



Toegepaste en  
Technische Wetenschappen

# EXCELLENCE IN UNCERTAINTY REDUCTION OF OFFSHORE WIND SYSTEMS

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# OVERVIEW

- Overall aim of the programme
- The partners
- The projects
- How it fits together
- Summary

# AIM



- Design
- Construction
- Logistics

- Over-conservative parameters increase costs
- Safety margins can be reduced by reducing uncertainties
- EUROS aims to lower costs by *reducing uncertainties* and *increasing efficiencies*

# PARTNERS

Budget = €3.4M

## Universities



## Research Institutes

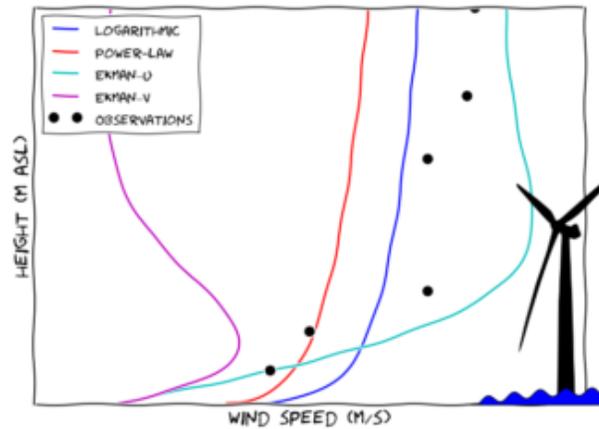


## Companies



# PROJECT 1: EXTERNAL CONDITIONS

## Wind Loads



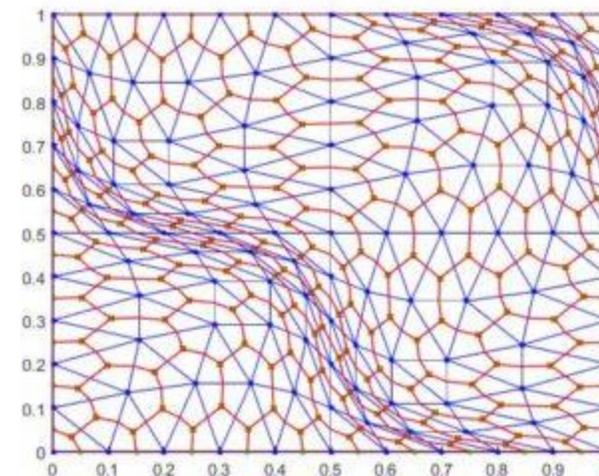
## Extended Weather Forecasts



## Uncertainty Quantification in Wind and Waves

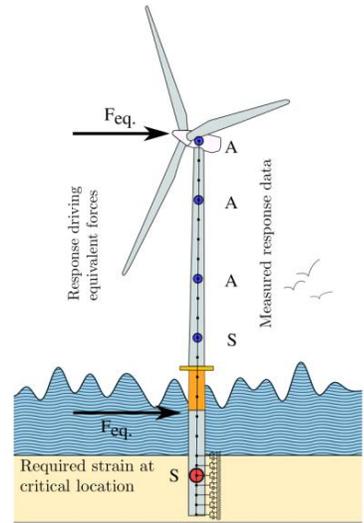


## Wind Farm Wake Effects



# PROJECT 2: LOADS AND DAMAGE

## Smart Monitoring and Damage Development



## Physical Modelling of Crack Initiation and Propagation



## Physical Modelling of Service Life Consumption by Pile Driving



## Physical Modelling of Scour and Seabed Variations

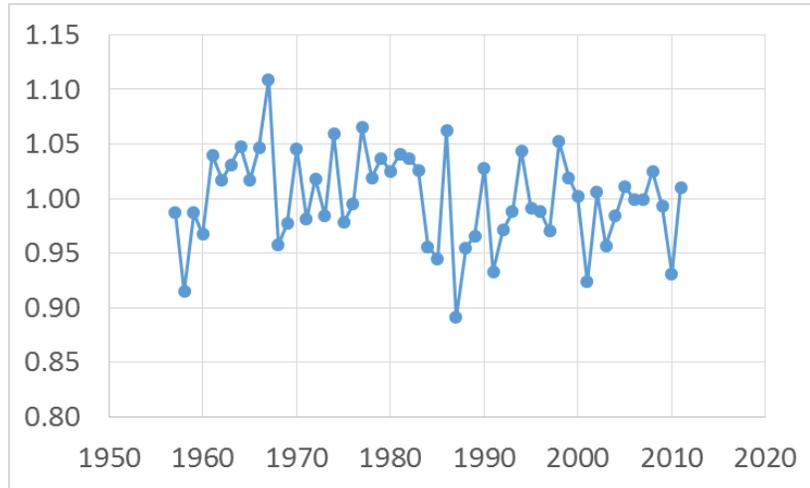


## Uncertainty Propagation

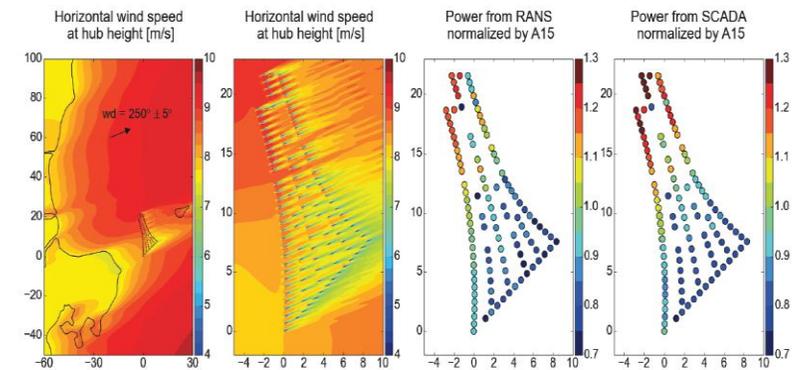
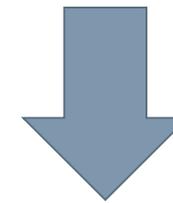




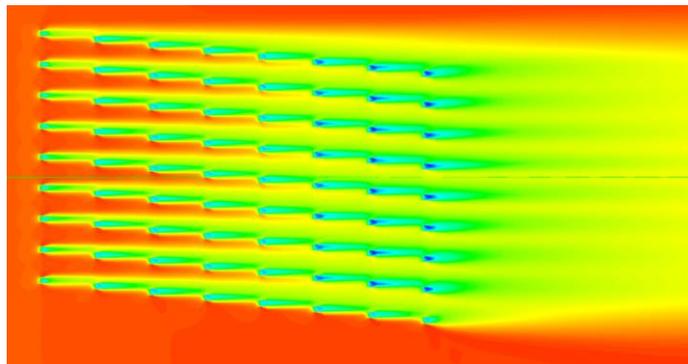
# WIND CONDITIONS TO FARM OUTPUT



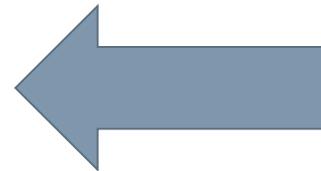
Long term conditions



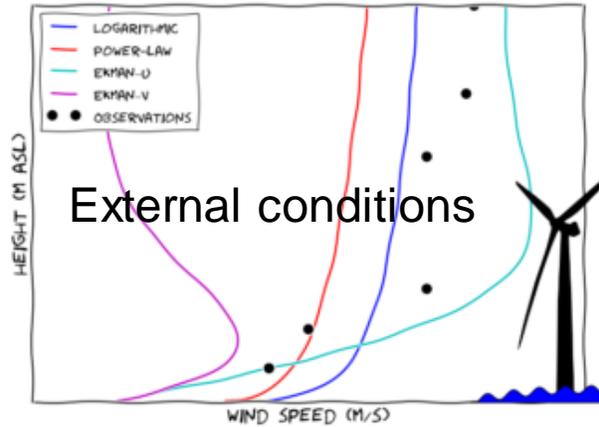
Local effects



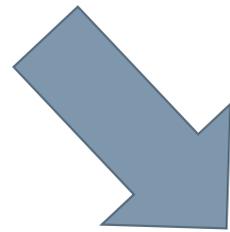
Wake losses



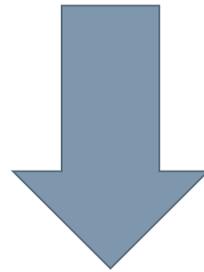
# EXTERNAL FACTORS TO LIFETIME ESTIMATE



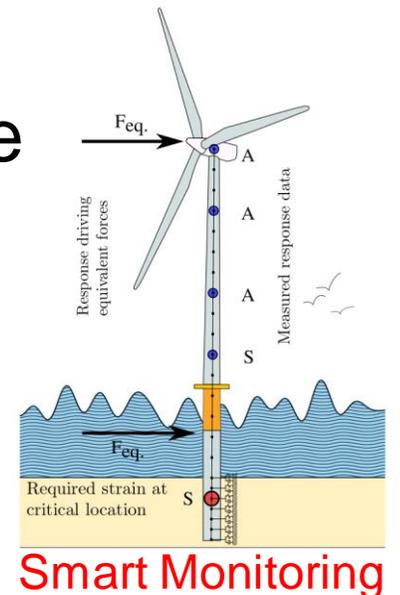
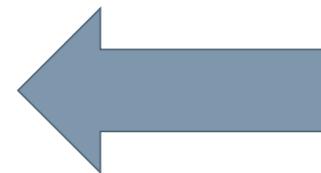
What are the damage drivers?



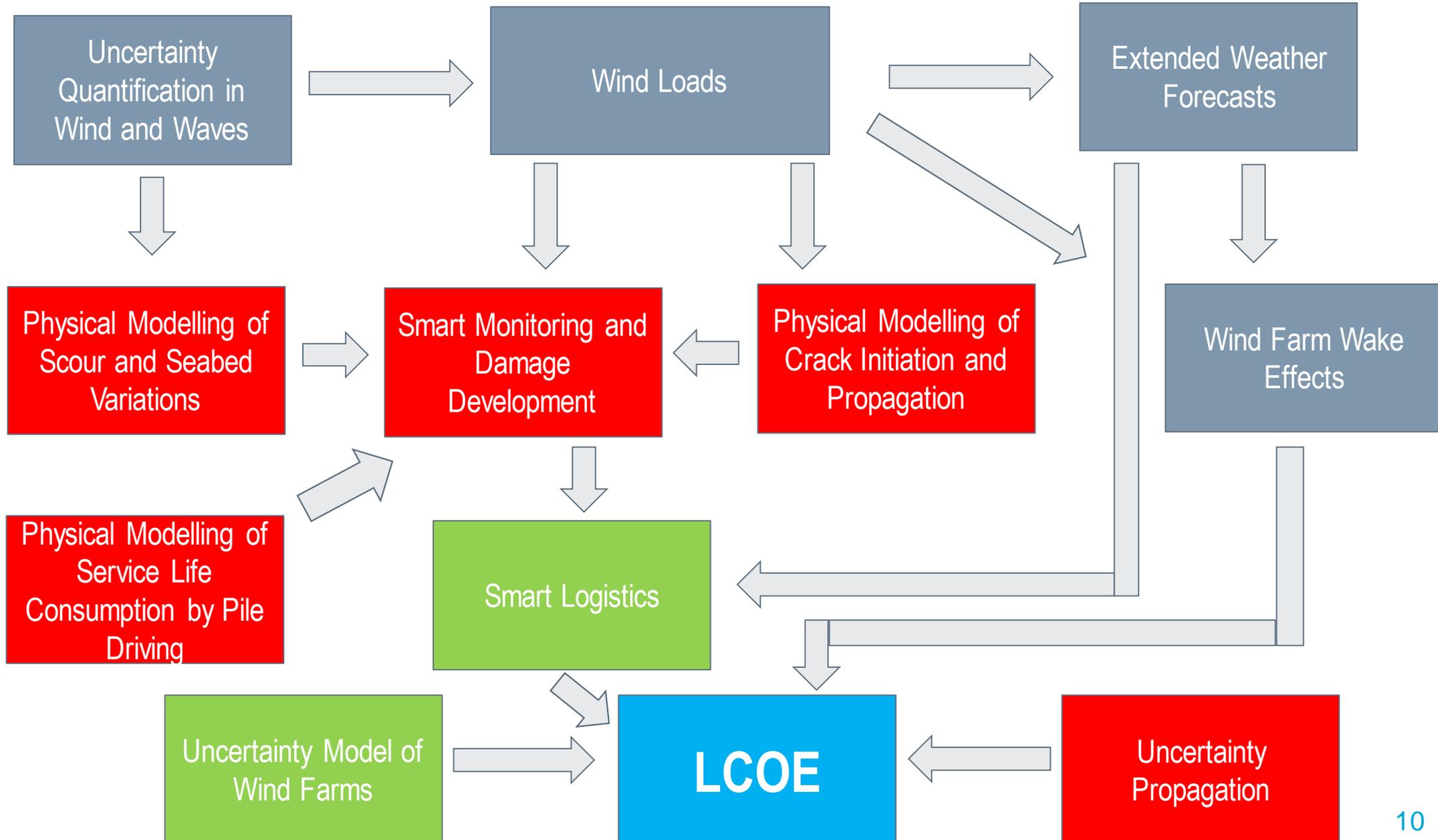
How do they affect fatigue damage?



How do we measure them?



# THE BIG PICTURE



# SUMMARY

- Inter-connected programme with three main themes: environment, damage, system optimisation
- Cross-cutting
- User engagement
- Aiming to reduce uncertainties and make design, operation and maintenance leaner and more efficient