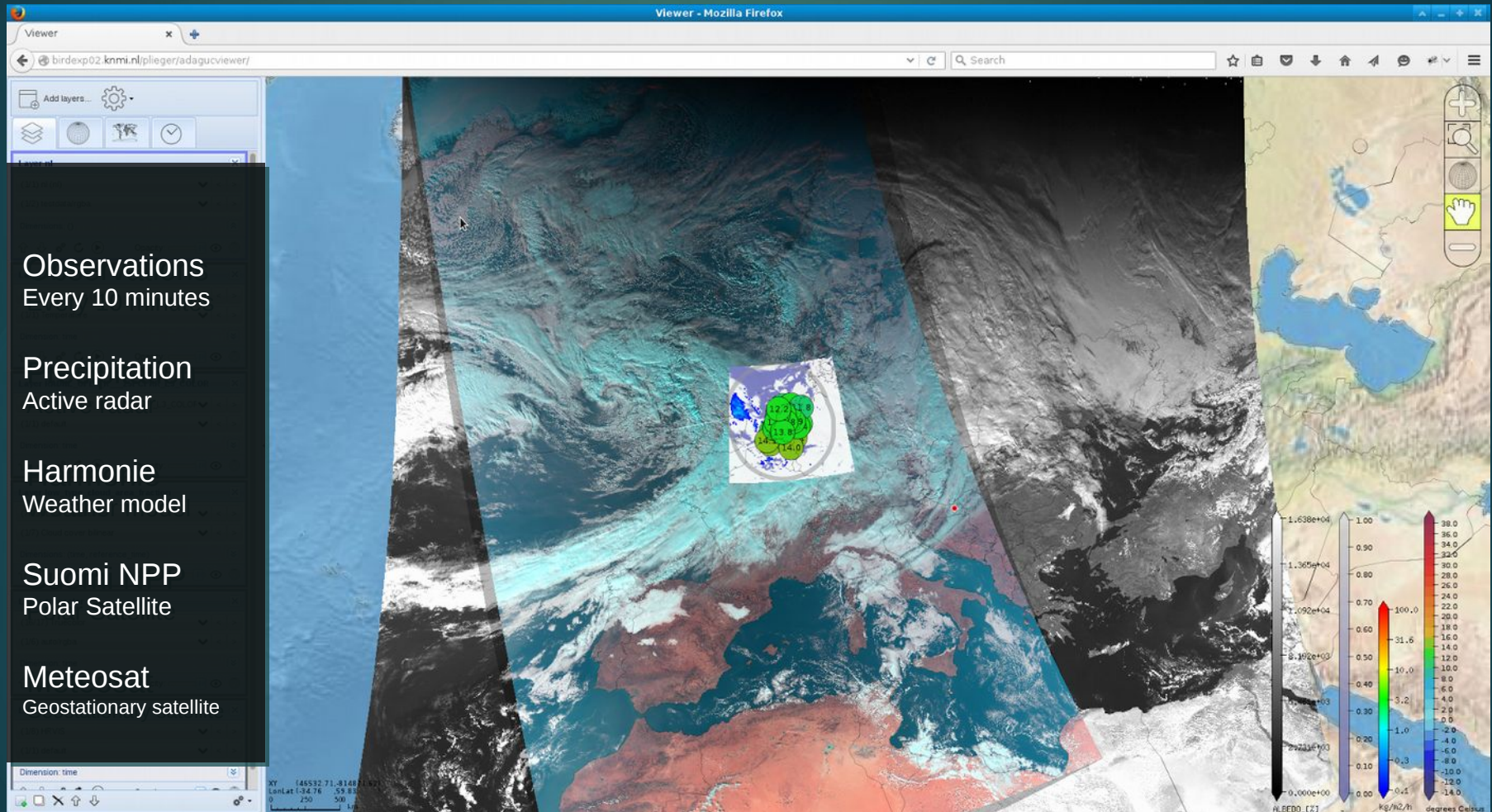


# Visualization - Web Map Services - ESGF

- ▶ Meteorological and climatological data
- ▶ ADAGUC
- ▶ WMS and WCS
- ▶ Combine data
- ▶ Data Formats and Styling
- ▶ ESGF
- ▶ Climate4Impact
- ▶ UERRA



# Satellite, radar, model & observation





# Tools for mapping ▯ ADAGUC

- ▶ ADAGUC – KNMI development since 2009
  - ▶ Serves OPeNDAP, WMS and WCS
  - ▶ Server (C++) and Viewer (JS) decoupled using WMS standard
  - ▶ Data in NetCDF format
  - ▶ AutoWMS mode – Automatic reading of new data
  - ▶ Combines multiple sources into a single WMS layer
  - ▶ Precipitation radar is publicly available as WMS, data since 2009, new data each 5 minutes, ~70000 timesteps, fast!



<http://adaguc.knmi.nl/>  
(open source + wiki)



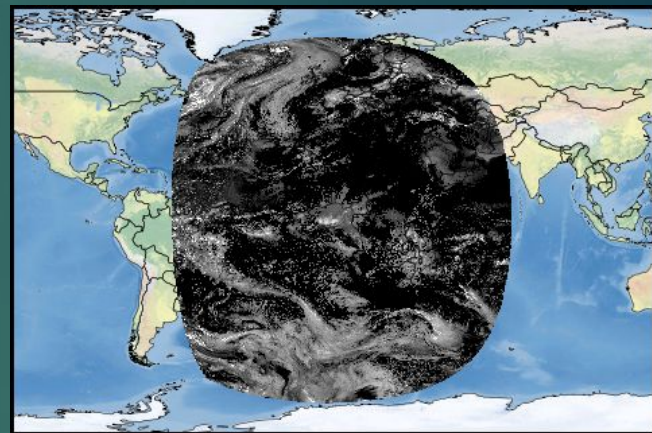
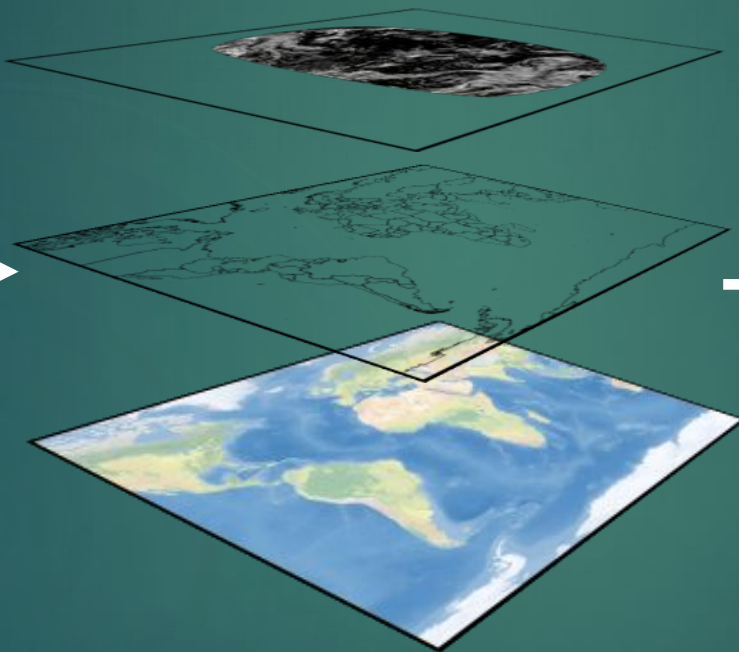
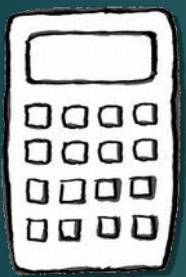


# Web Map Services

From data to image



+



NetCDF Data  
(big, 5.5Gb)

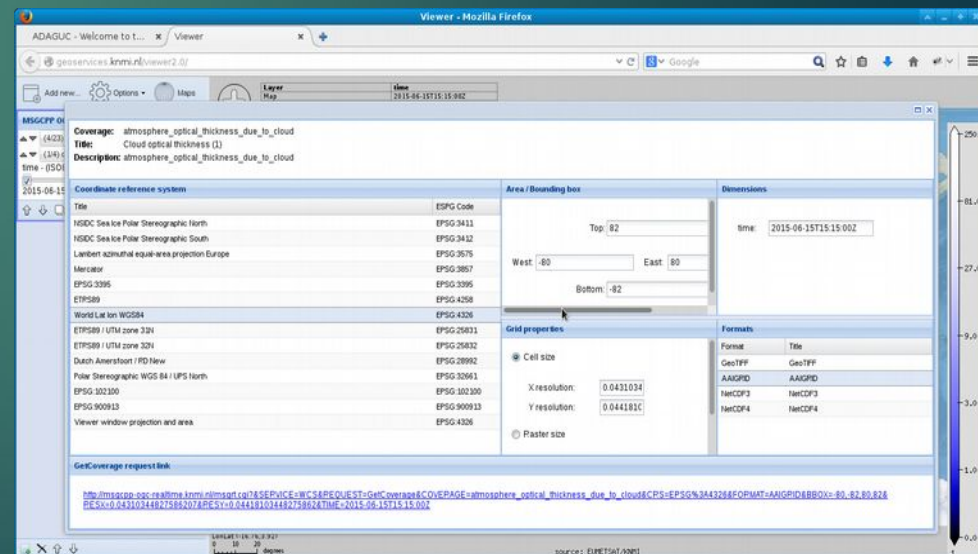
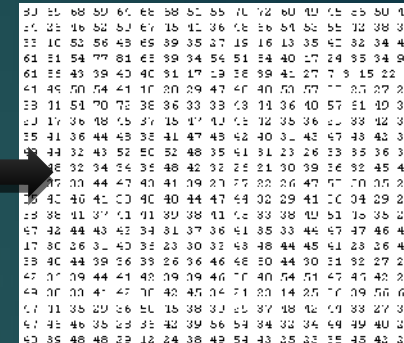
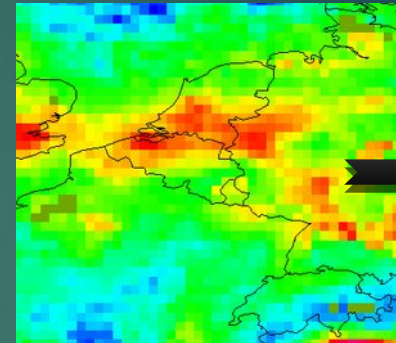
PNG images  
(small, 180Kb)

Combined  
geographically



# Web Coverage Services for data

- Download what you see
- Convert to ASCII, Geotiff
- Reproject and subset
- Use WCS directly in your script!
  - R
  - Python
  - Matlab
- Supports time, elevation, ...
- WCS client in viewer





# Combine different sources

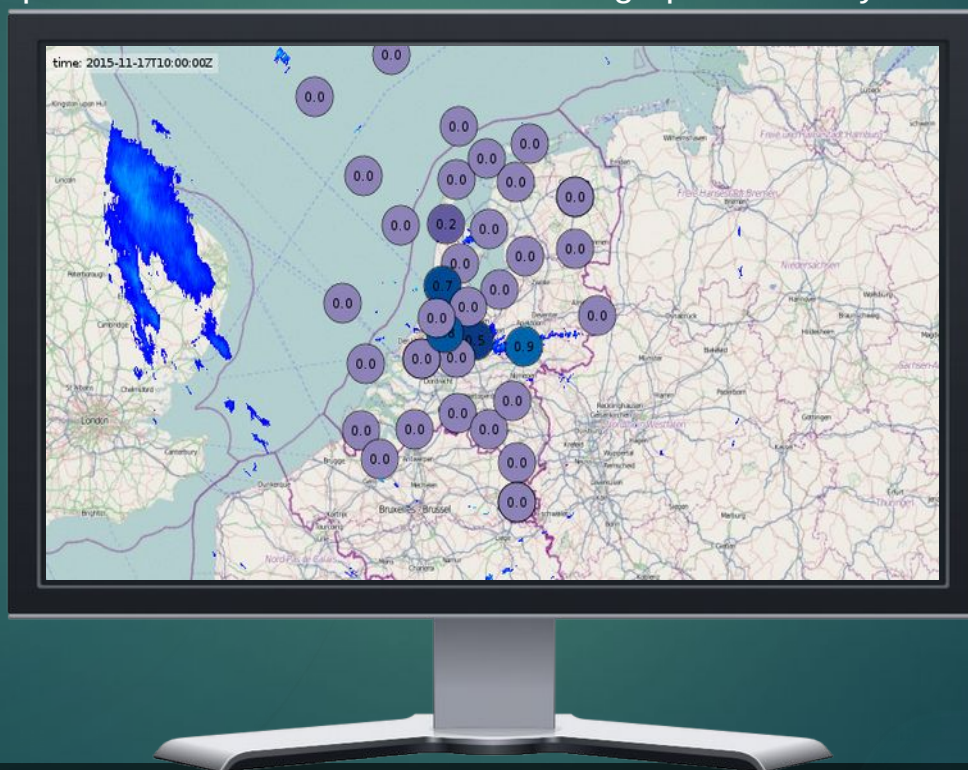
Share research results

Share data via internal network

Web Map Services on all workstations

Experiment with data without interfering operational systems

Precipitation radar  
Every 5 minutes



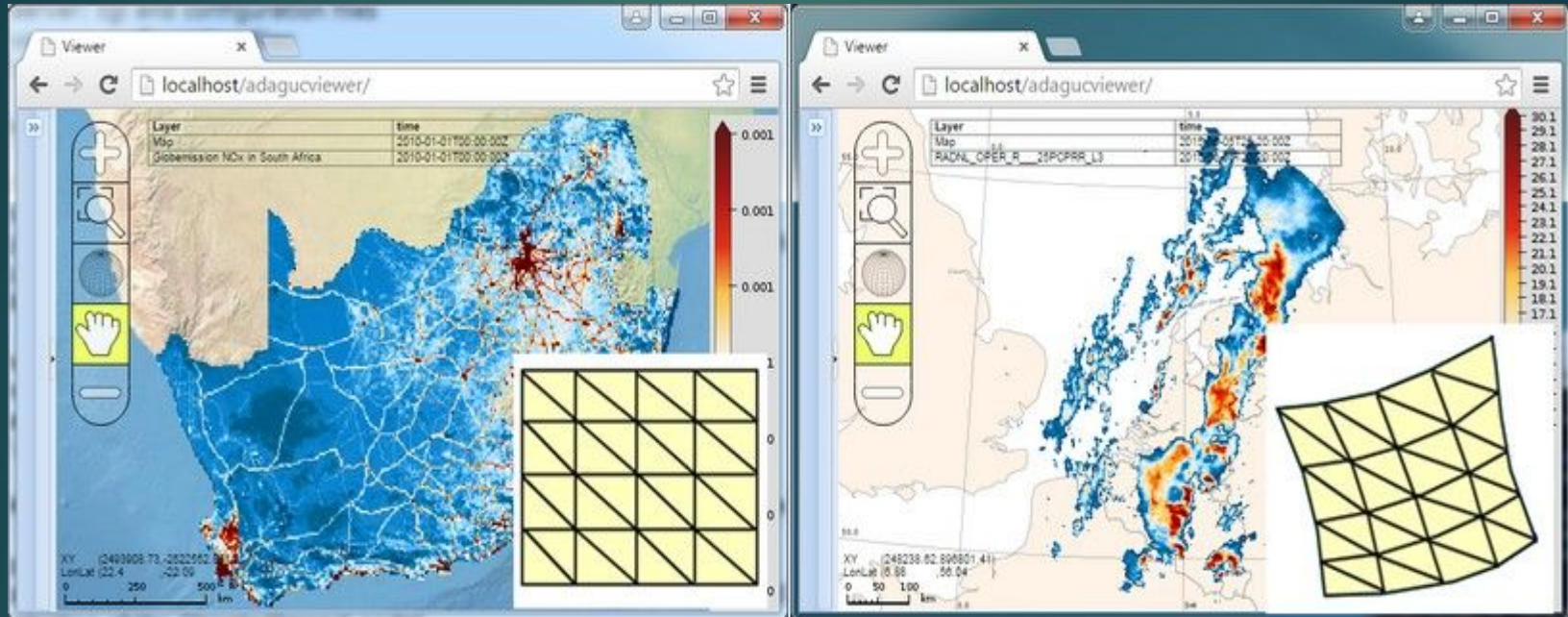
Observations  
Every 10 minutes

ADAGUC WEB-based visualization





# Data : structured grids



- Structured grids - Model/satellite/radar
  - Lat/lon and projected data
  - Regular grids





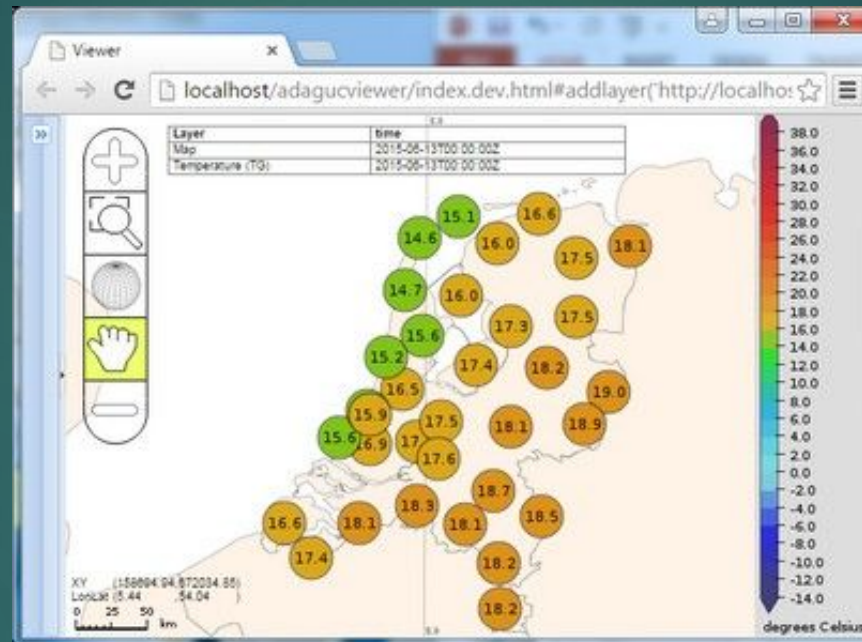
# Data : Georeferenced Pictures



- ▶ True color data (RGBA)
  - ▶ Background maps, meteorological maps, composites,
  - ▶ 4 channels, red, green, blue and alpha – 8 bits per channel = 32bits pp



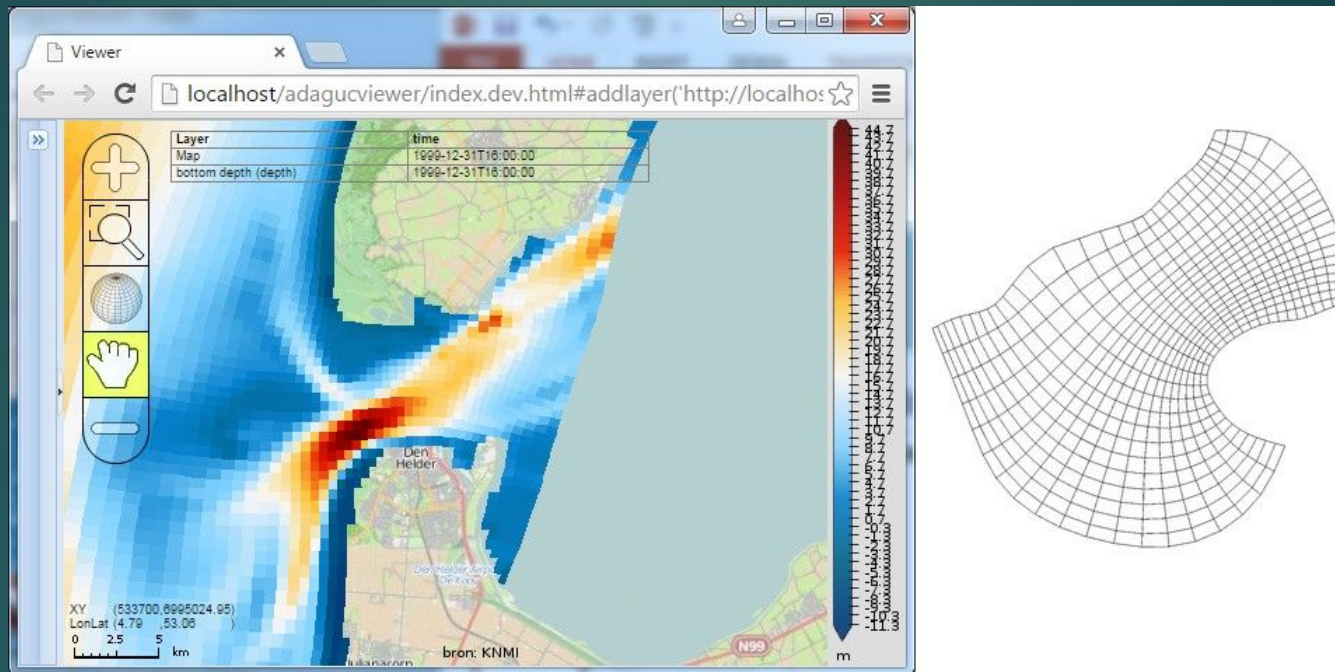
# Data : Point measurements / observations



- Point data / timeseries
  - Measurements from automated weather stations, timeseries
  - Seismological measurements



# Data : Curvilinear data

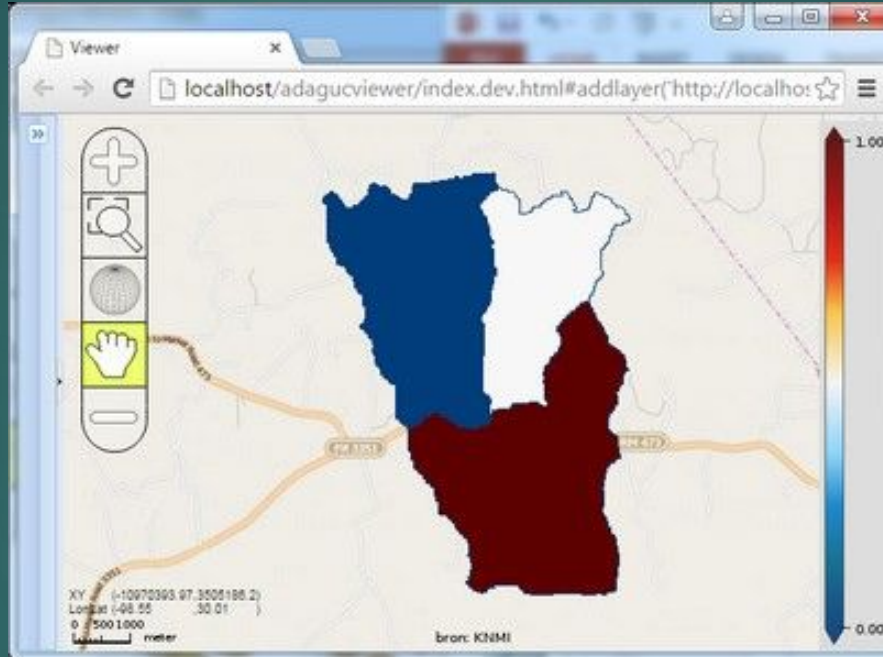


- ▶ Curvilinear data – Models
  - ▶ Fluid mechanics
  - ▶ Quads are linked with irregular shape and size





# Data : Unstructured grids – UGRID

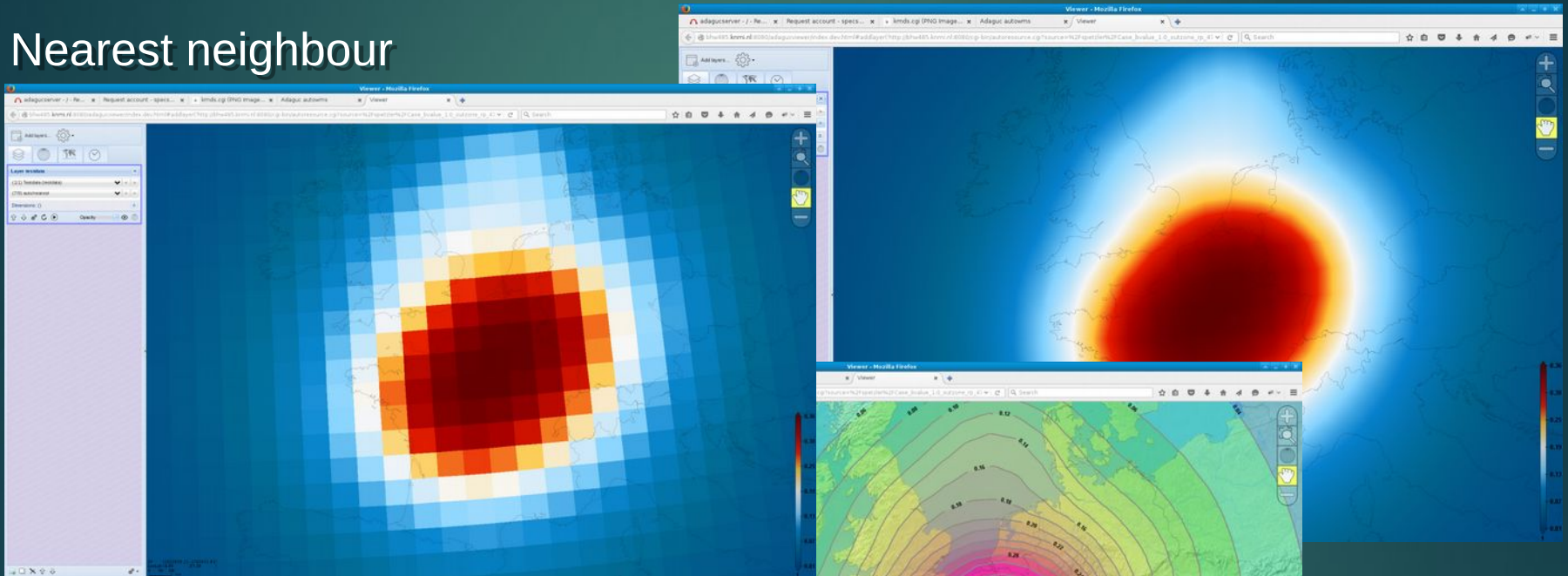


- Unstructured grids according the UGRID convention
  - Land boundaries, river catchments, masks,
  - Data stored as mesh: lines and polygons



# Nearest neighbor, bilinear and contour

Nearest neighbour

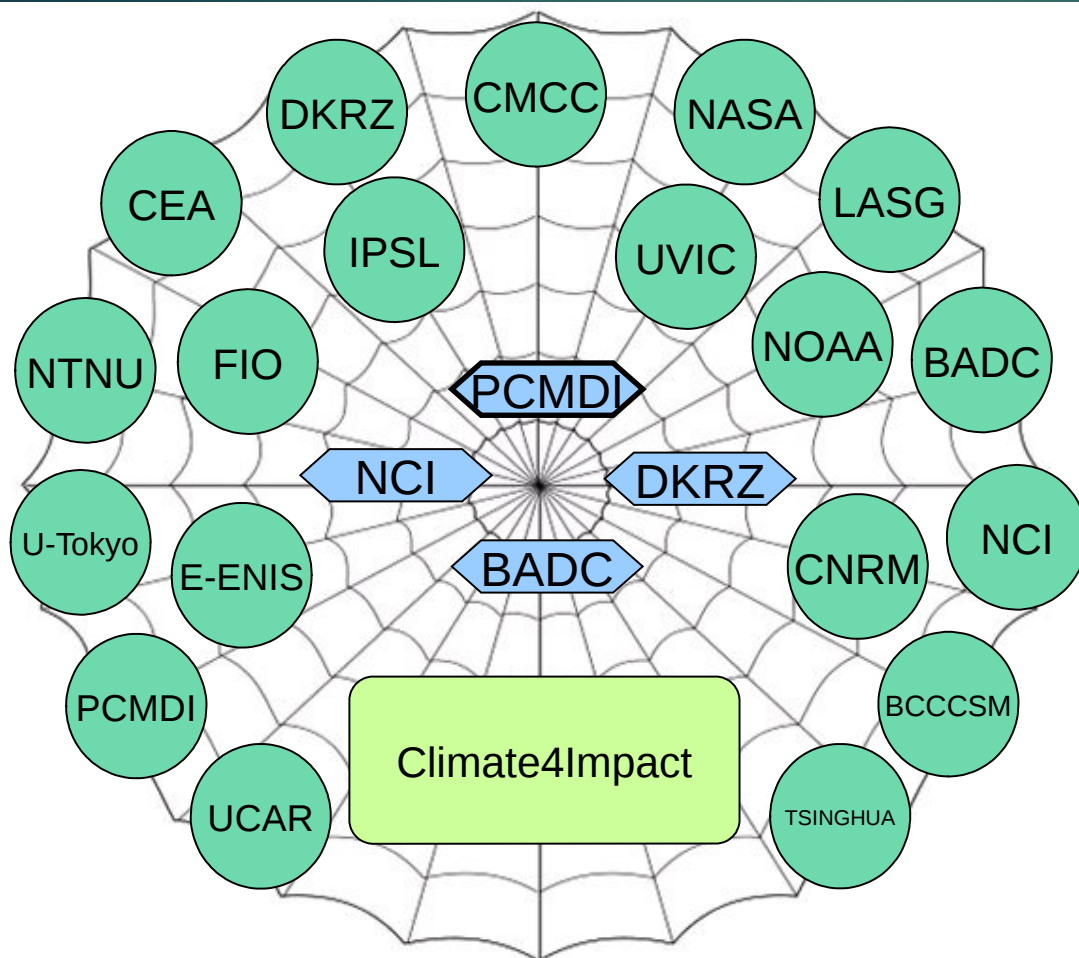


Bilinear

Shading + Contours

ADAGUC WEB-based visualization

# Earth System Grid Federation

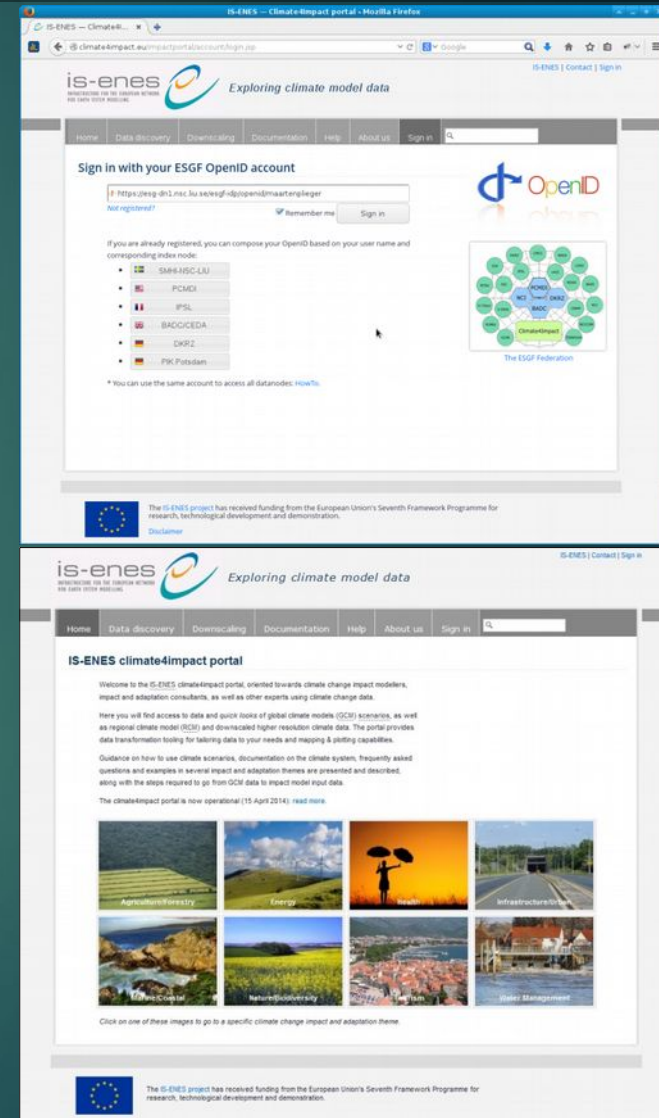


- Robust and distributed
- Global Climate Model Data (CMIP5)
- Regional Climate Model Data (CORDEX)
- ~3 Petabyte of data
- **Search API**
- **OpenDAP data access**
- **THREDDS Catalogs**
- Climate4Impact builds on and contributes to this global infrastructure
- KNMI is installing a data node for UERRA





- ▶ Platform for impact researchers to explore climate data and perform analysis
- ▶ Searches ESGF using search API
- ▶ Visualizes ESGF data using OpenDAP
- ▶ Uses ADAGUC WMS visualization
- ▶ Perform calculations
  - ▶ Climate indices calculation, data reduction
  - ▶ Personal store for processing outcomes
  - ▶ Upload and store your own data





# For UERRA datasets



- ▶ KNMI can help setting up visualization services
  - ▶ Serve your data via OpenDAP – Install THREDDS
  - ▶ Install ADAGUC server at institute
  - ▶ Make your data available through ESGF
    - ▶ fixed data format and conform to strict standard
- ▶ KNMI is installing an ESGF data node for UERRA
  - ▶ Available June 2016
- ▶ Climate4Impact uses ESGF
  - ▶ Visualizes OpenDAP resources and WMS services
- ▶ Automatic WMS on files is available
  - ▶ <http://euro4mvis.knmi.nl/>



# Thanks for listening!!!

- ▶ <http://euro4mvis.knmi.nl/>
- ▶ <http://adaguc.knmi.nl/>
- ▶ <https://climate4impact.eu/>



- ▶ For any questions:
  - ▶ Else van den Besselaar: [besselaar@knmi.nl](mailto:besselaar@knmi.nl)
  - ▶ Maarten Plieger: [maarten.plieger@knmi.nl](mailto:maarten.plieger@knmi.nl)

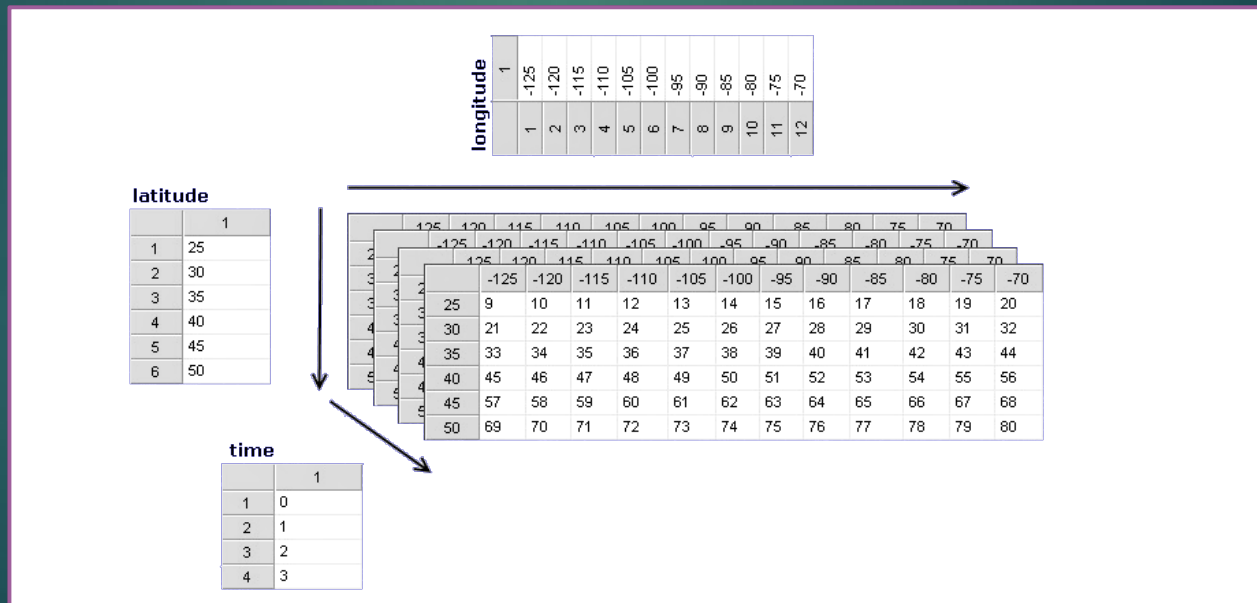






# Data format: NetCDF-CF

- ▶ NetCDF4 with Climate and Forecast conventions
- ▶ Standard names and units
- ▶ Identify and compare
- ▶ Dimensions, variables and attributes



# Drill down search results using available filters

**Selected filters:**  
none

**Filters:**  

Project (5) Parameter (645) Frequency (8) RCP/Experiment (100) Model (75) [> more...](#)

Quick select

All variable properties (645)

**Temperature**

- ☐ Temperature (tas)
- ☐ Min. Temperature (tasmin)
- ☐ Max. Temperature (tasmax)
- ☐ Air Temperature (ta)

**Precipitation**

- ☐ Rain (pr)
- ☐ Conv. Precip. (prc)
- ☐ Snow (prsn)

**Humidity**

- ☐ Specific Humidity (huss)
- ☐ Rel. Humidity (hurs)
- ☐ Spec. Humidity (hus)
- ☐ Rel. Humidity (hur)
- ☐ Rel. Humidity (rhs)
- ☐ Max. Rel. Humidity
- ☐ Min. Rel. Humidity (rhsmin)

**Wind**

- ☐ Wind (sfcWind)
- ☐ Max. Wind (sfcWindmax)
- ☐ E. Wind (uas)
- ☐ N. Wind (vas)

**Radiation**

- ☐ SW Radiation (rsds)
- ☐ SW Up Radiation (rsus)
- ☐ LW Radiation (rlsds)
- ☐ LW Up Radiation (rlus)
- ☐ Diff. Radiation (rsdsdiff)
- ☐ Clouds (clt)

**Pressure**

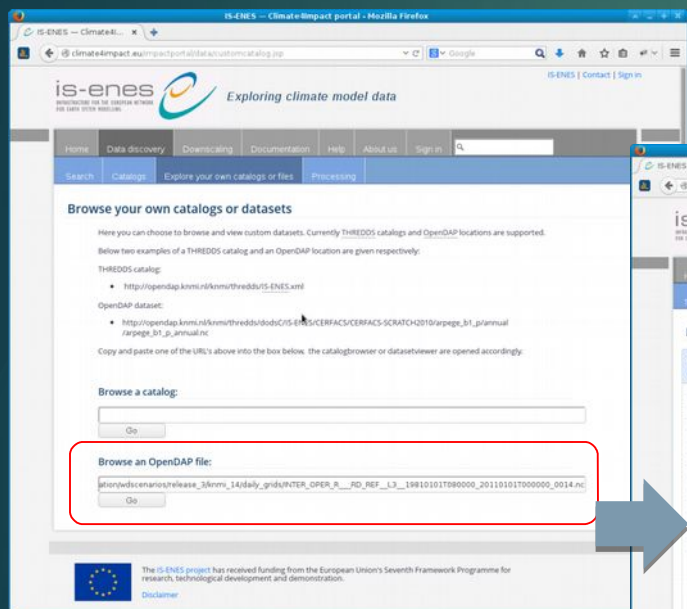
- ☐ Pressure (ps)
- ☐ SL Pressure (psl)
- ☐ Evaporation (evspsbl)
- ☐ ~~Pot. Evaporation~~



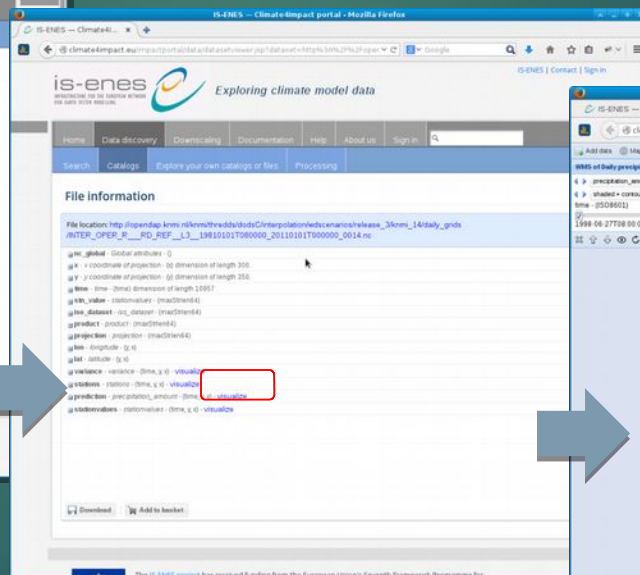


# OpenDAP Web Map

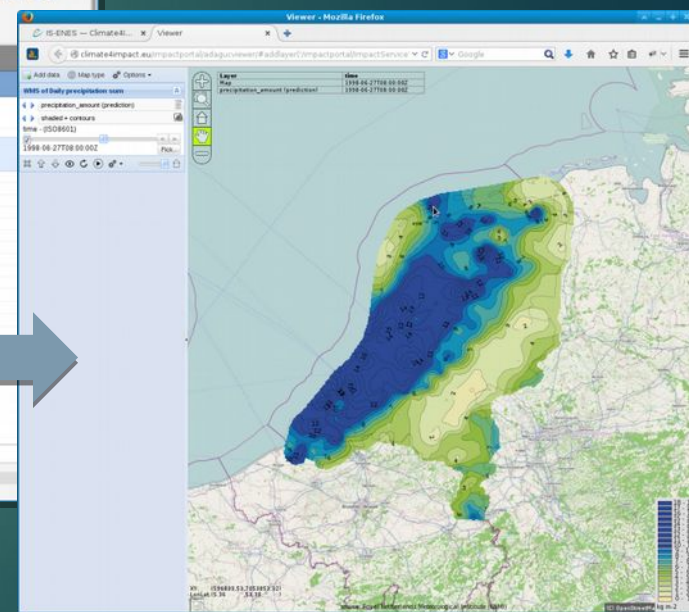
## Automatic visualization of remote data



Go to “Data discovery”/  
“Explore your own  
catalogs or files”



File Metadata



ADAGUC viewer WMS

ADAGUC WEB-based visualization