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Weather forecast visualization
Spatial DB project

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Outline

Topic

Subject

Implement a client and server for weather measurements and forecasts

Motivation

- get in touch with spatial databases like postgres/postgis
- model data in raster and vector representation
- visualize spatial data on a dynamic map

Outline

Data sources - Measurements

Deutsche Wetterdienst weather stations

- 503 weather stations in germany
- measurements like temperature, air pressure and so on.
- data available through public ftp server
  `ftp://ftp.dwd.de/pub/CDC/observations_germany/`
- data for the past (several month up to years) until today

Data sources - Measurements

Approach

- download stations metadata and measurements

  Problem: station measures for a point (not region)
- use irregular tesselation (voronoi) to calculate region

DWD weather stations

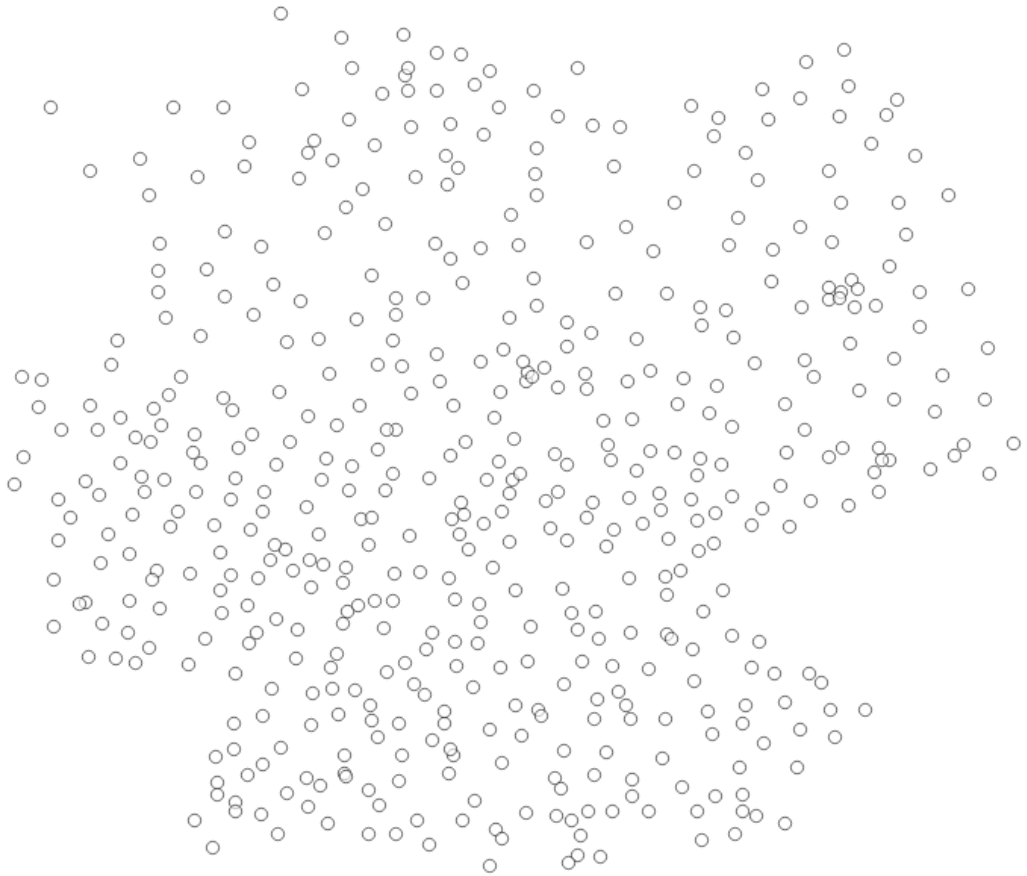

Figure: weather stations of Deutsche Wetterdienst

Natural Earth Germany

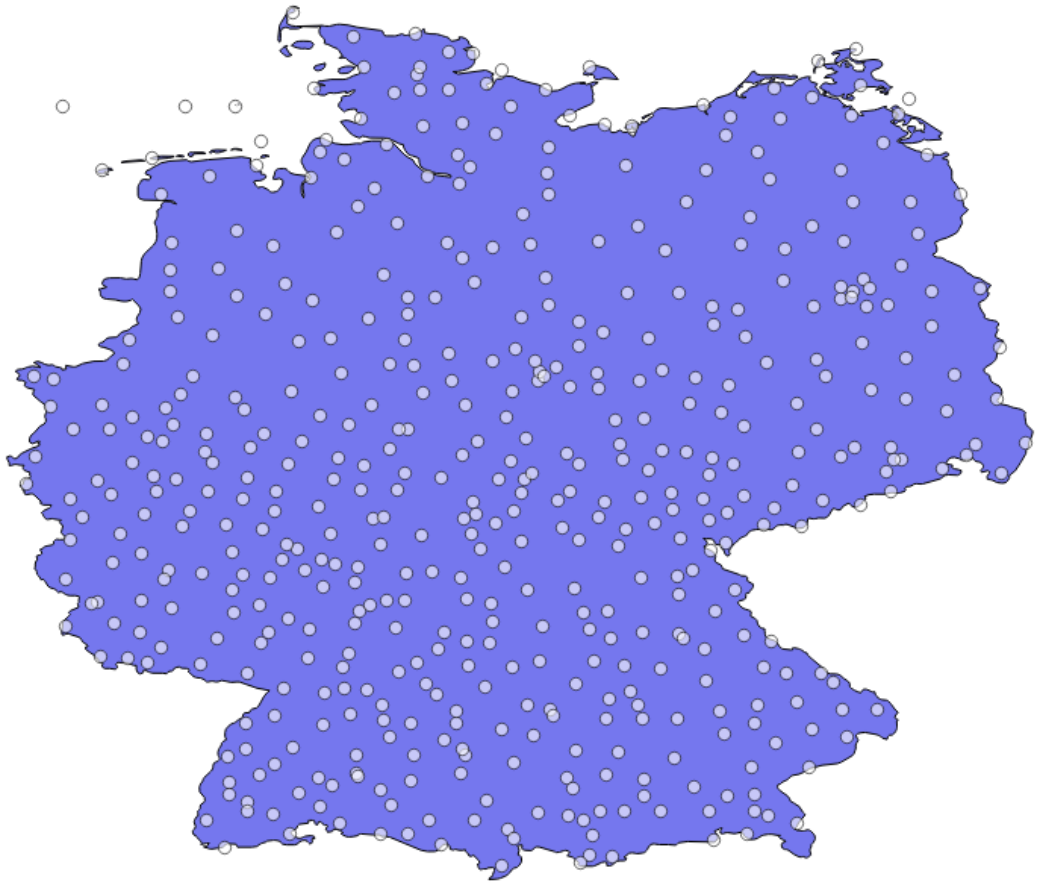

Figure: weather stations on top of polygon of germany

Voronoi

Figure: germany divided into voronoi cells based on weather stations

Outline

Data sources - Forecast

NOAA Global forecast system

- global weather forecast model
- data public available for current and past forecasts
- data format grib2 (raster)

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Raster data

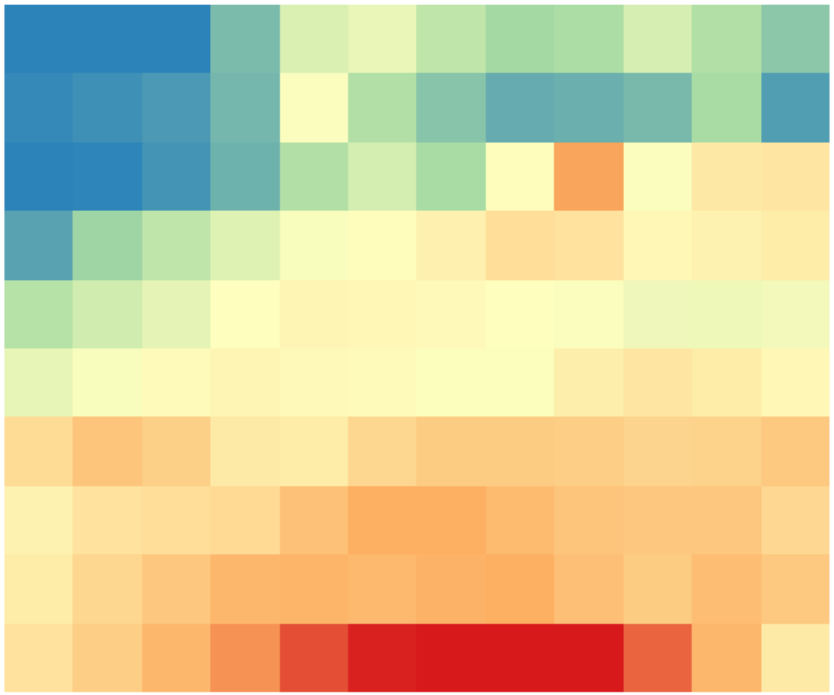

Figure: 24h forecast for *germany* 2015-02-05 18:00

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Raster data

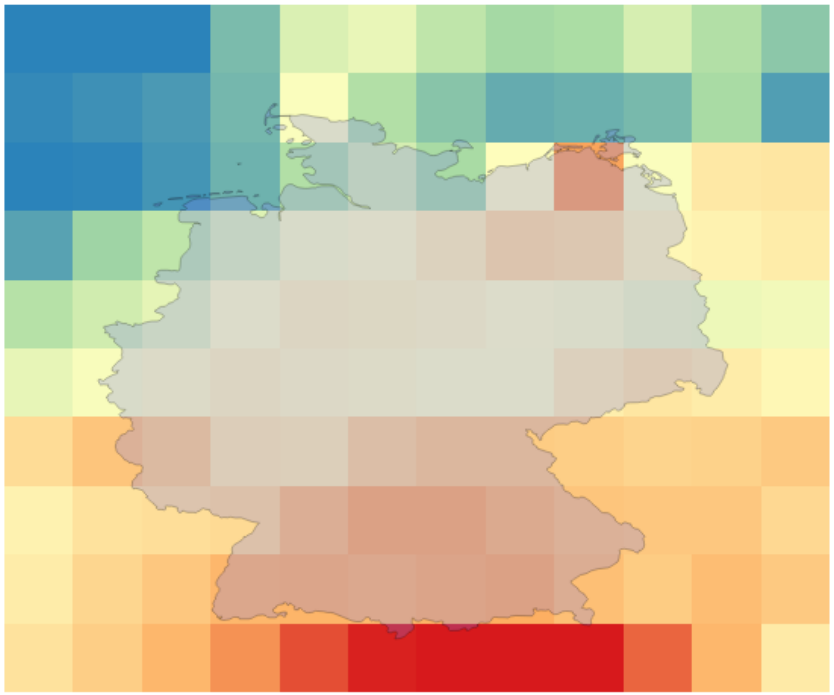


Figure: 24h forecast for *germany* 2015-02-05 18:00

Data sources - Forecast

Raster data resized and resampled (cubic interpolation)

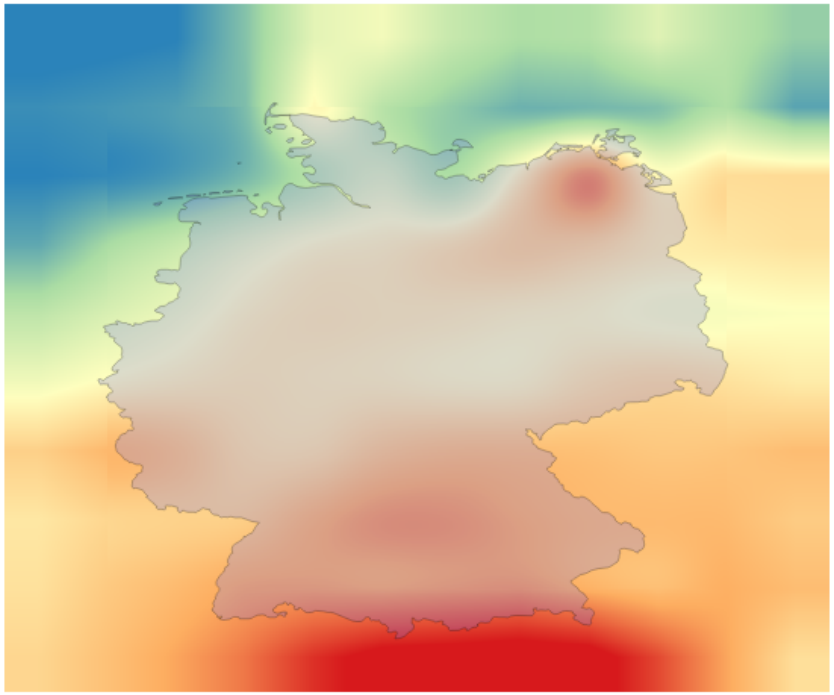
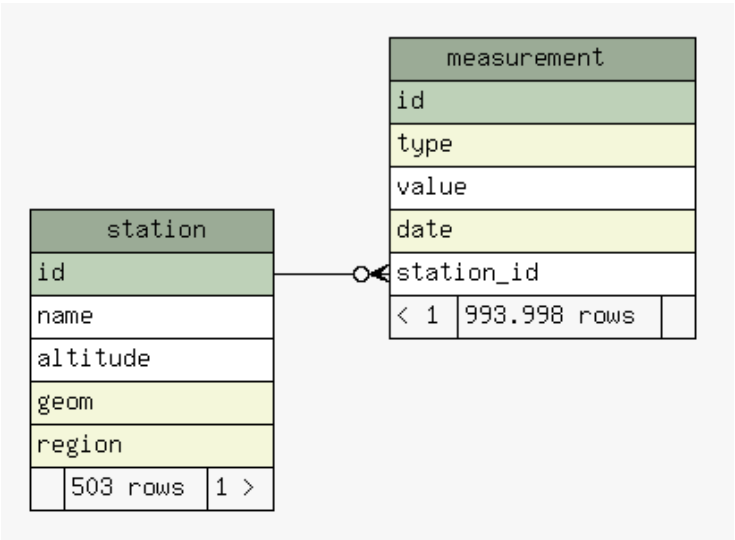


Figure: 24h forecast for *germany* 2015-02-05 18:00

Outline

Measurement

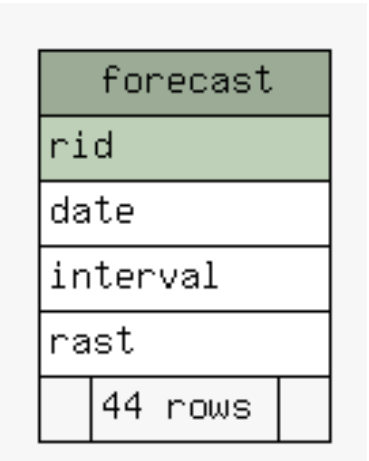
- station models weather station
- a station measures arbitrary data (measurements)



Implementation - Schema

Forecast

date	computation date
interval	time interval in future
rast	forecast data in raster format (on several bands)



Outline

Implementation - Server

Overview

language	python
database	postgres+postgis
architecture	REST api

Libraries

- flask web framework
- geoalchemy
- numpy
- shapely

Outline

Implementation - Client

Overview

language	javascript
visualization	html/svg

Libraries

- leaflet
- jquery
- spin

Demo

Presentation - Measurements

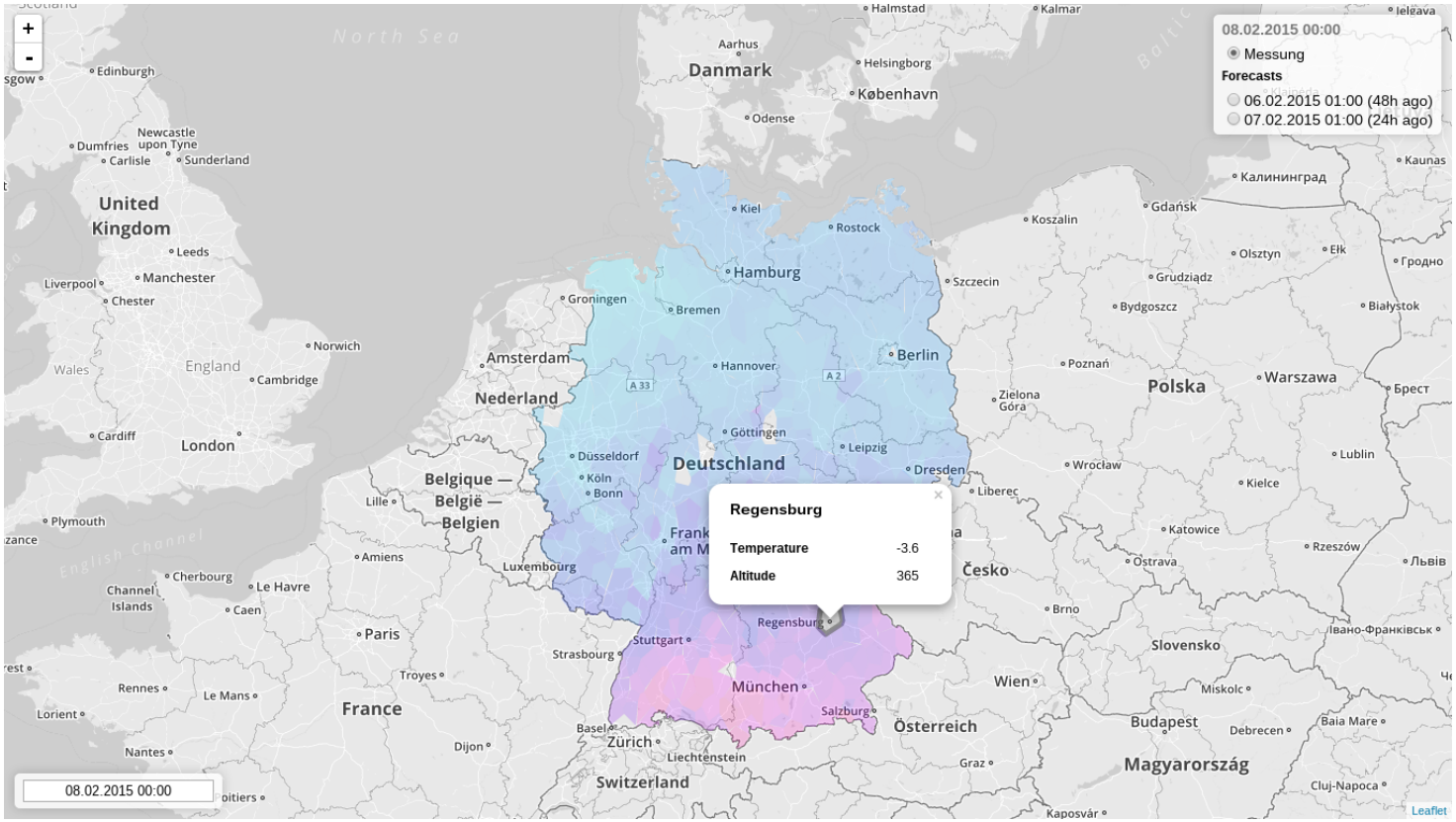


Figure: weather for germany 2012-02-08 00:00

Presentation - Forecast

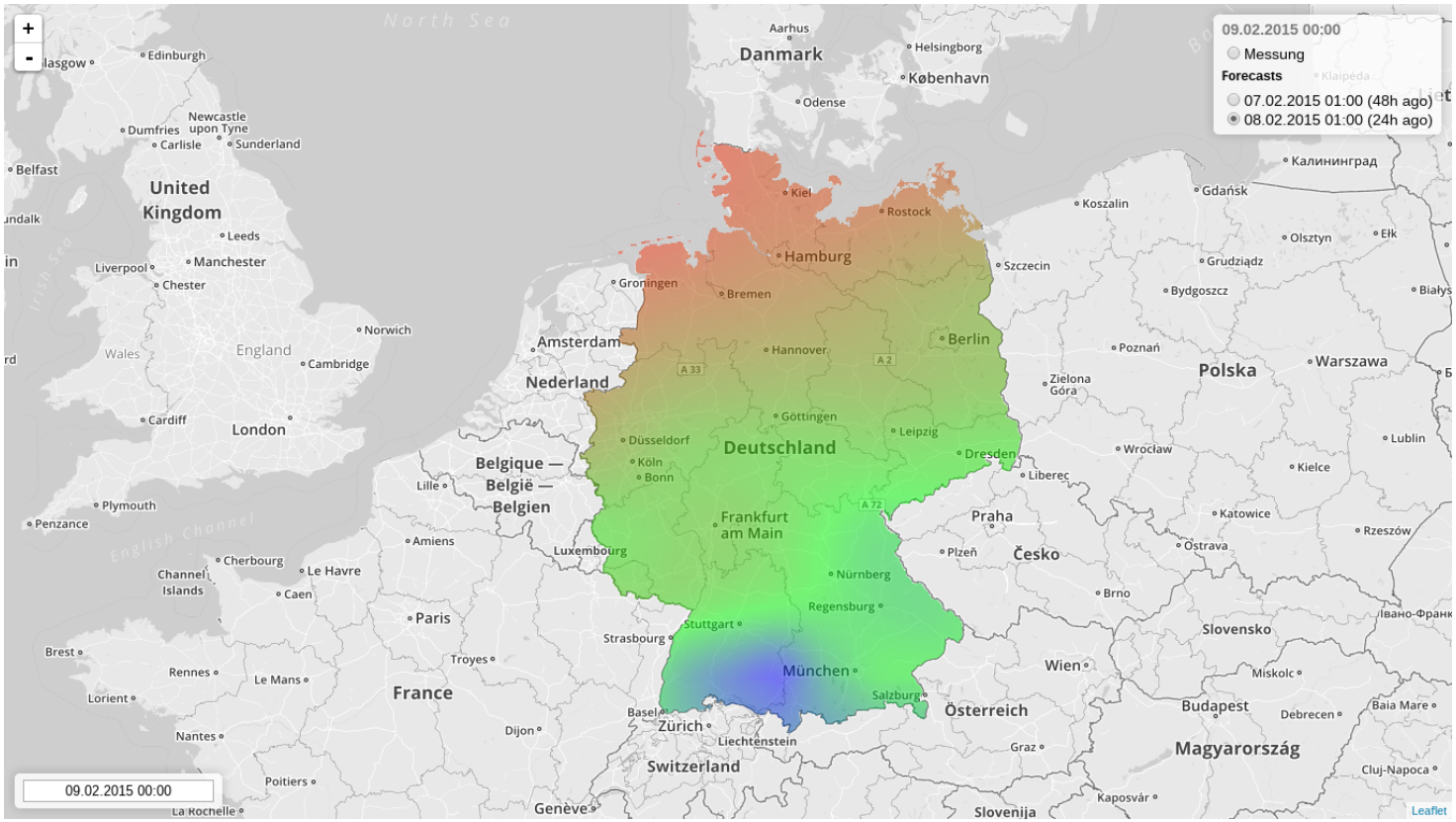


Figure: forecast for 2015-02-09 00:00 for germany 24h before

Outlook

Possible extensions

calculations	creation of own forecast system
datasets	include and integrate more forecast sources
visualisation	further features of a weather client

Summary

lessons from a mini project

- learned to account for vector and raster data in postgis
- learned latest visualisations frameworks in python

End

Question?

Feedback?