

Ruisdael observatory



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NLeSc
ESA
TUD

Herman Russchenberg

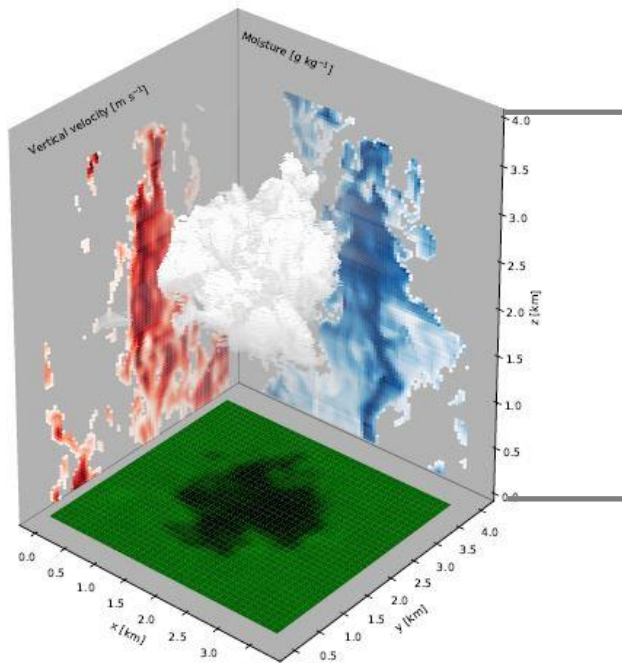
The Ruisdael Consortium

The past



The present

interactive system: land – water – carbon – aerosols - cloud



Sikma et al. (2017)



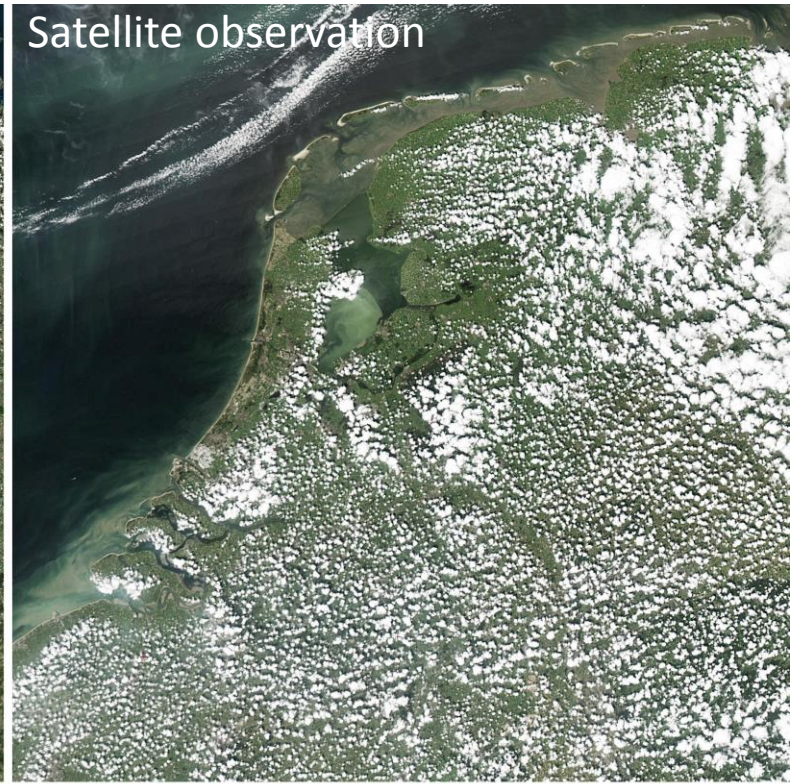
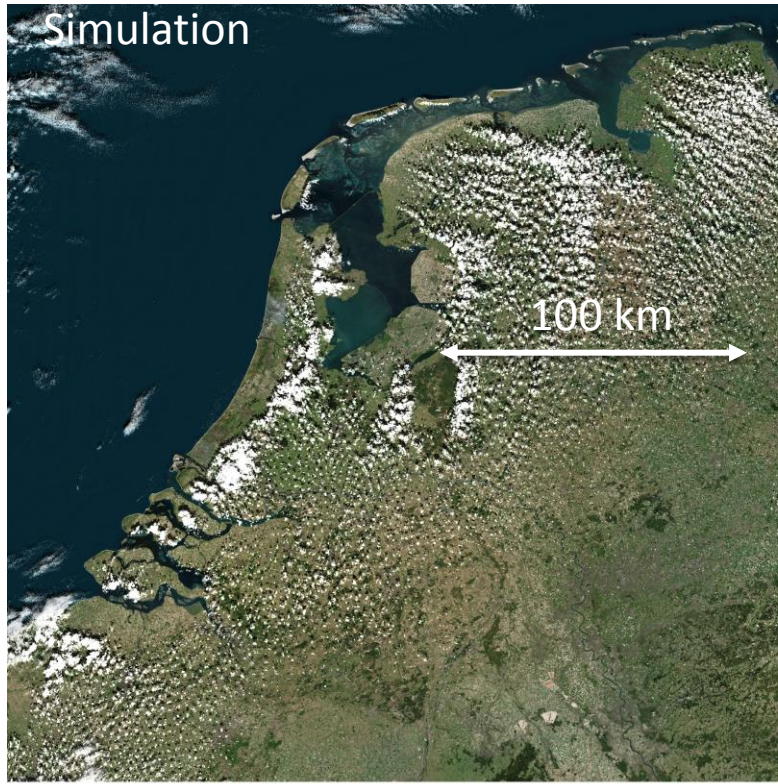
Simulations

Remote sensing

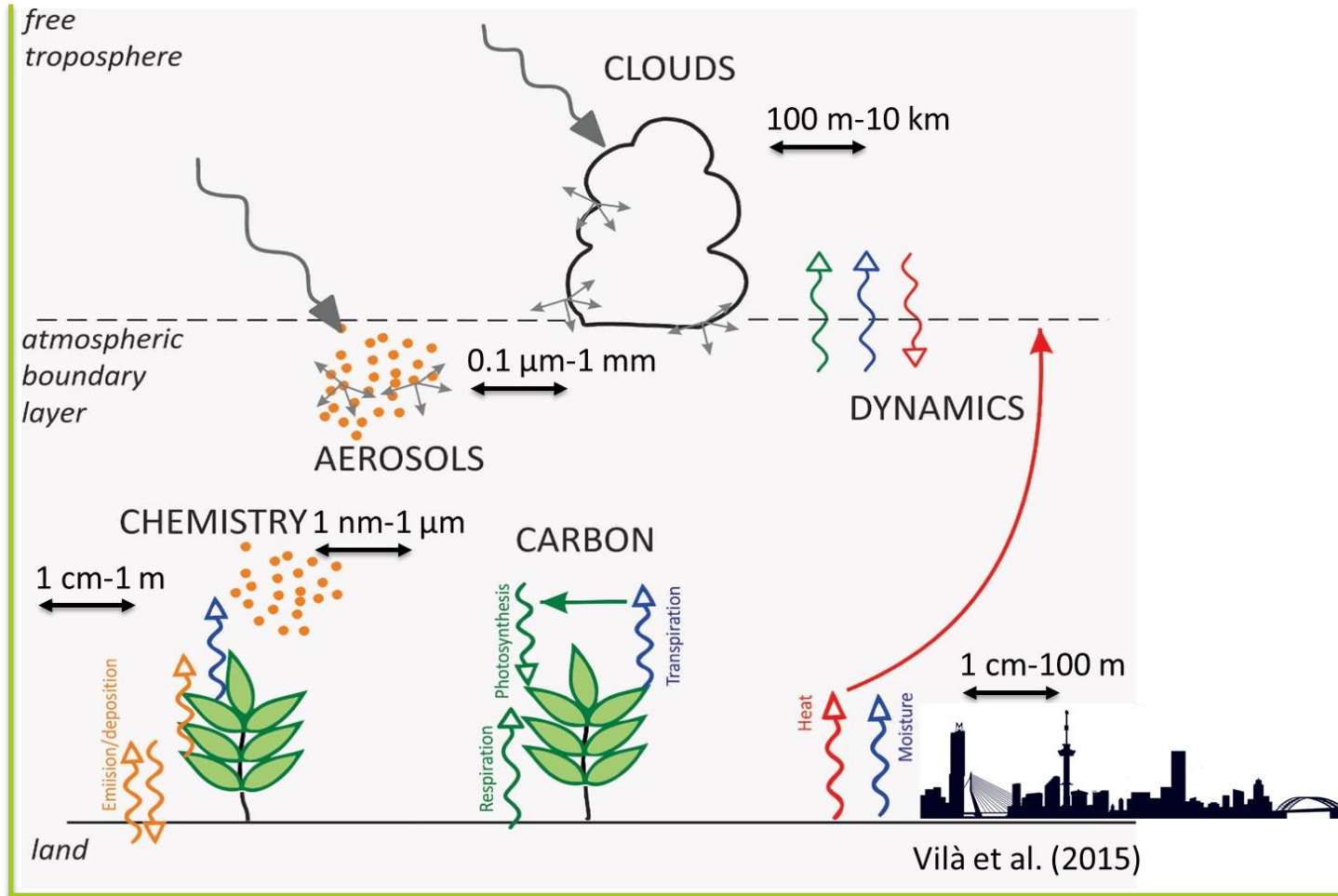
In situ

The future

Connecting the scales and spheres over a large domain



Why? The challenge zoomed in



The Scientific Challenges

Science focus 1: Forcers: aerosols and greenhouse gases

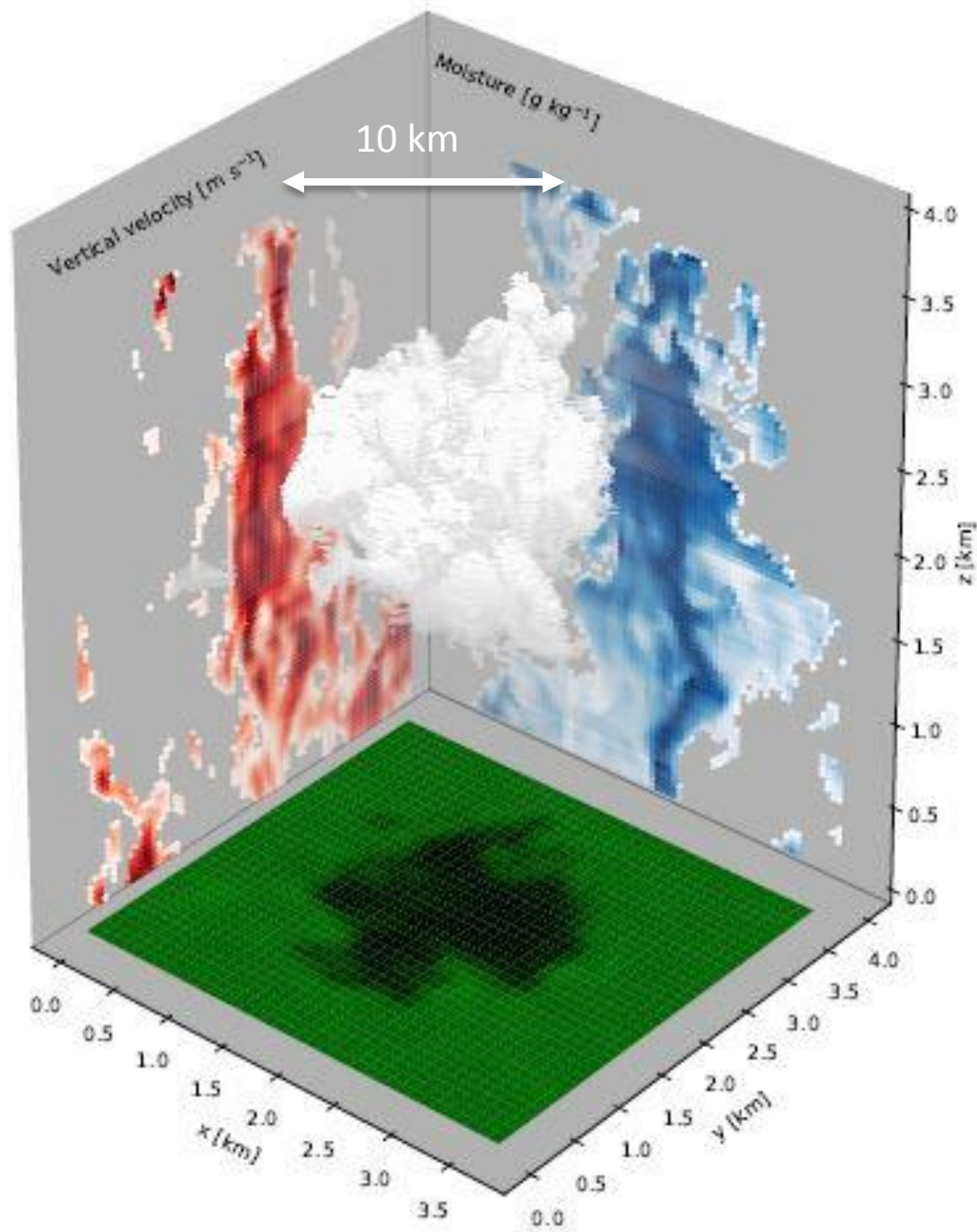
1. Understanding aerosol growth and aging
2. Aerosol, clouds and radiation
3. Multi species fingerprinting
4. Transport of emissions across scales all the way through the diffusion cascade
5. Regional and national scale emission estimates and verification of mitigation measures
6. New mitigation pathways

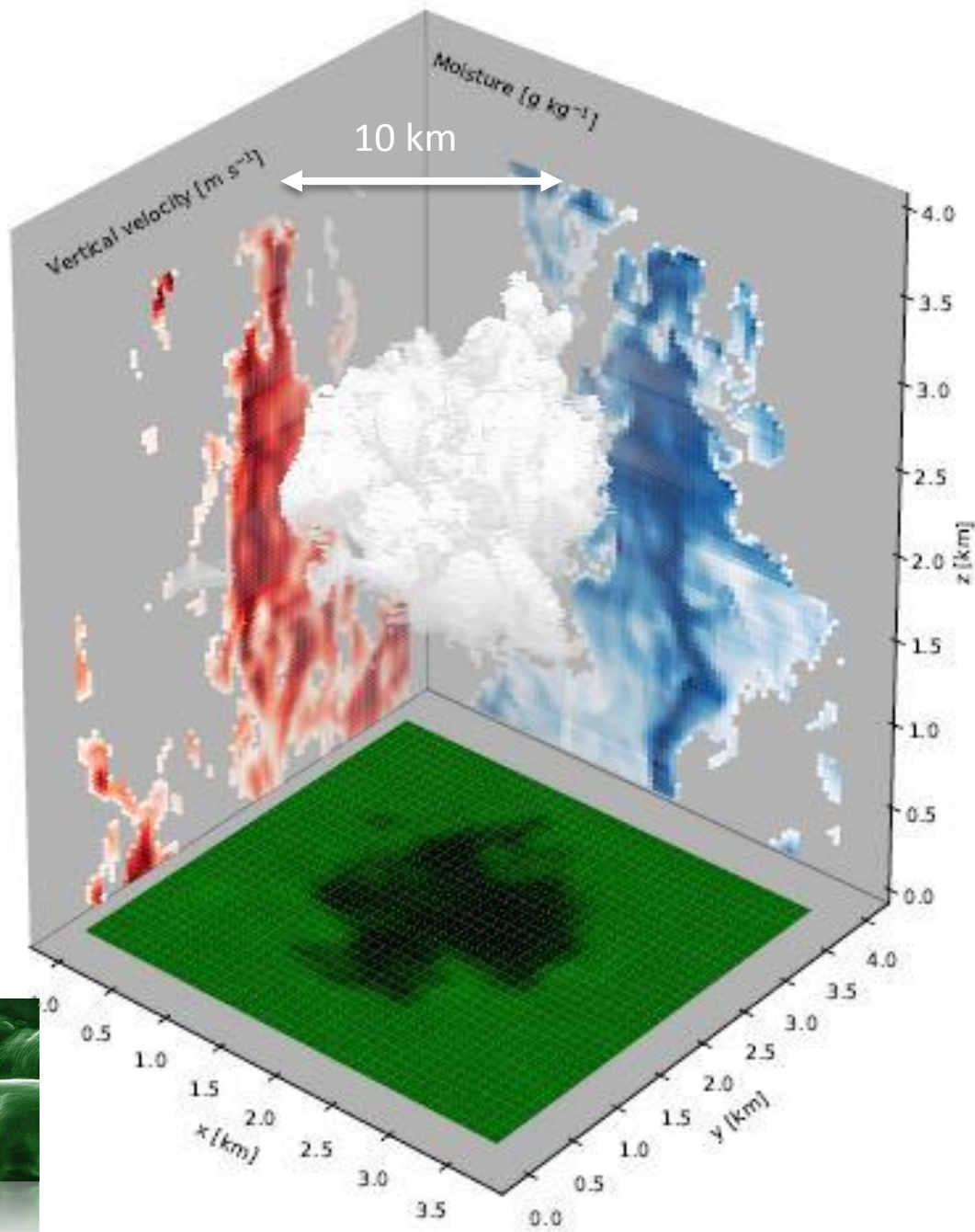
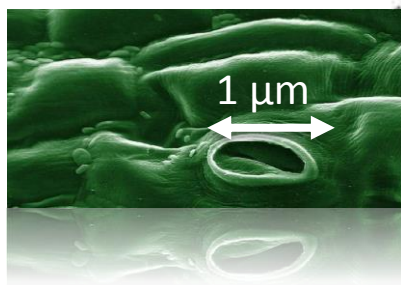
Science focus 2: Feedbacks

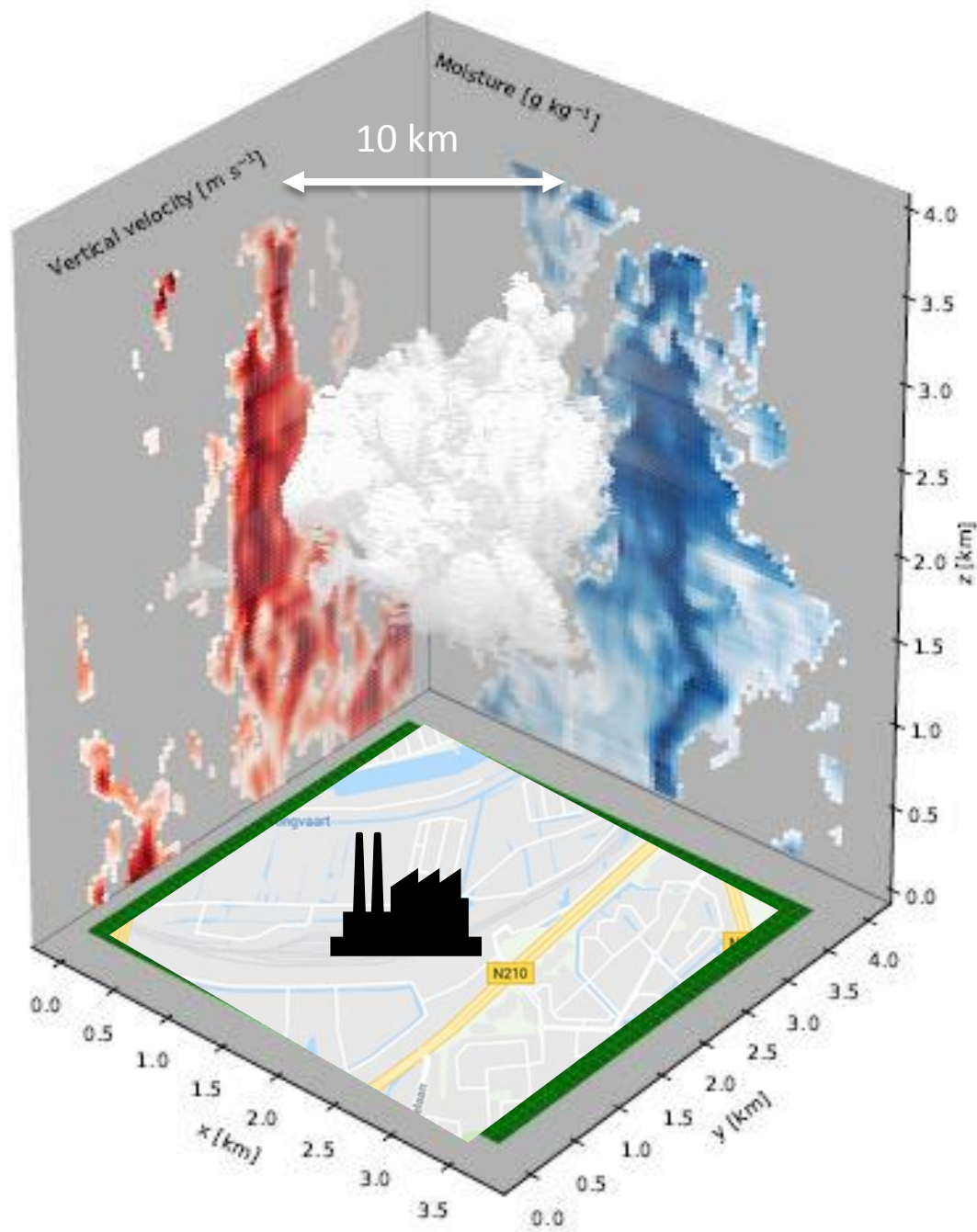
1. Coupling of clouds and precipitation to surface properties
2. Clouds and Climate
3. Extreme Precipitation and Climate
4. Carbon cycle feedbacks

Science focus 3: Forecasts: weather, air quality, climate

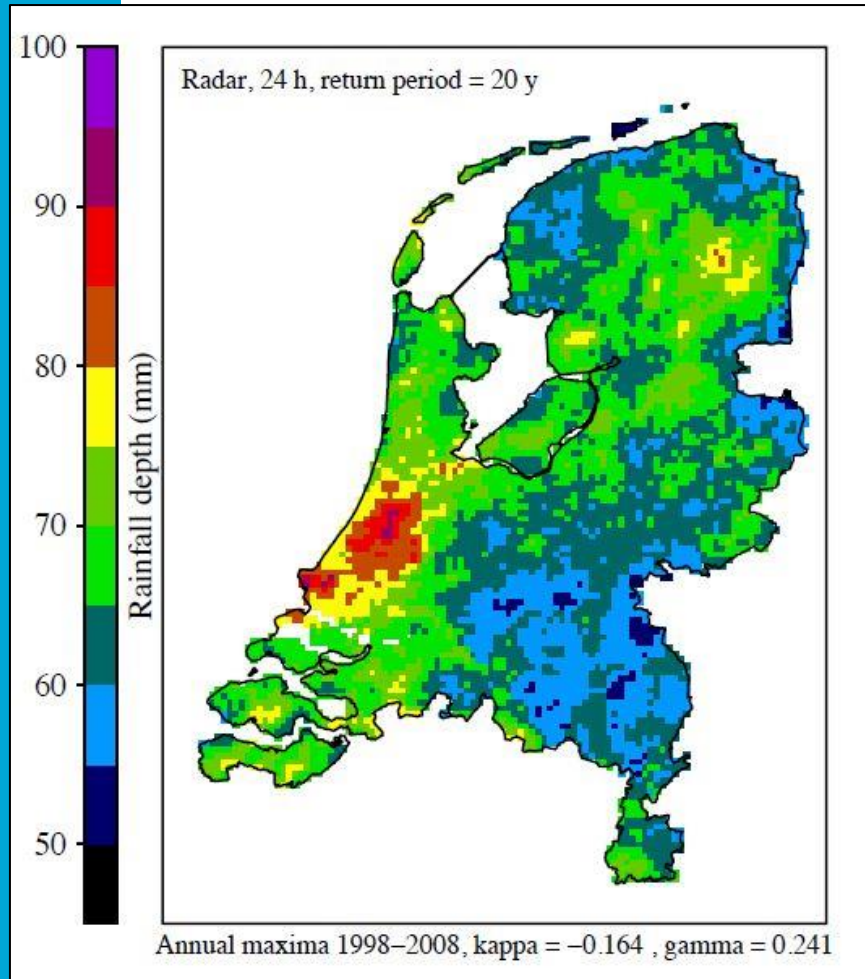
1. Cloud Heterogeneity and Radiation
2. Forecasting Precipitation
3. Momentum transport and clouds
4. Forecasting weather and air quality on the sub-kilometer scales





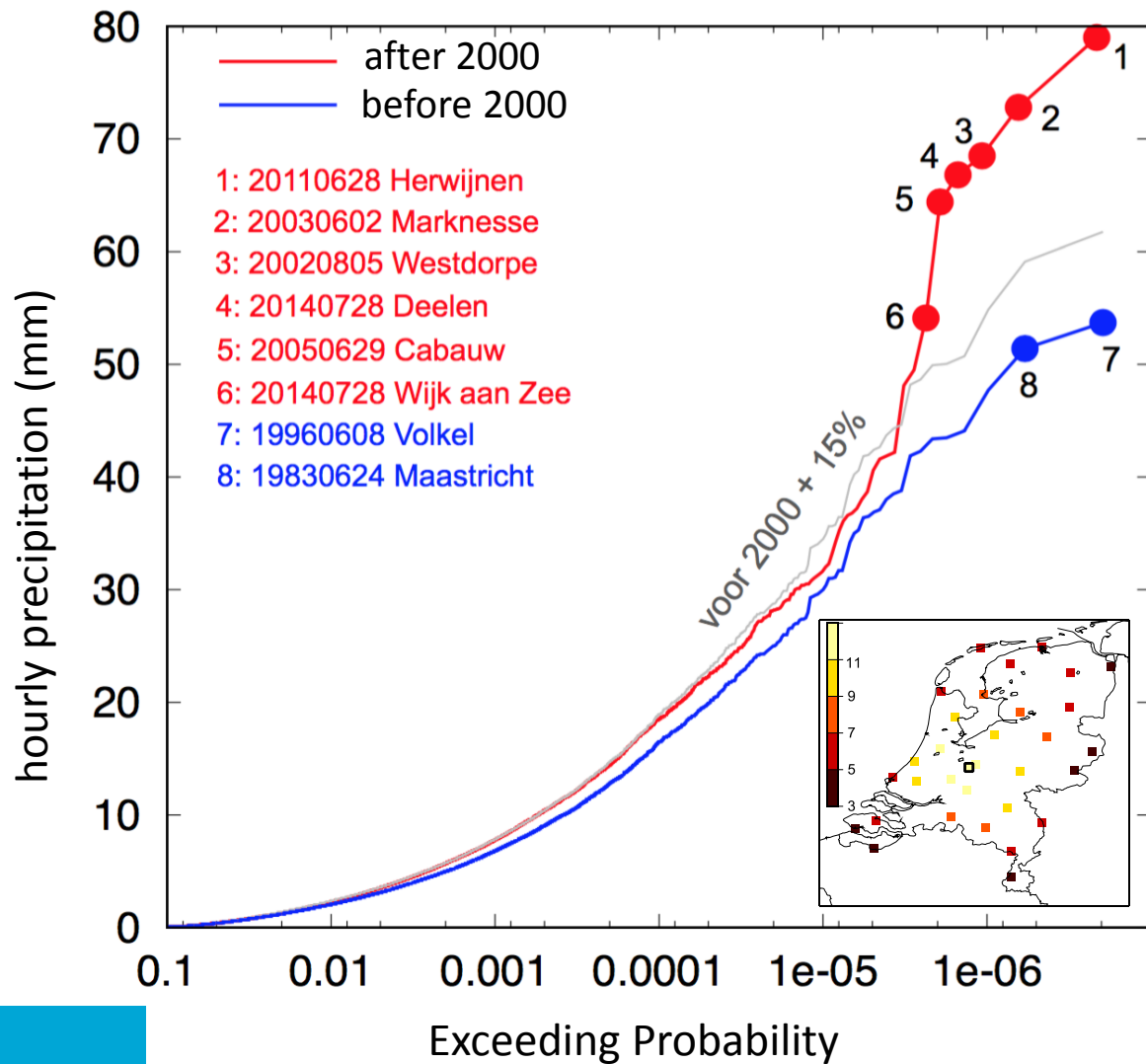


Spatial heterogeneity of the atmosphere



Annual statistics rainfall
Overeem et al, 2010

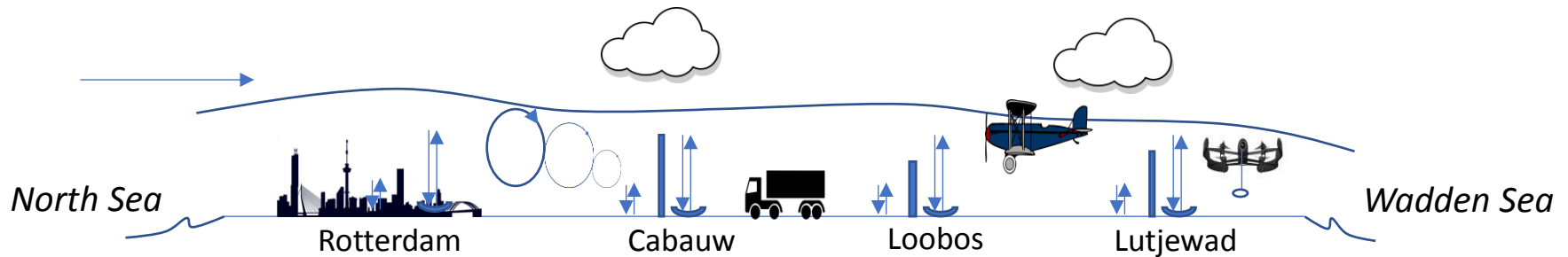
Increase of (extreme) precipitation



5 unprecedented high values after 2000

Increase of ~15% per degree warming for extreme precipitation

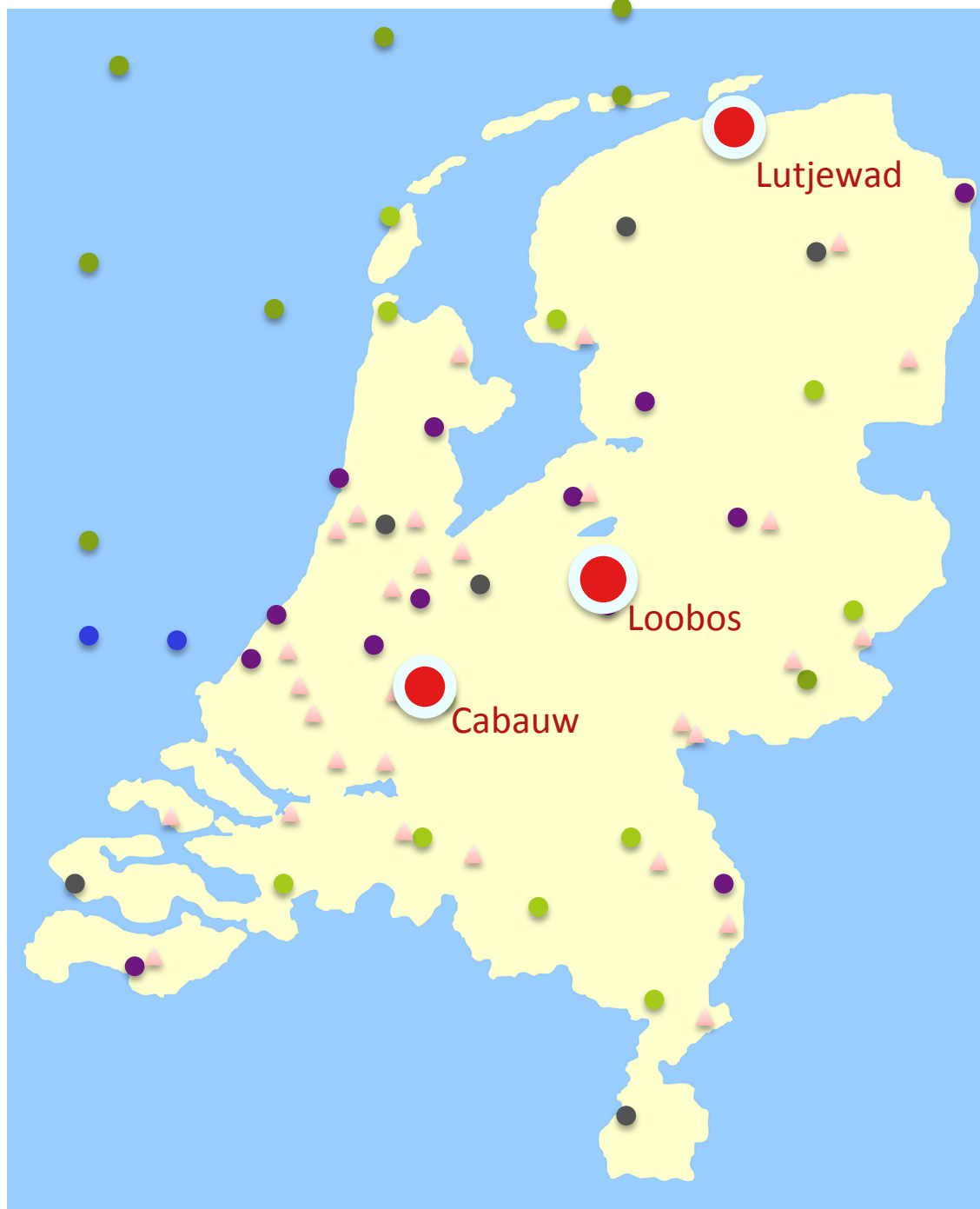
The Ruisdael concept



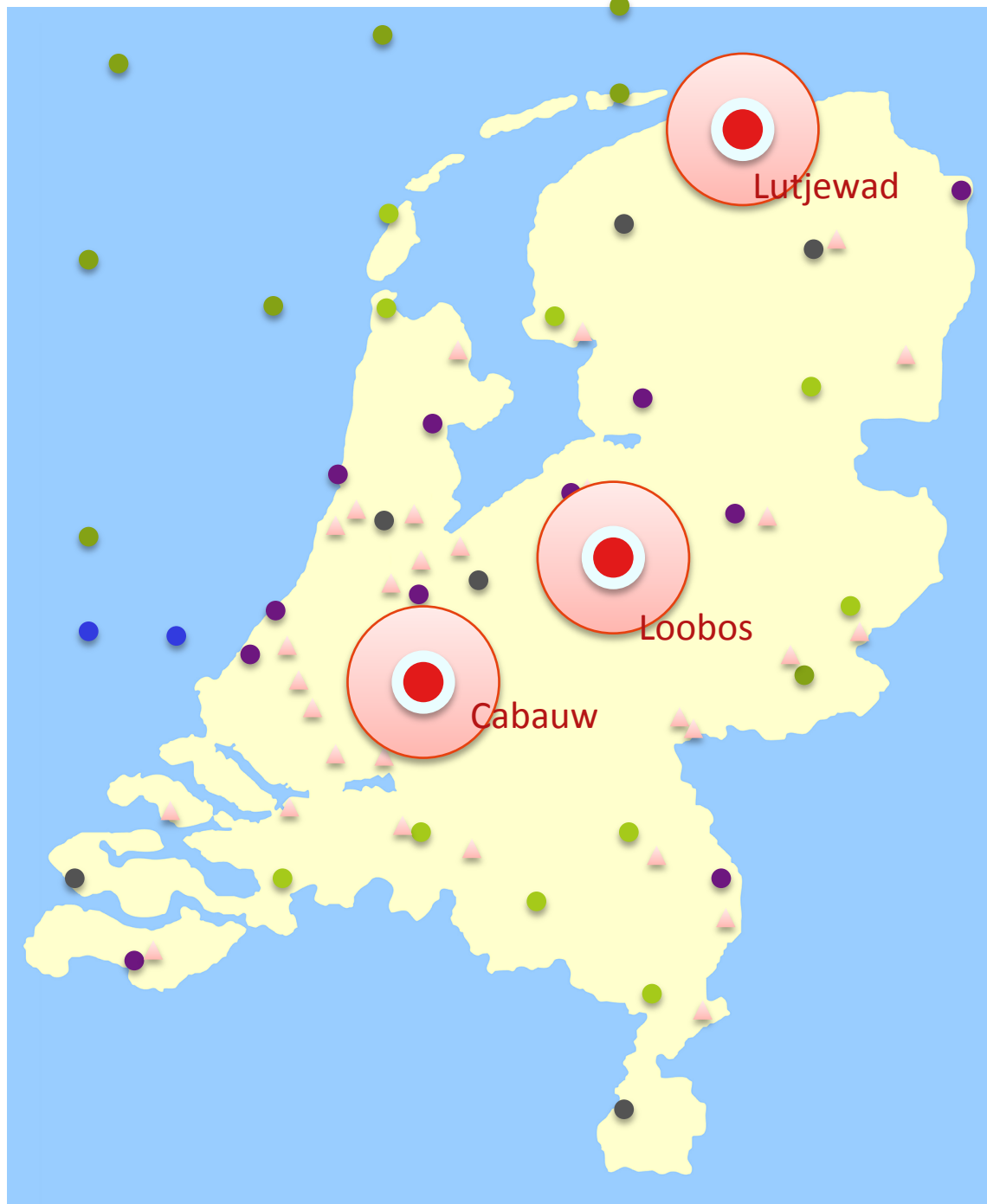
- Four advanced anchor stations with top-notch instrumentation
- A backbone network of meteorological and air quality measurements
- An aircraft for routine transect flights
- A mobile atmospheric profiler
- A mobile chemical analyzer
- A real time simulation facility

backbone

3 anchor sites
networks for
operational
monitoring of
Air Quality &
Meteorology
& Clouds
ICOS & ACTRIS

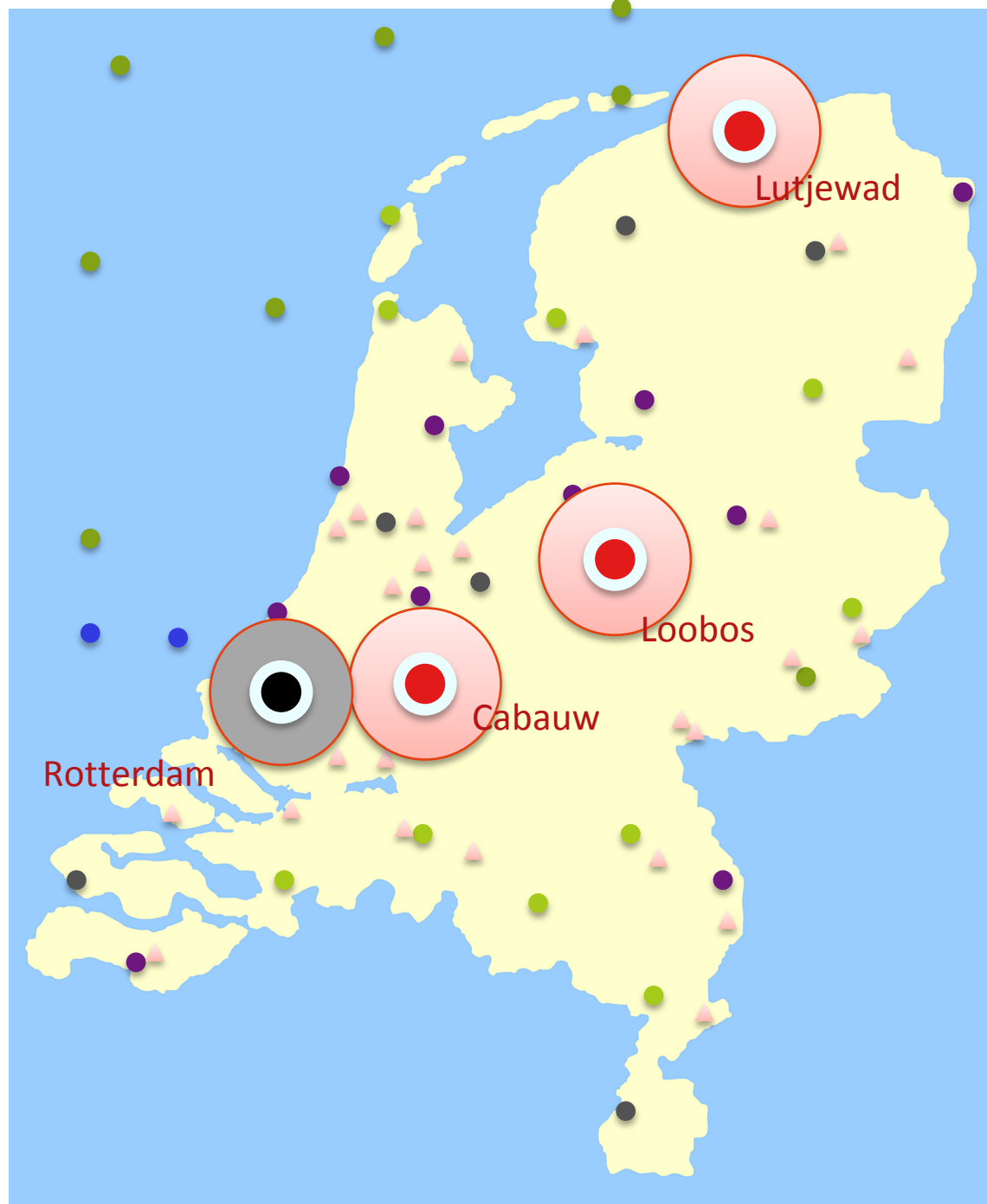


+3-D



+3-D

+ Rotterdam



+3-D

+ Rotterdam

+ Aircraft

+ Mobile
Laboratory

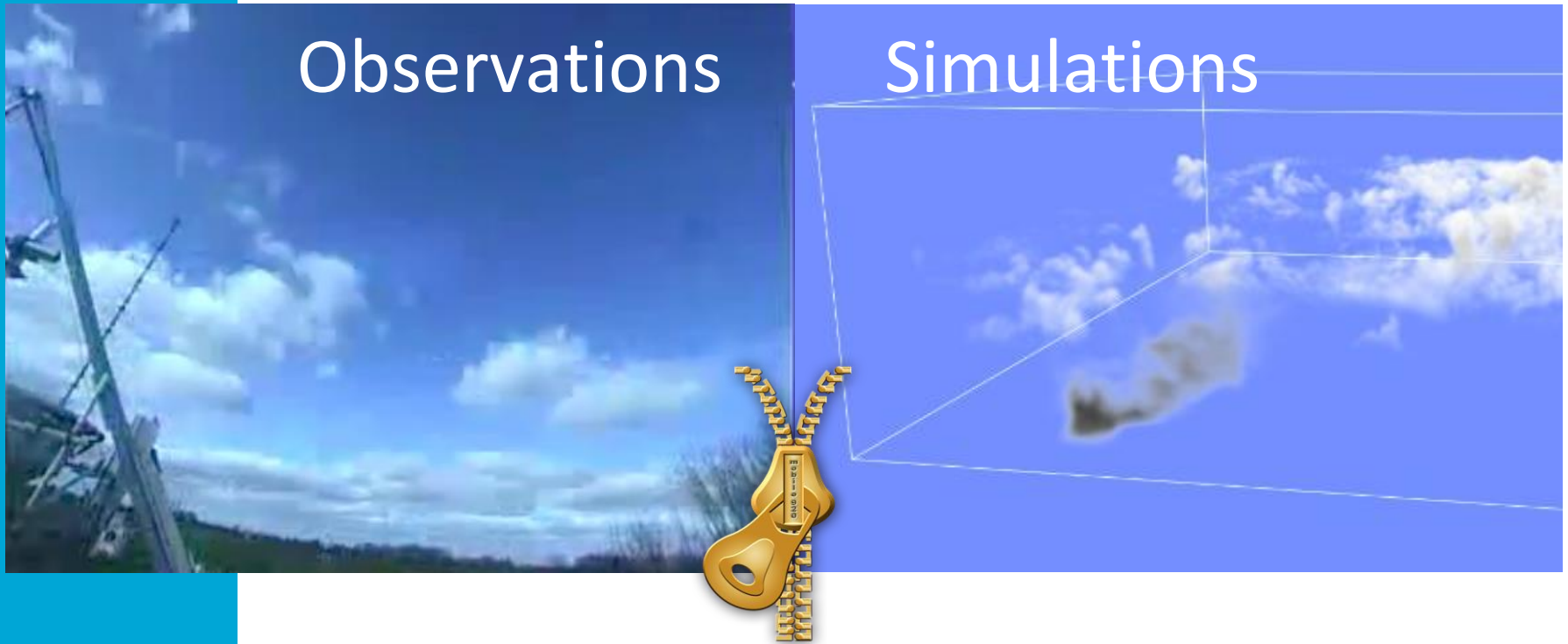
+ Mobile Radar



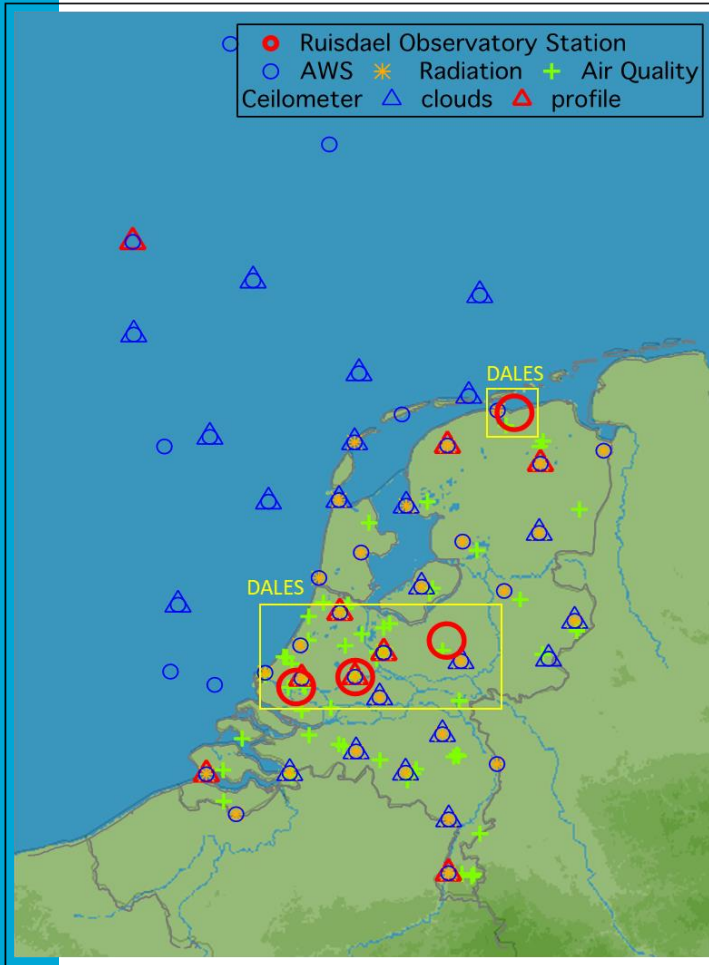
Integration

Model-Observation

turbulence, radiation, aerosol, chemistry, CO₂, ...



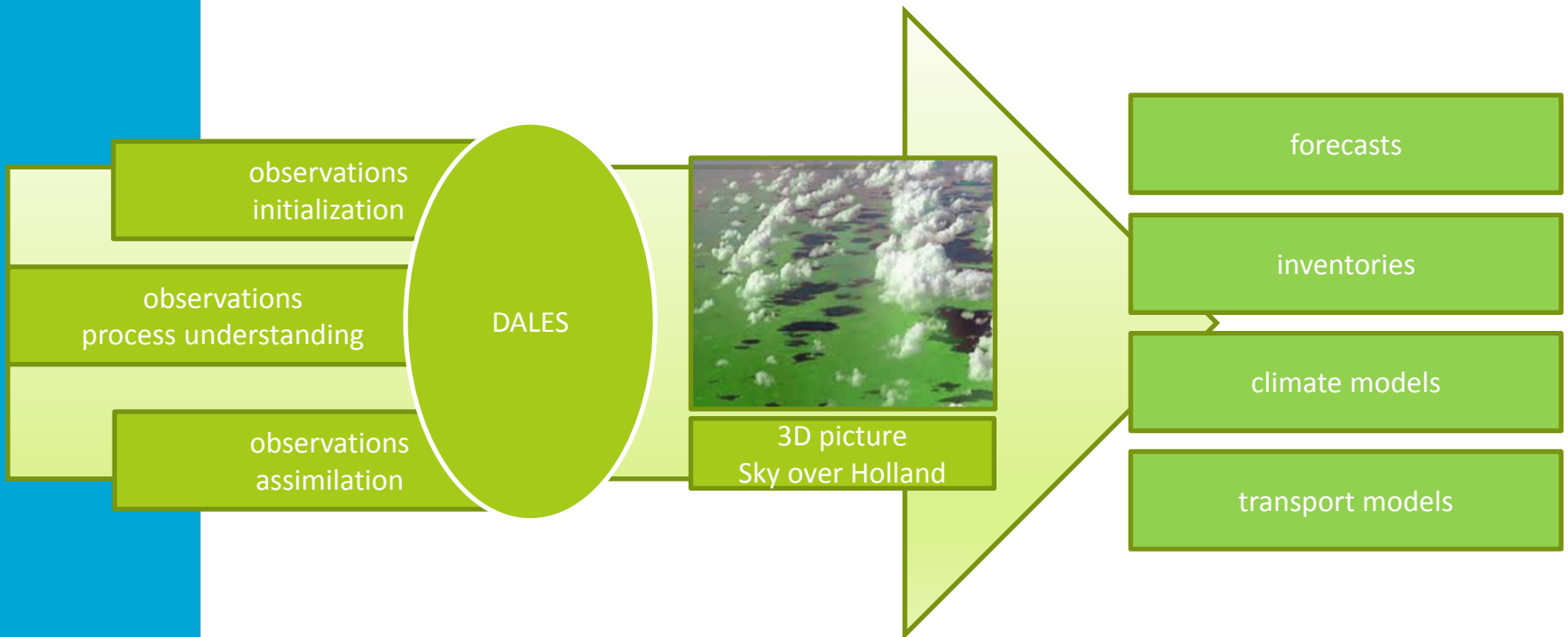
Ruisdael concept



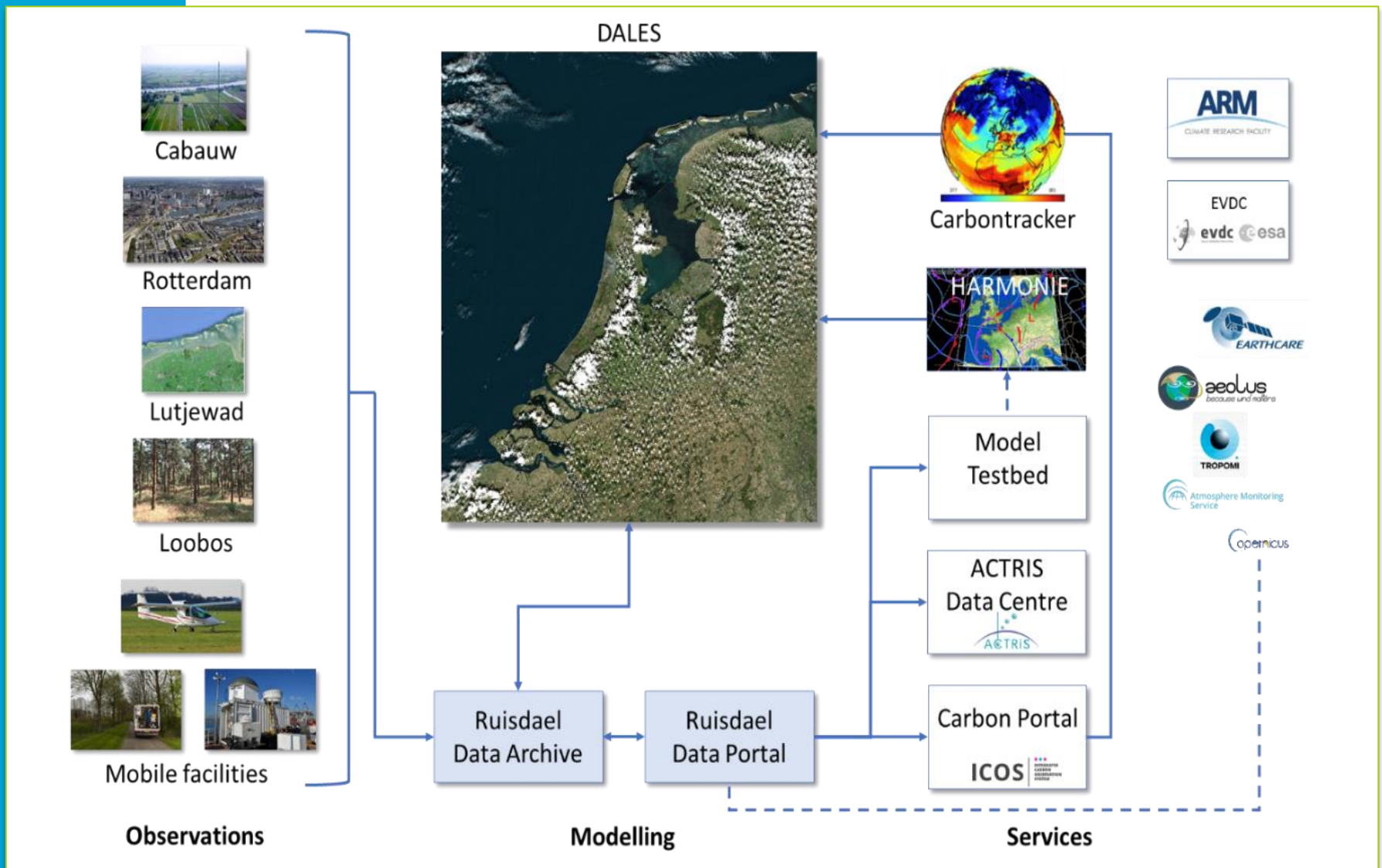
Heterogeneity of the surface

Land
Forestry
Water surfaces
Sea
Cities

The Ruisdael Strategy

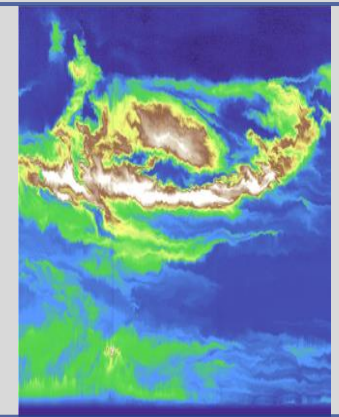
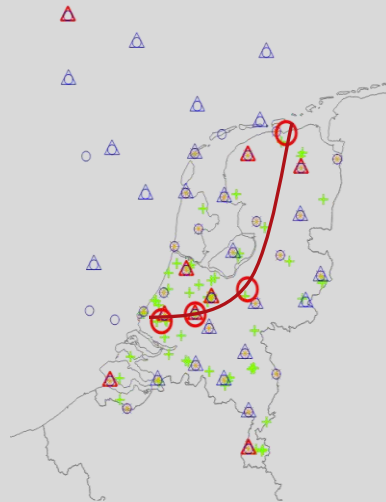
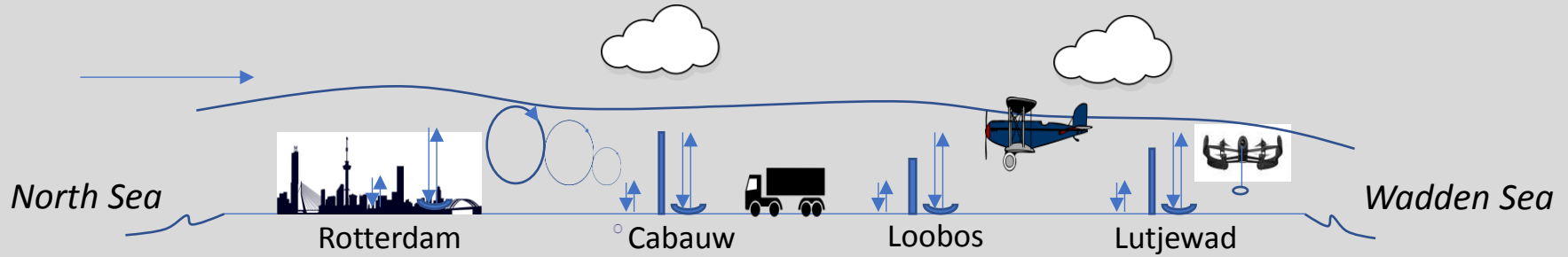


The Ruisdael practice



Ruisdael Observatory

understand the future of our atmosphere



Delft University of Technology
Utrecht University
Wageningen University and Research
University of Groningen
Free University Amsterdam

Royal Netherlands Meteorological Institute KNMI
National Institute for Public Health and Environment RIVM
Netherlands Organisation for Applied Scientific Research TNO
Energy Research Netherlands ECN