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The Ruisdael Consortium
The past
The present interactive system: land – water – carbon – aerosols - cloud

Simulations  Remote sensing  In situ
The future
Connecting the scales and spheres over a large domain
Why? The challenge zoomed in

Vilà et al. (2015)
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 at 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 anchors stations with top-notch instrumentation
- A backbone network of meteo 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

+ 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

observations
initialization

observations
process understanding

observations
assimilation

DALES

3D picture
Sky over Holland

forecasts

inventories

climate models

transport models
The Ruisdael practice
Ruisdael Observatory
understand the future of our atmosphere

North Sea

Rotterdam

Cabauw

Loobos

Lutjewad

Wadden Sea

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