

MOTIVATION

Goal

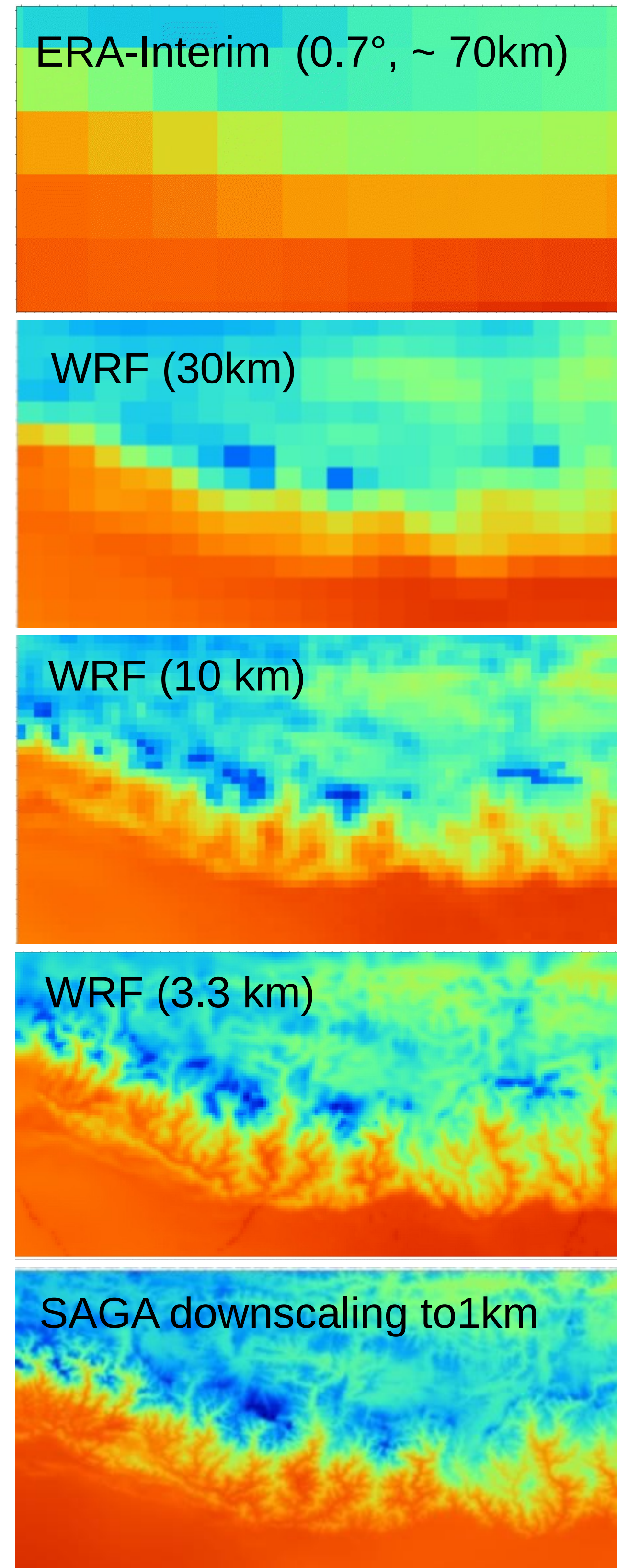
- Decision support system to optimise cultivation of agricultural crop land
 - Increase crop yield
 - Minimise damage to the environment
- Using HPC architecture to handle fine-scaled, distributed fields

Status Quo

- Input: Remote sensing, on-site measurements, weather forecast
- Test sites: Brazil, France, Germany
- Tool implementation in SAGA-GIS
 - Toil workflow engine (ongoing transition to Dask)
 - DKRZ Mistral (80th on Top500 of 2019-11)
 - Universität Hamburg research cluster
- Cooperation between Universität Hamburg and BASF SE
- Duration of project: 2016-04-01 / 2021-03-31

STATISTICAL VARIABLE DOWNSCALING

- Scale weather forecast to higher resolution target grid
- Comparison with observations shows actual benefit



Temperature

- SAGA-GIS multilevel-to-surface
- Consider ground effects

Humidity

- SAGA-GIS multilevel-to-surface
- Normalisation needed
- Consider ground effects

Near ground wind speed

- Processes 10m wind components
- Derives ESA CCI LandCover roughness length
- Consider effect of wind speed

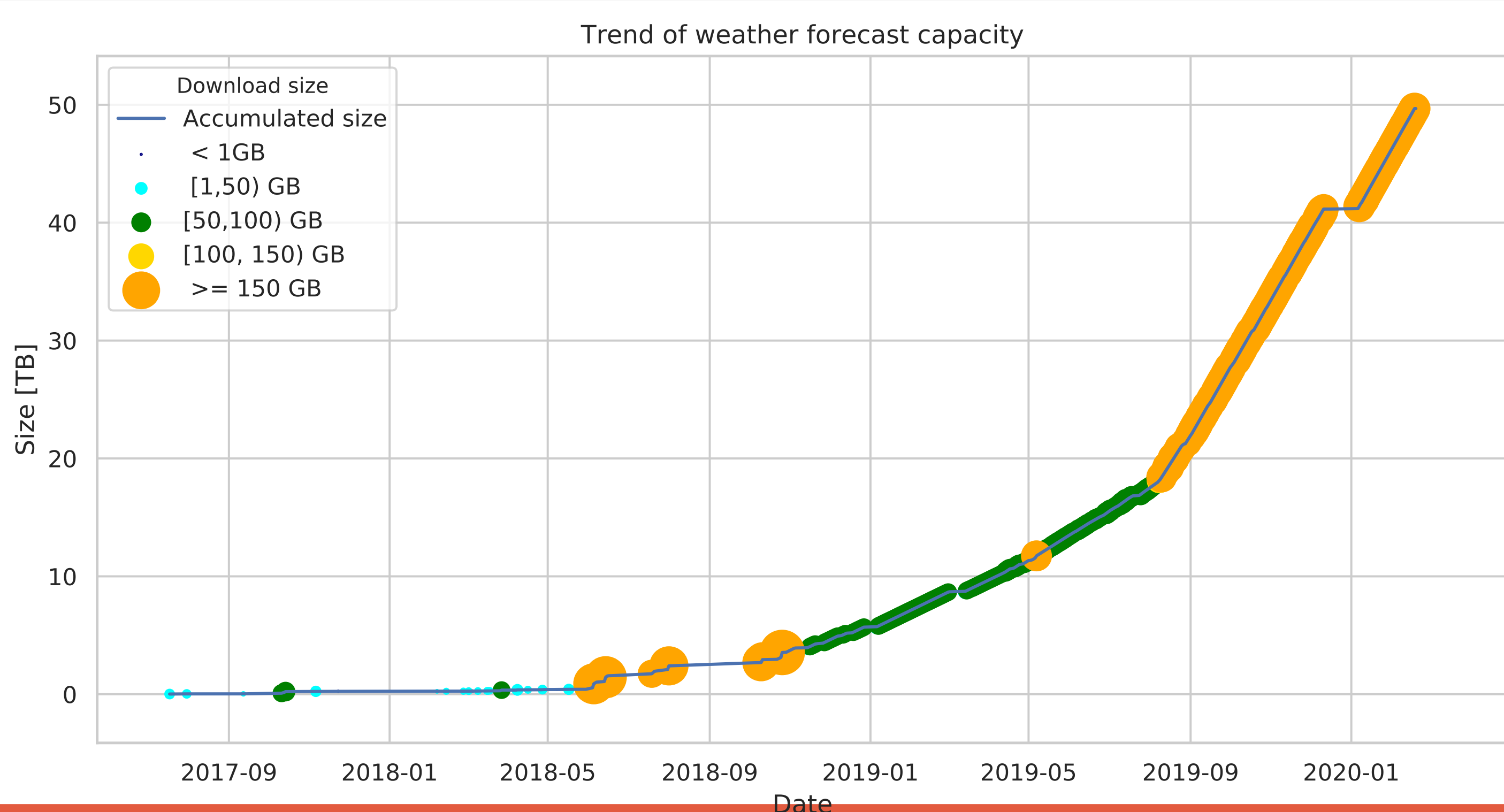
Precipitation

1. Reduce precipitation to msl
 2. Get condensation level CL (e.g. convective cloud base)
- ⇒ Case distinction: model height above CL?
 - Consider wind effect
 - Consider advective rainfall

Radiation

- Topographic effects
 - * Shadowing
 - * Slope
- 10 day interval → interpolation

OPERATIONAL DATA RETRIEVAL DURING I_SSS

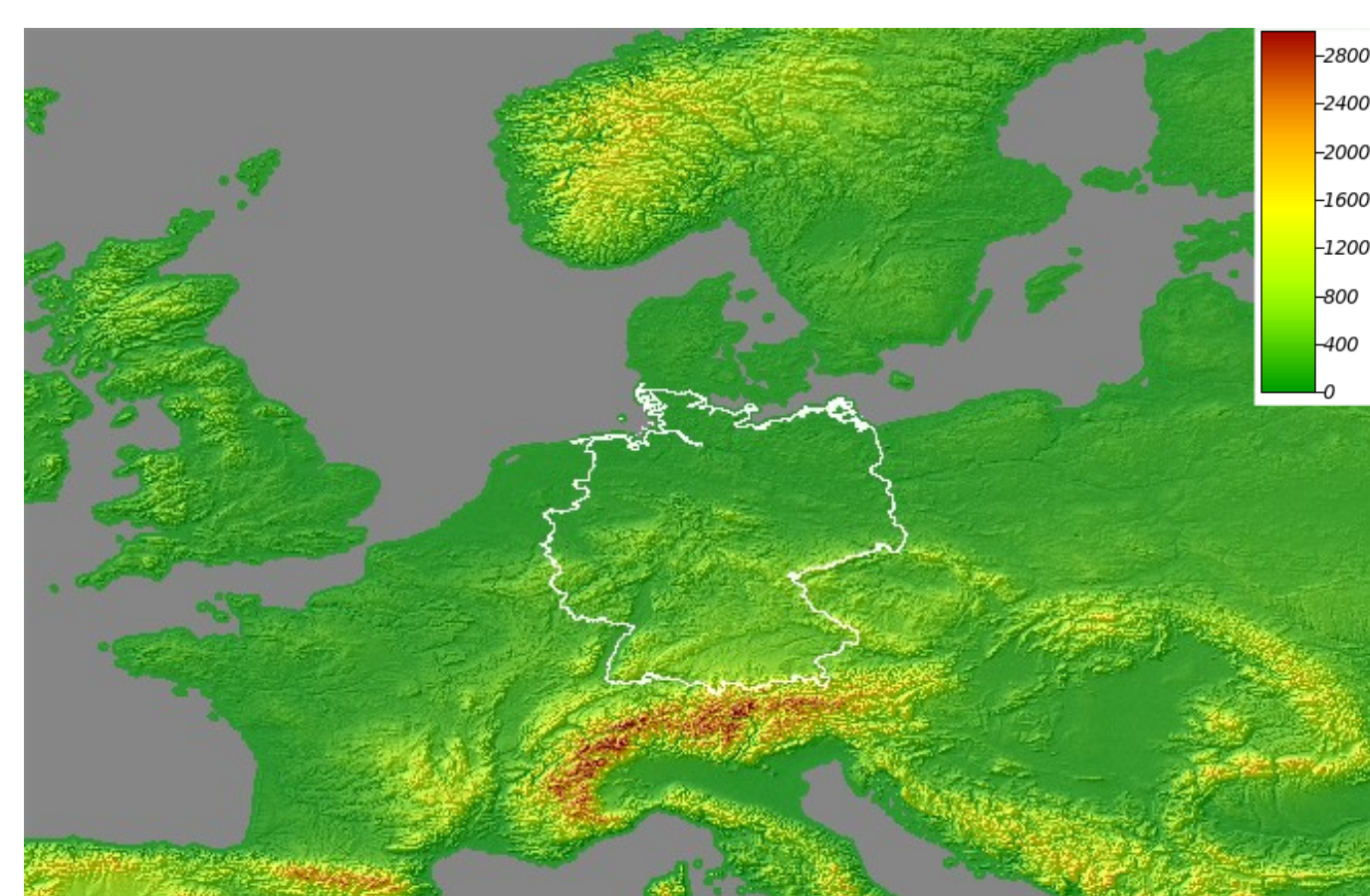


EXAMPLE: TEMPERATURE DOWNSCALING

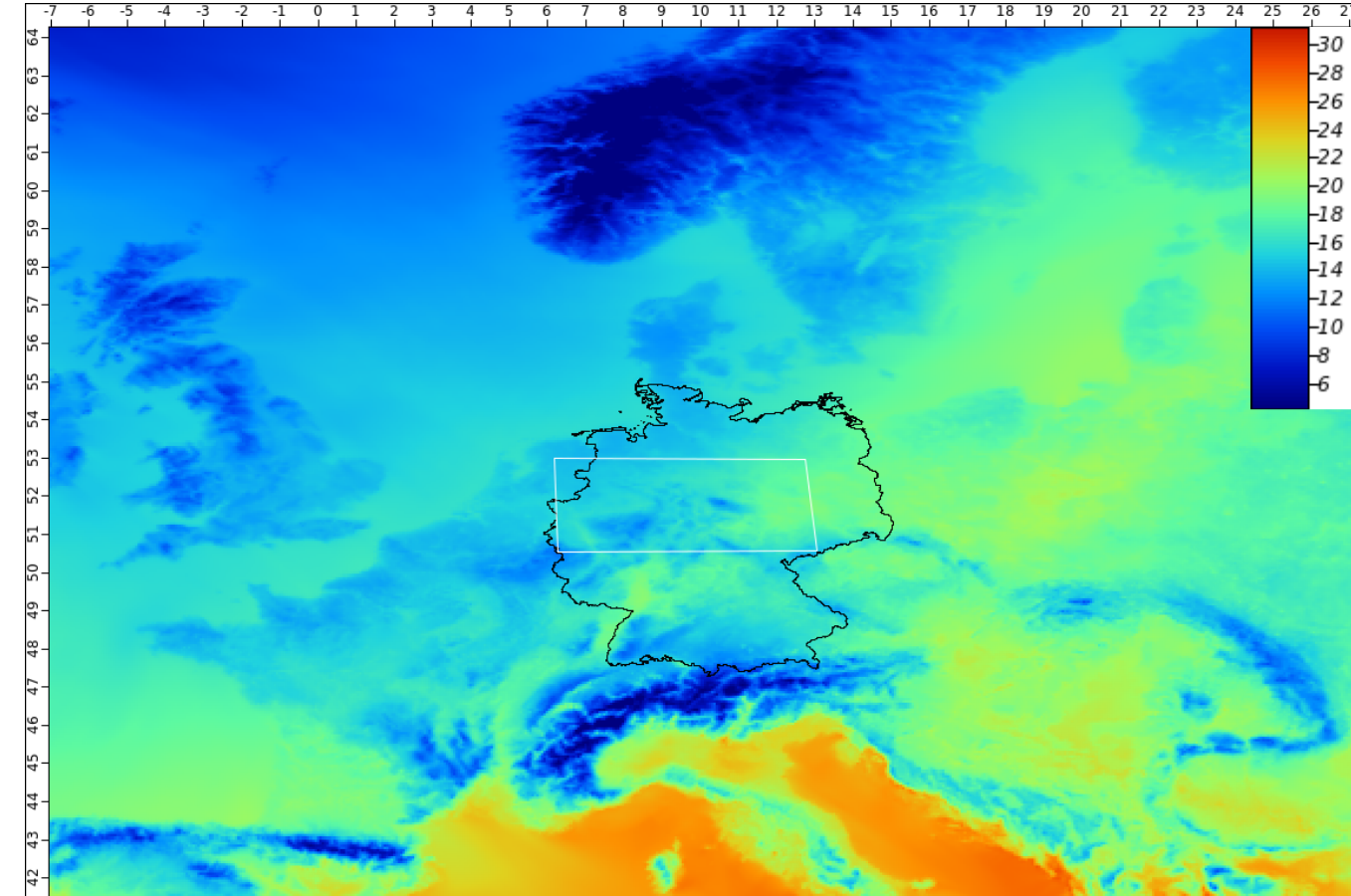
Available data sources

- ICON
 - OpenData
 - Pamore Archive
 - Status: **operational**
- ERA
 - ERA5
 - ERA5-Land
 - Status: **on demand**
- GFS
 - NCEP
 - NCDC
 - Status: **implemented**
- RADOLAN
 - Radar data on precipitation
 - Status: **implemented**

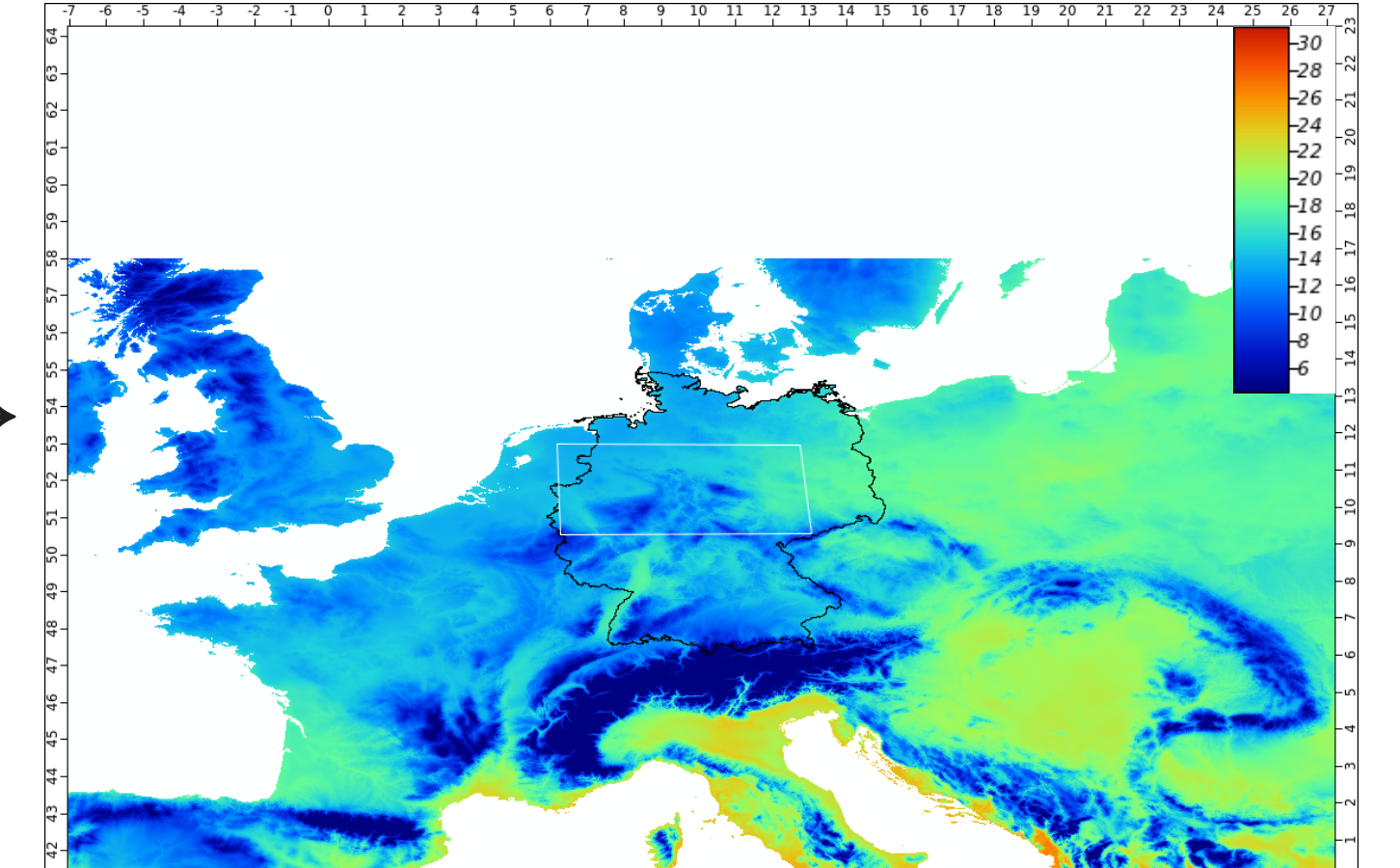
Target grid (250m)



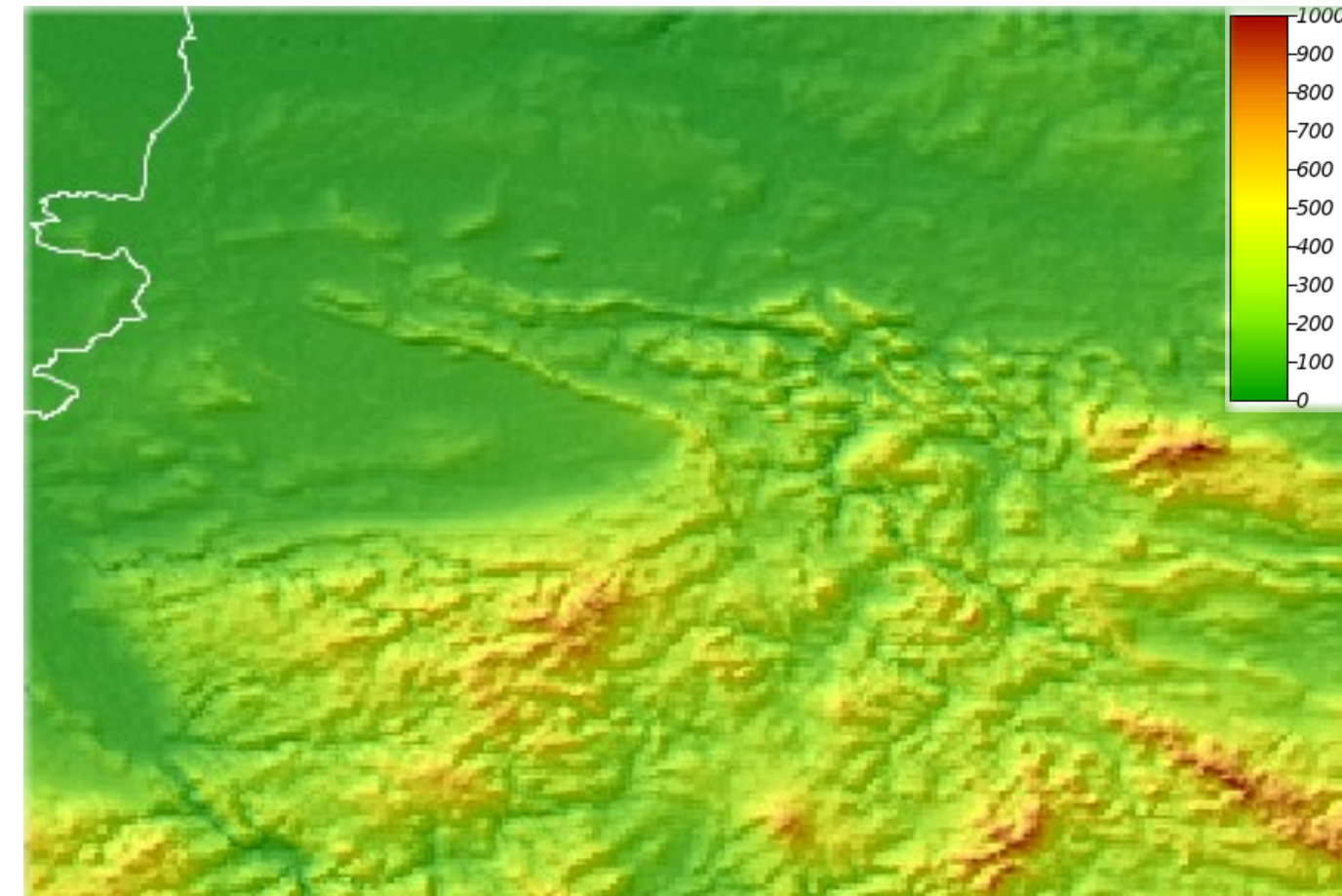
Original dataset (6.5km)



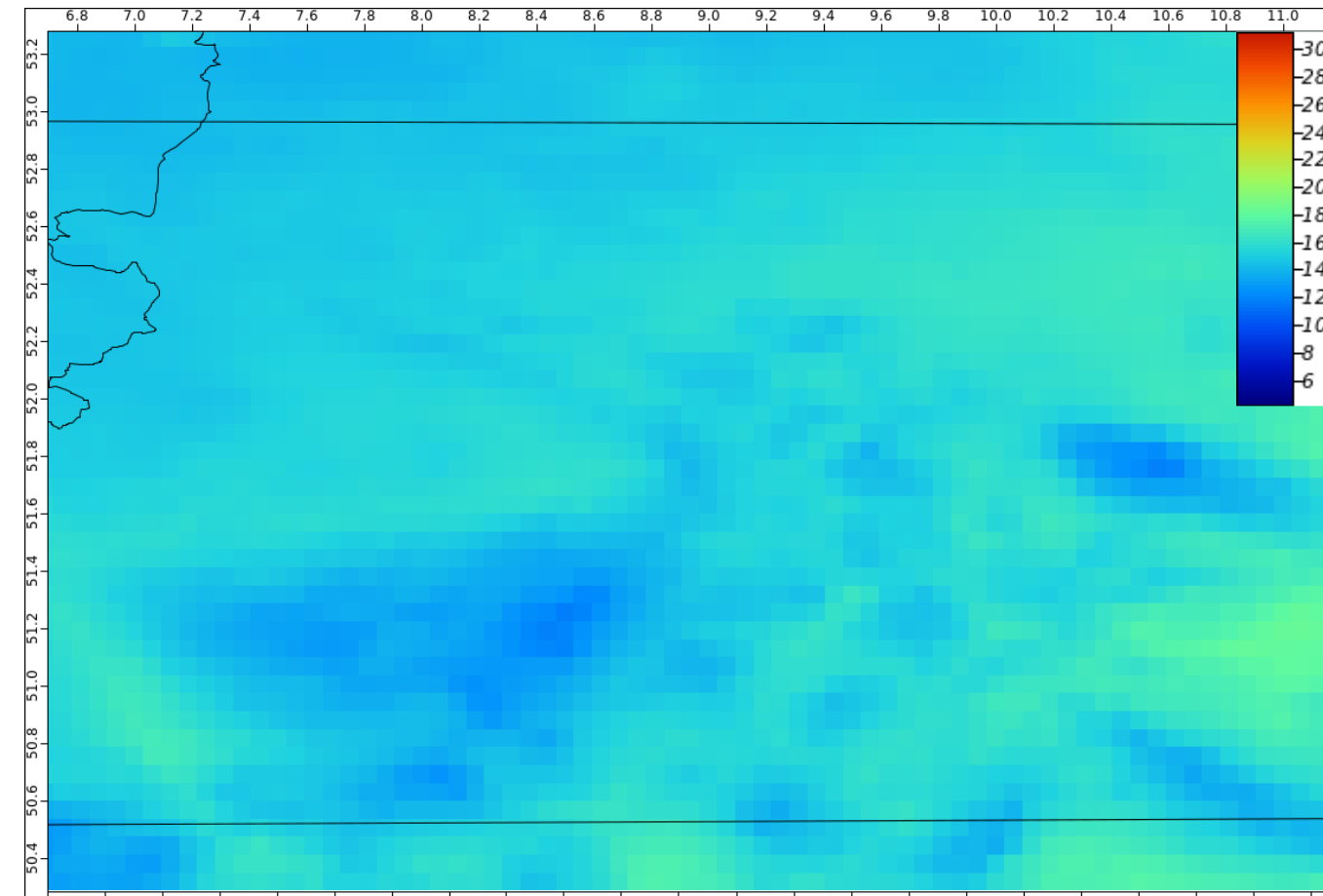
Downscaled dataset (250m)



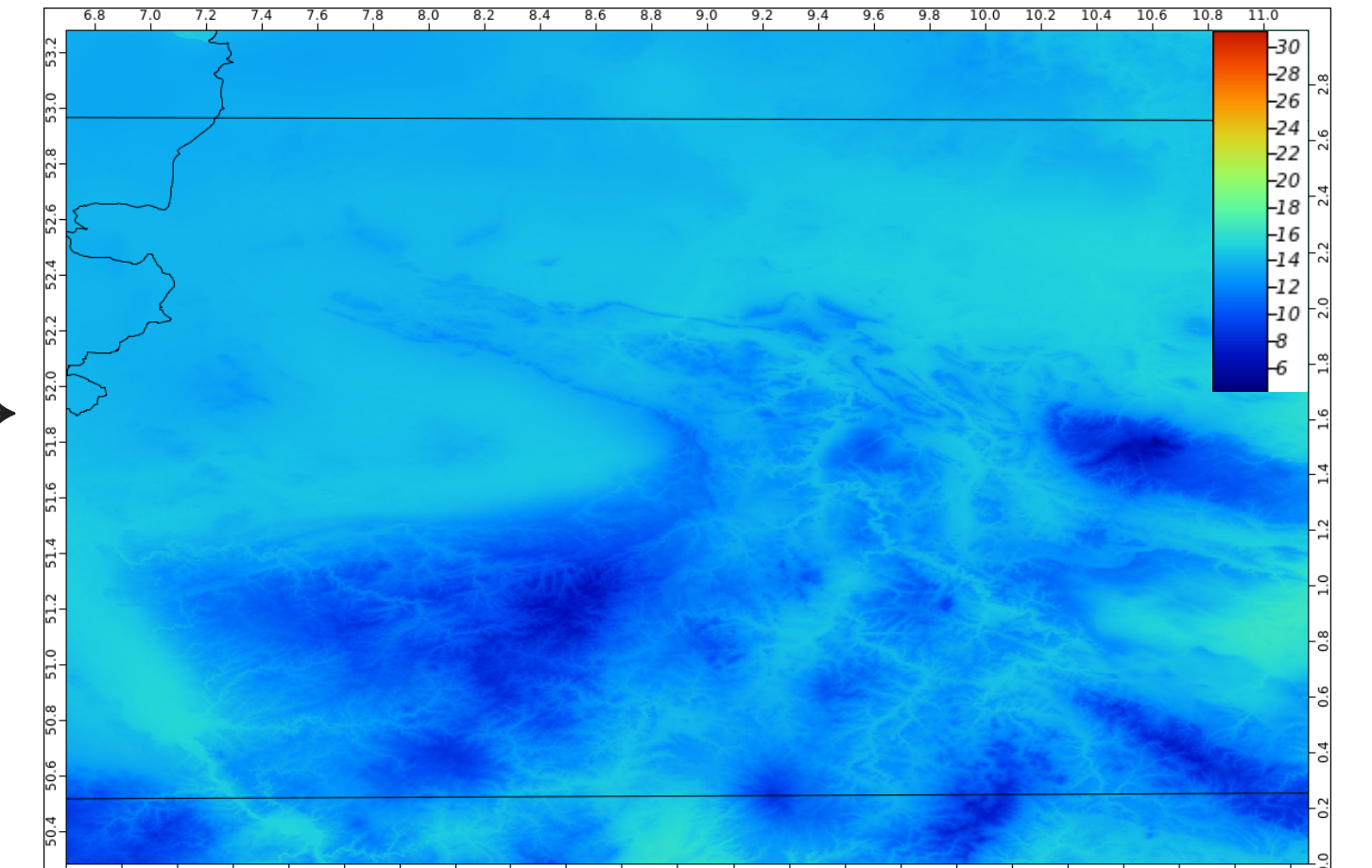
Target grid (250m)



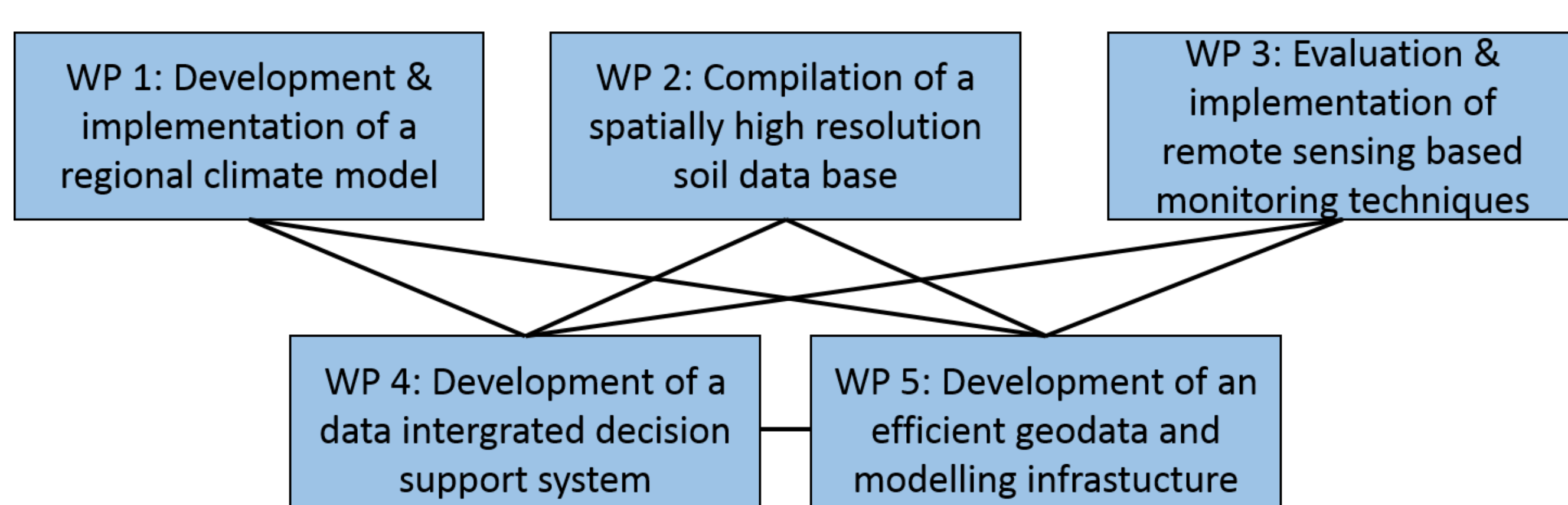
Original dataset (6.5km)



Downscaled dataset (250m)



PROJECT WORKPACKAGES



FUTURE WORK

- Finish exchange of workflow engine (Toil → Dask)
 - Implement individual DSS components as Dask tasks
 - Use more dynamic load balancing via SLURM
 - Utilise Dask distribution techniques for preprocessing
- Operationalise remaining DSS components
- Tune modeling coefficients through validation
- Integrate more advanced compression methods into workflow

URL

More information are available at https://wr.informatik.uni-hamburg.de/research/projects/i_sss/start