

# Digital twins for a safe and sustainable delta in a changing climate



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Delft University of Technology

Courtesy Port of Rotterdam

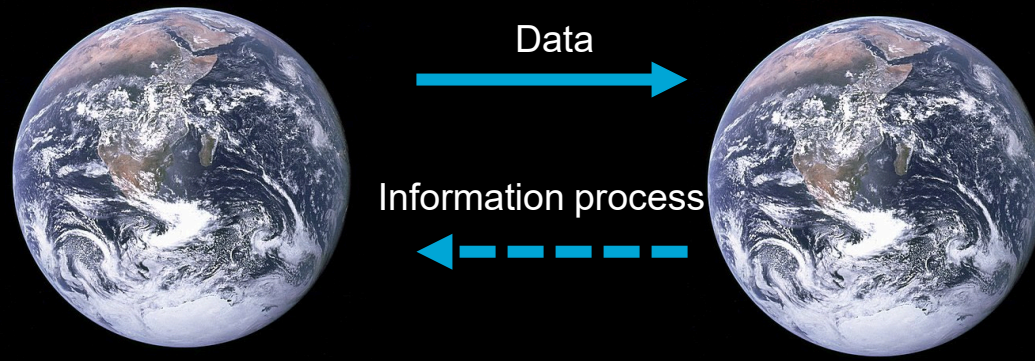






*Courtesy Port of Rotterdam*







Data

Information process







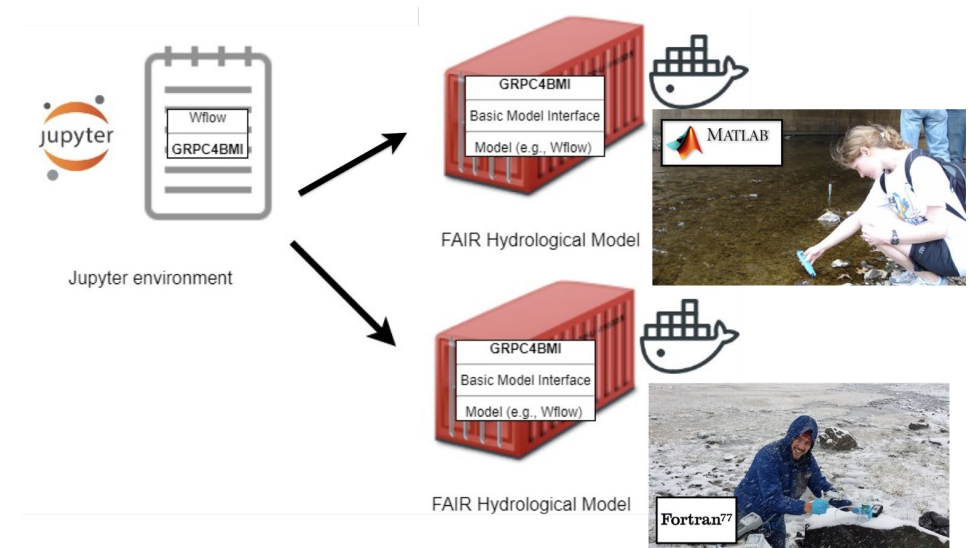
# Monitoring salt intrusion in the Rhine-Meuse Delta

# Purpose and potential use of eWaterCycle

Hydrology:  
many models  
describing processes



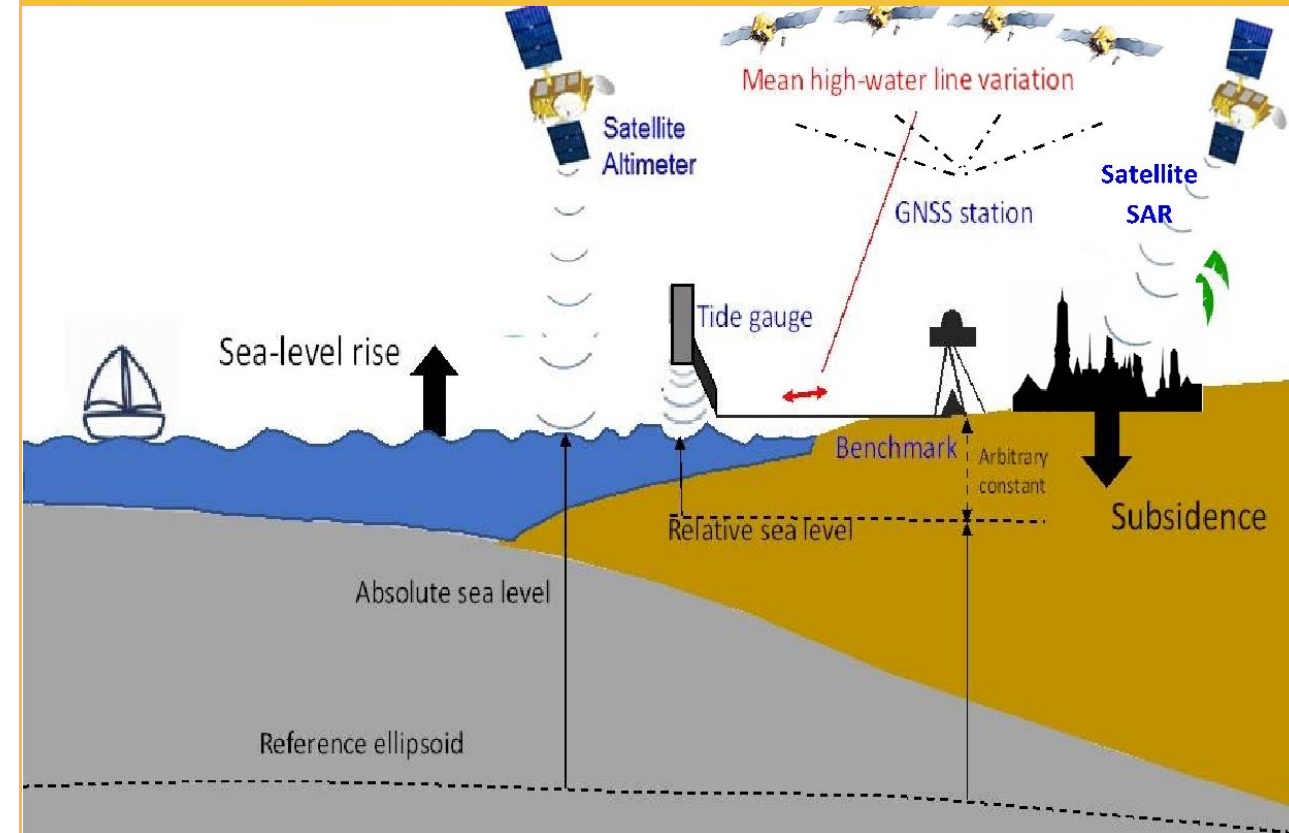
interact with  
existing models on  
common platform



# Lessons learned

- Original Data, Original Models
- Work across scales
- Context matters

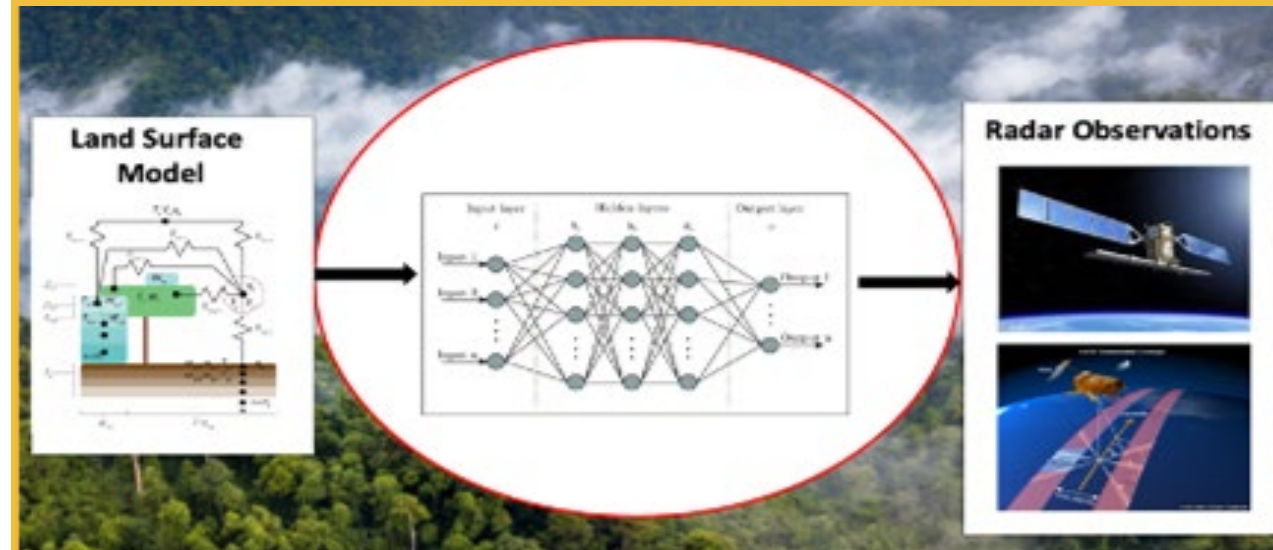
Data assimilation of in-situ and satellite data for assessment of coastline changes in Bangkok



# Lessons learned

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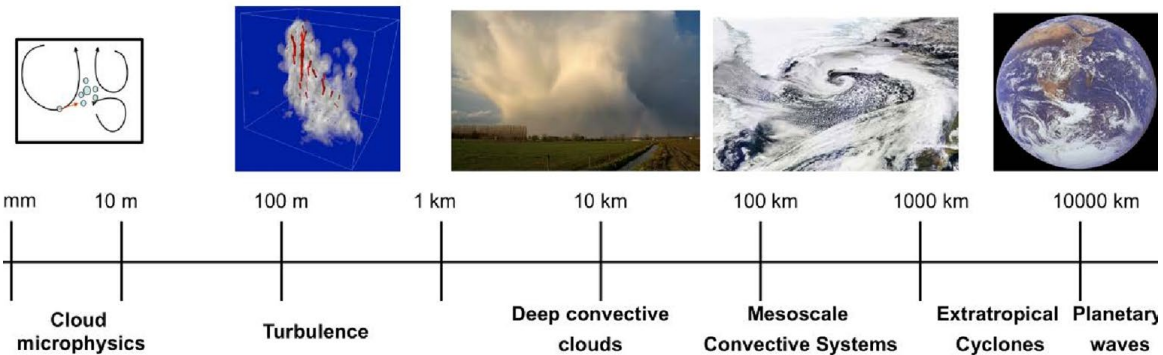
Data assimilation Advanced Scatterometer (ASCAT) satellite radar data for monitoring soil moisture



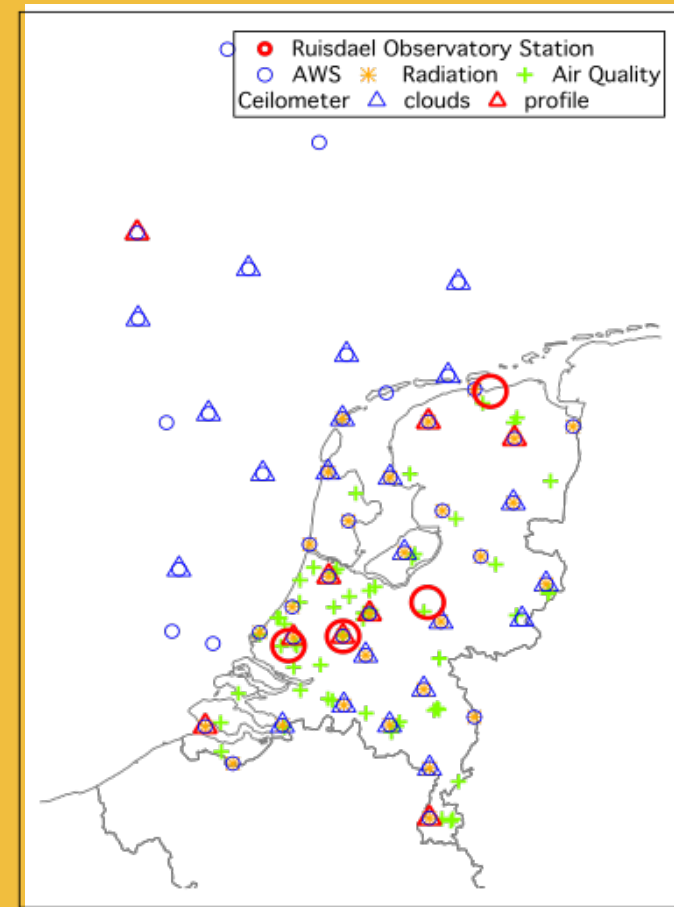
Shan et al. (2021, in review)  
Collaboration MeteoFrance, TU Wien, ESA

# Lessons learned

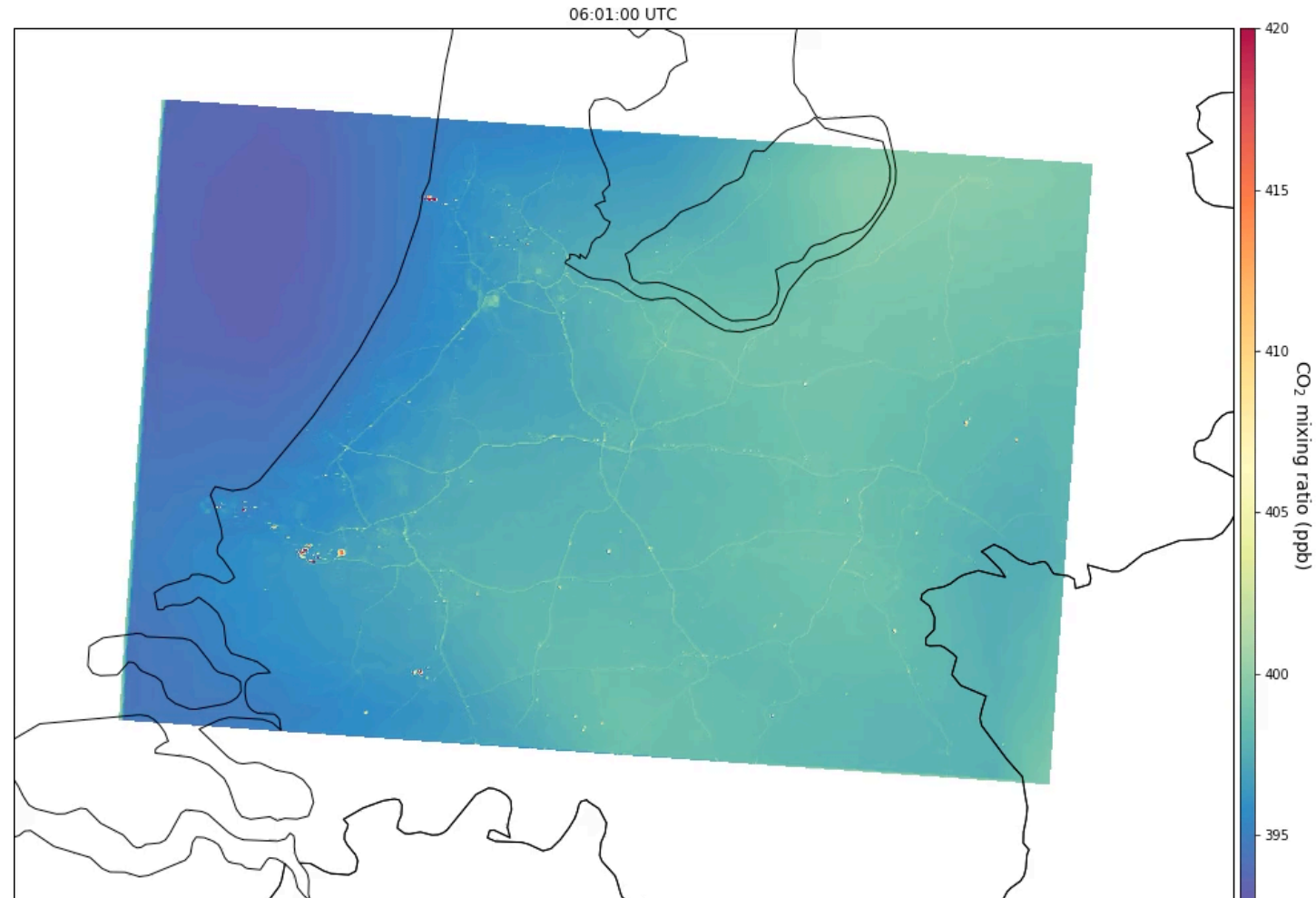
- Original Data, Original Models
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## Ruisdael Observatory



# Ruisdael Observatory



# Lessons learned

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## Negotiation Simulation Lab in Zambia

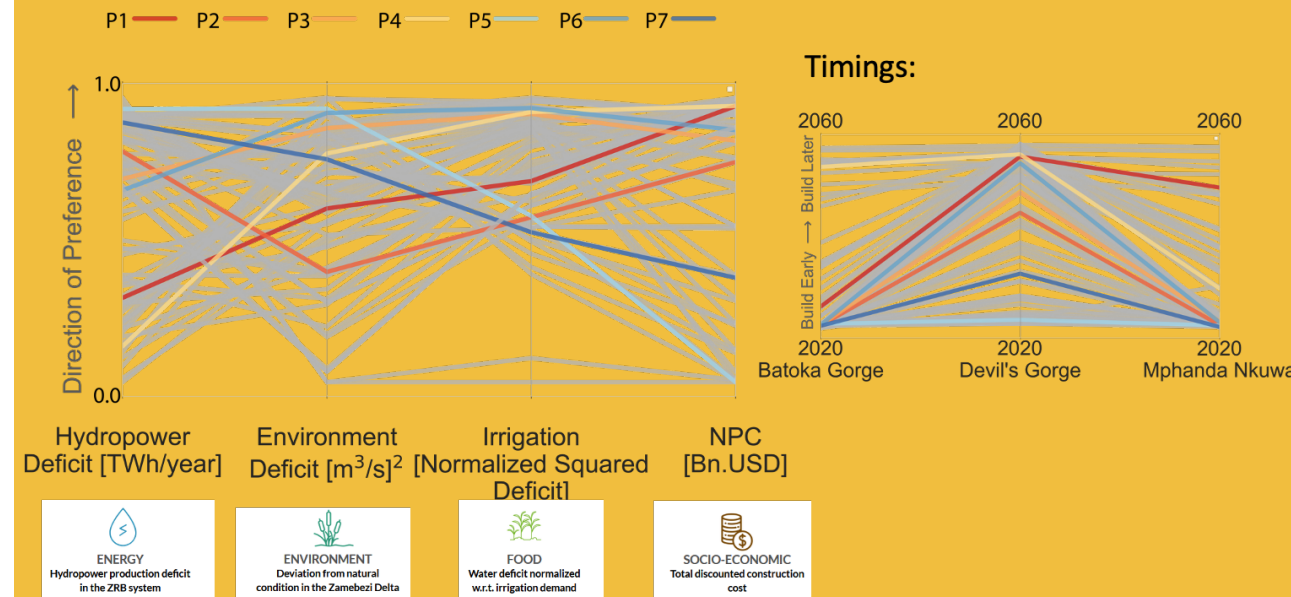


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## Negotiation Simulation Lab in Zambia

### Selected Tradeoffs





# Co-creation labs with serious gaming for a safe Delta



- Context and dilemmas
- Domain expertise
- Model development
- Data collection
- Intended use
- ...

Policymakers

Scientist

Model developers

Industry

- Localisation of risk
- Near real-time decision support
- Short-term planning, e.g., evacuation plan
- Long-term scenario-based planning
- ...



- Original data, Original models
- Work across scales
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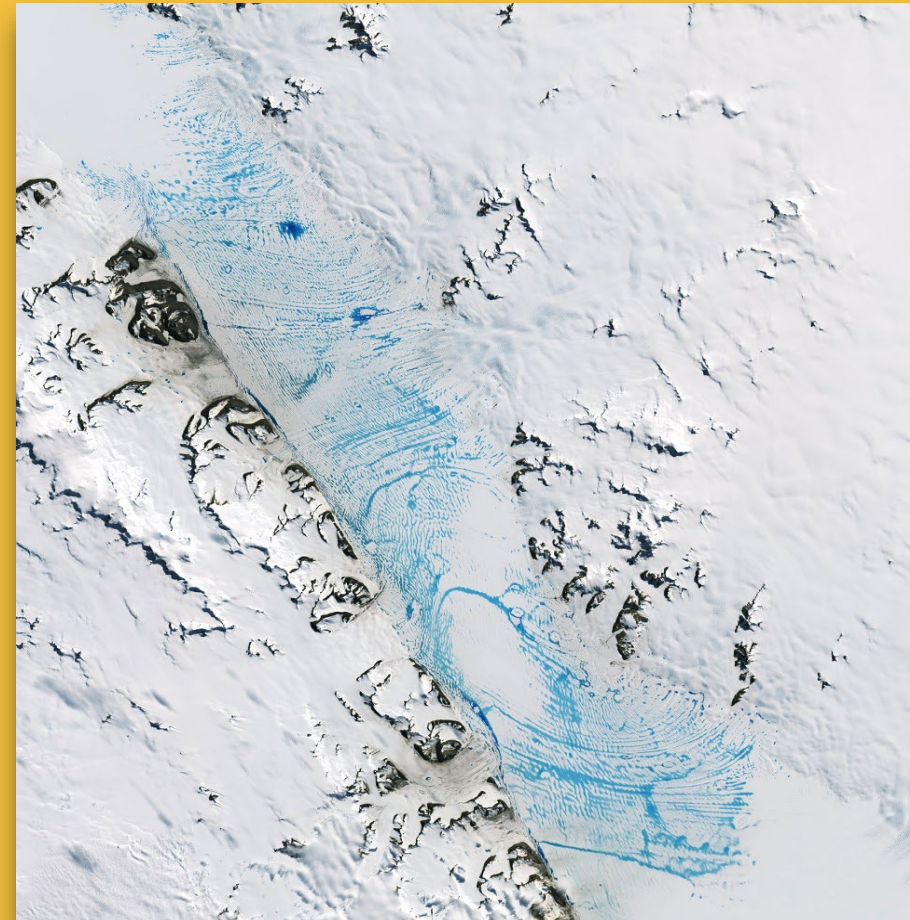
Thank you

Extras

# Lessons learned

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## Machine Learning in climate models for ice sheet Antarctica

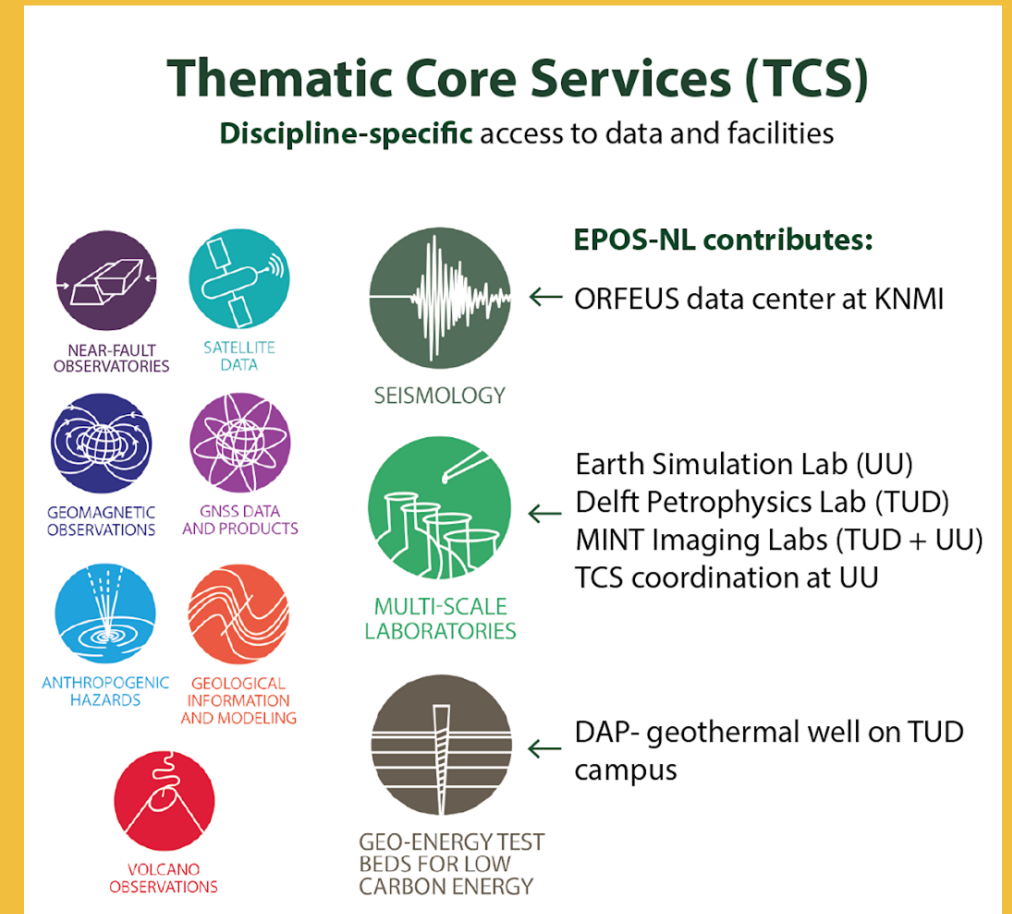


*Banwell et al, 2021*

# Lessons learned

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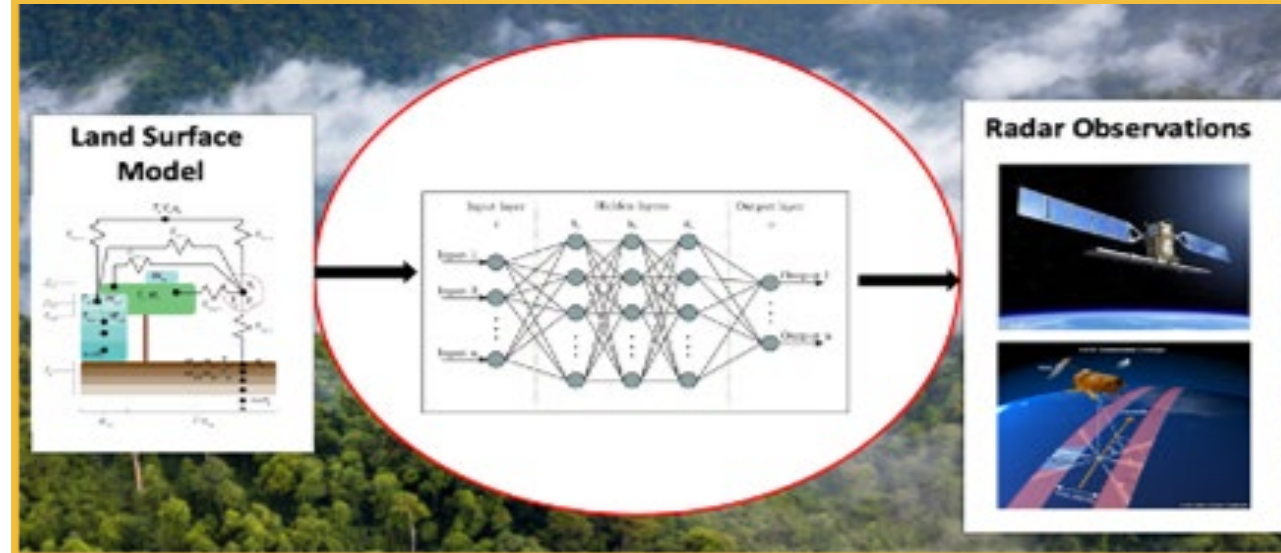
## EPOS-NL data infrastructure



# Lessons learned

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Data assimilation of Advanced Scatterometer (ASCAT) satellite radar data for soil moisture



*Shan et al. (2021, in review)  
Collaboration MeteoFrance, TU Wien, ESA*

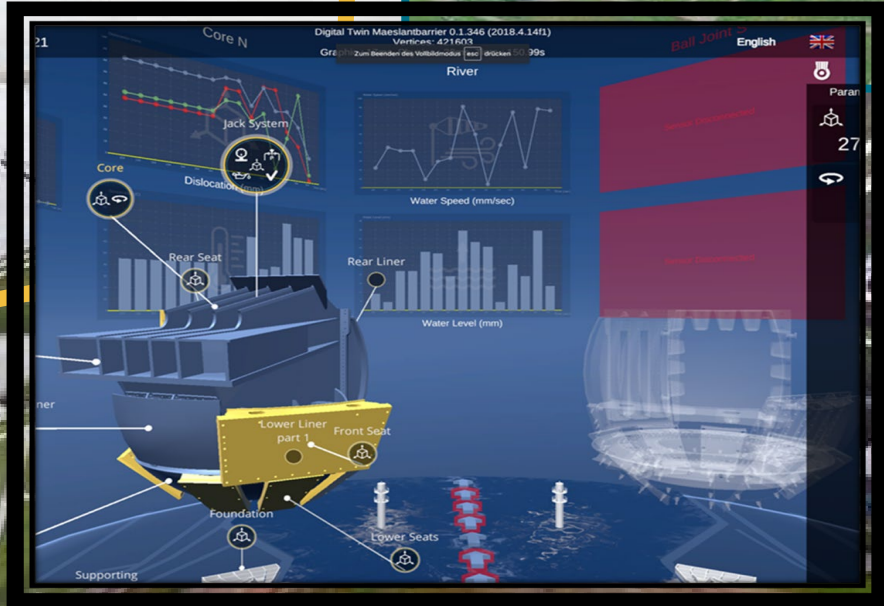
# Predictive maintenance

Dutch Delta

Lessons learned

Dutch Delta

Destination Earth



With Aveco de Bondt, Dutch Ministry of Infrastructure and Water Management (Rijkswaterstaat)

Bas Jonkman, Luc Ponsioen et al., TU Delft/Aveco de Bondt

