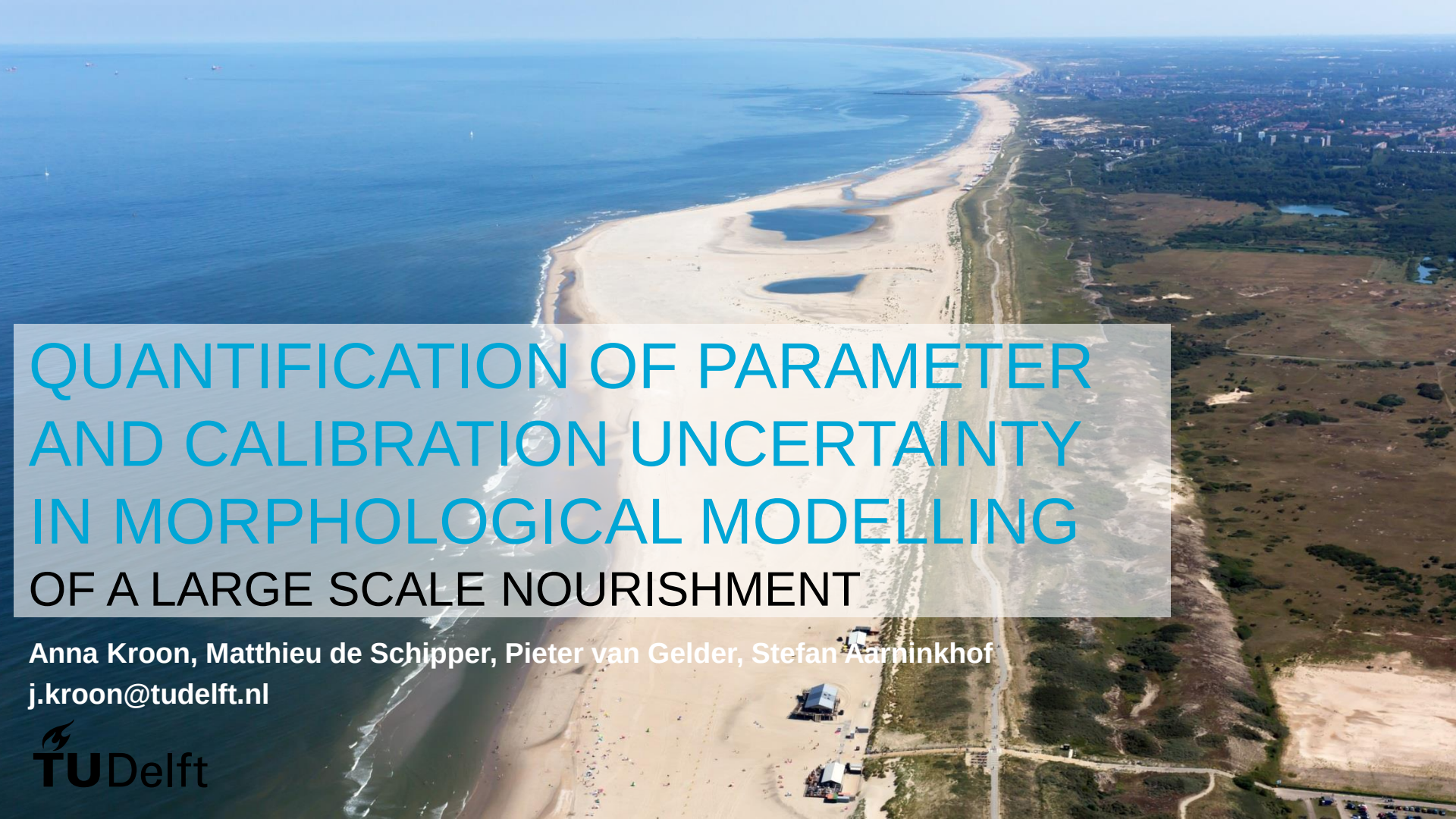


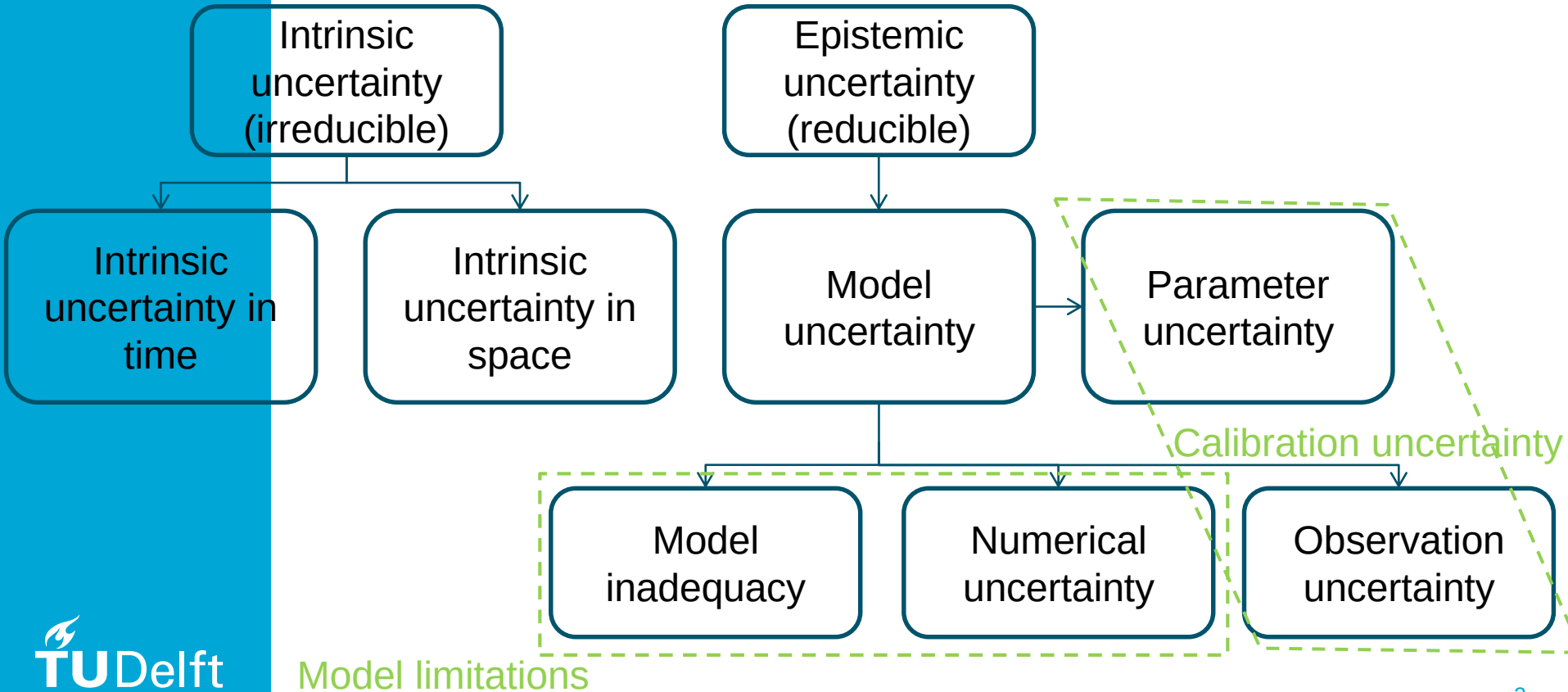
An aerial photograph showing a large-scale coastal nourishment project. A wide, sandy beach runs along the coast, with several small, dark blue ponds or depressions in the sand. The ocean is on the left, and a green, vegetated area with some buildings is on the right. The text is overlaid on the left side of the image.

QUANTIFICATION OF PARAMETER AND CALIBRATION UNCERTAINTY IN MORPHOLOGICAL MODELLING OF A LARGE SCALE NOURISHMENT

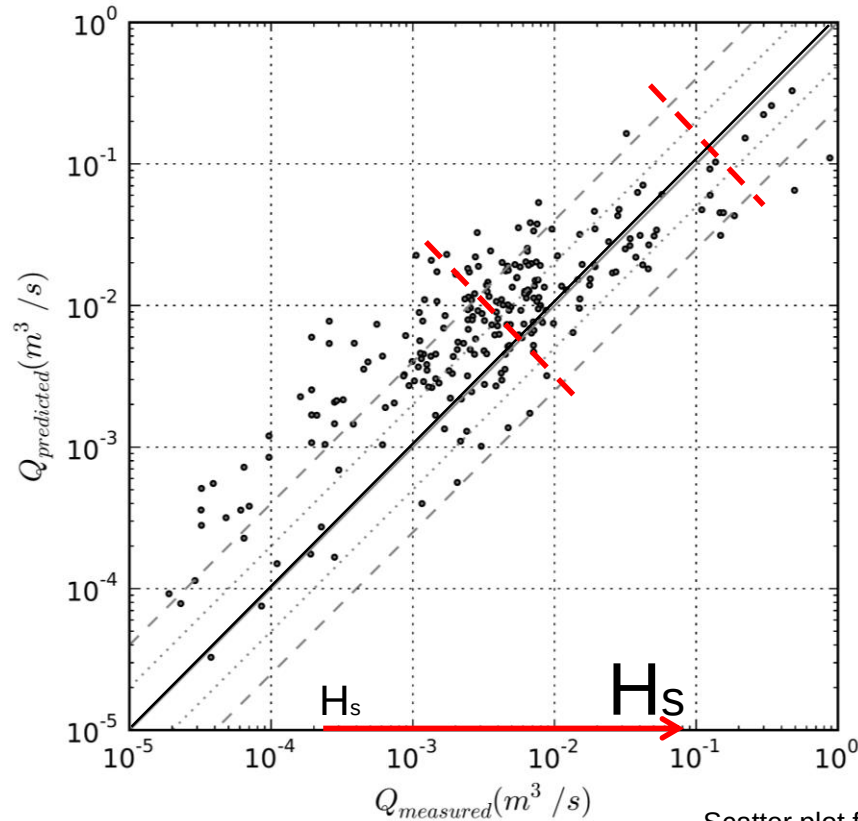
Anna Kroon, Matthieu de Schipper, Pieter van Gelder, Stefan Aarninkhof
j.kroon@tudelft.nl

Sources of uncertainty in Morphological modelling

Based on: Sources of uncertainty in Design of Civil Structures, (P. Van Gelder, 2000)



Example of combined uncertainty

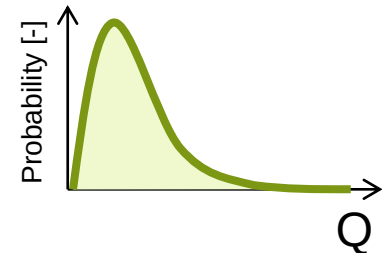
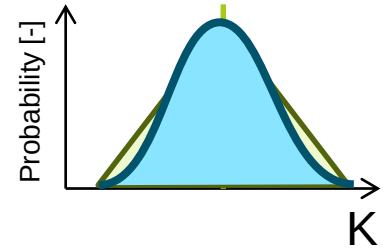
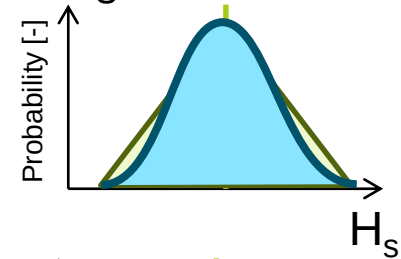


Scatter plot from (Mil-Homens, 2016)

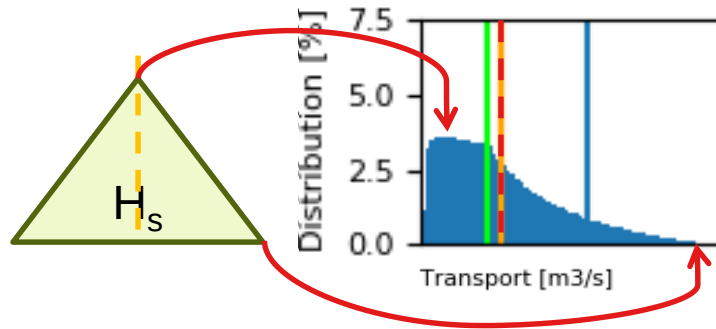
Approach: Effect of uncertainty

- Kamphuis formula
- Assume uncertainty in wave parameter
- Assume uncertainty in calibration parameter
- Monte Carlo sampling to get distribution of transport

$$Q \sim K * H_s^{2.5}$$

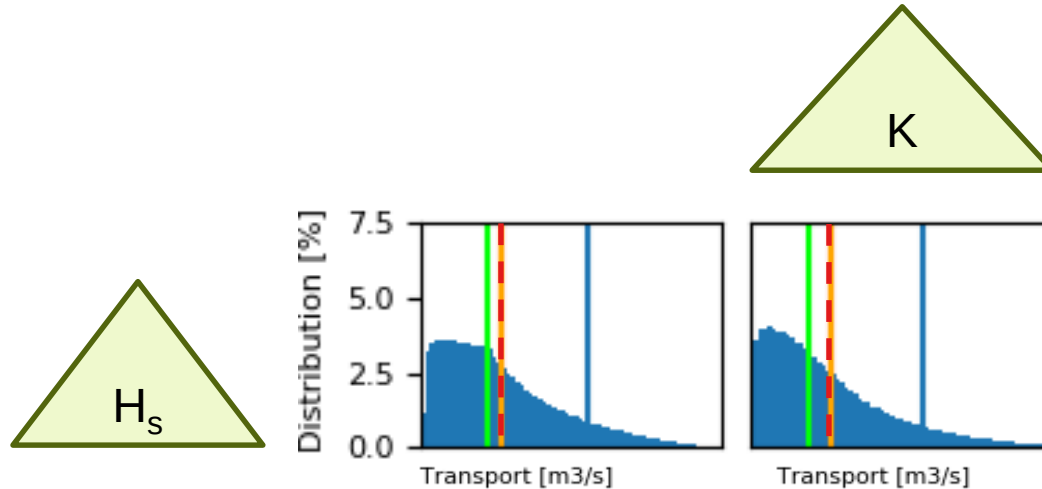


Effect of uncertainty



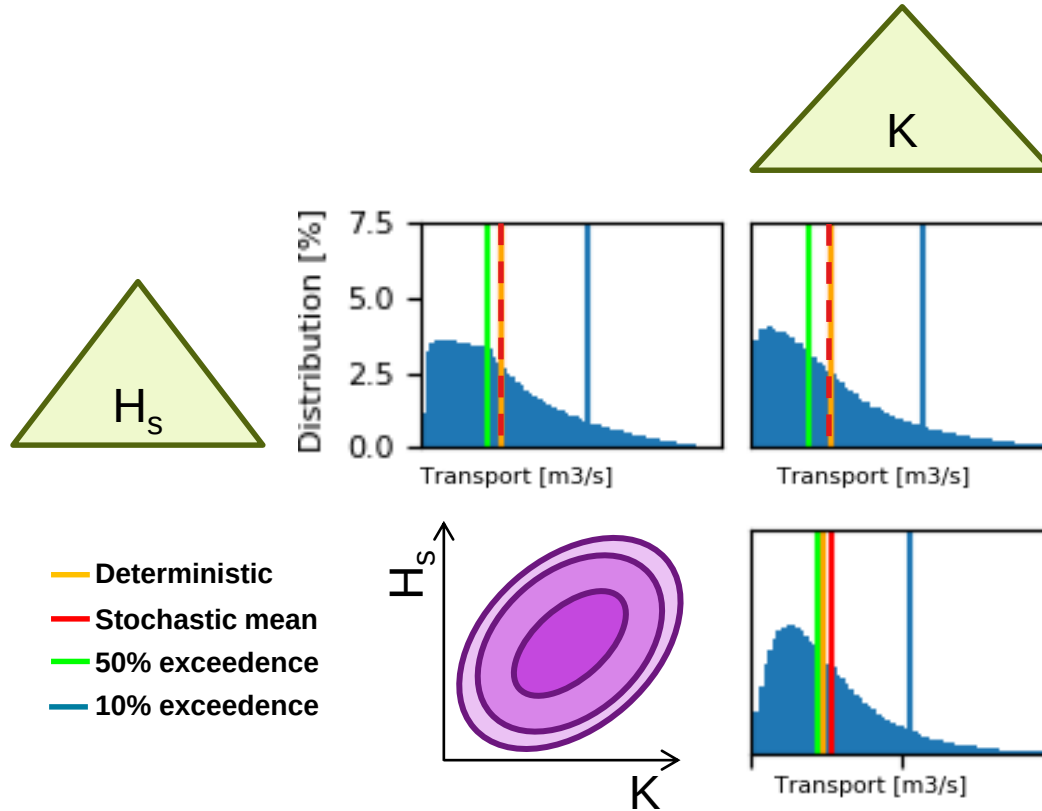
- Deterministic
- Stochastic mean
- 50% exceedence
- 10% exceedence

Effect of uncertainty



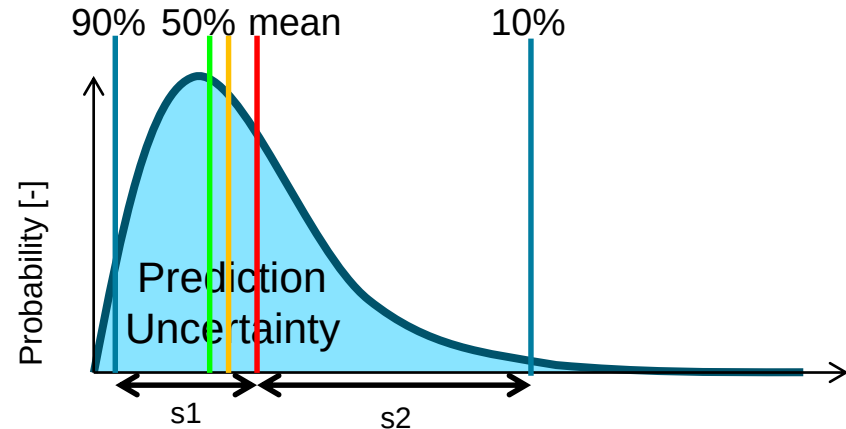
- Deterministic
- Stochastic mean
- 50% exceedence
- 10% exceedence

Effect of uncertainty

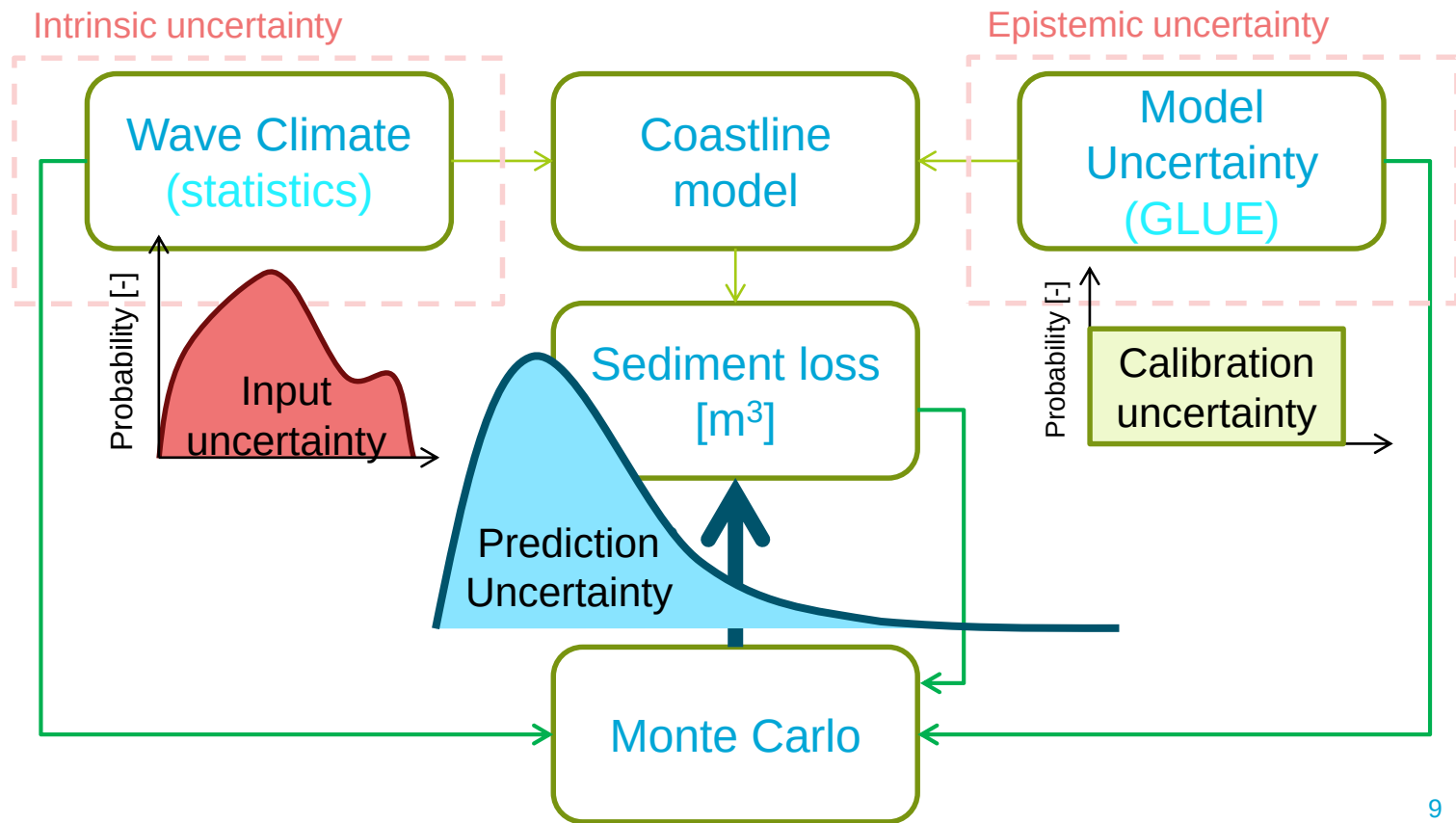


Message

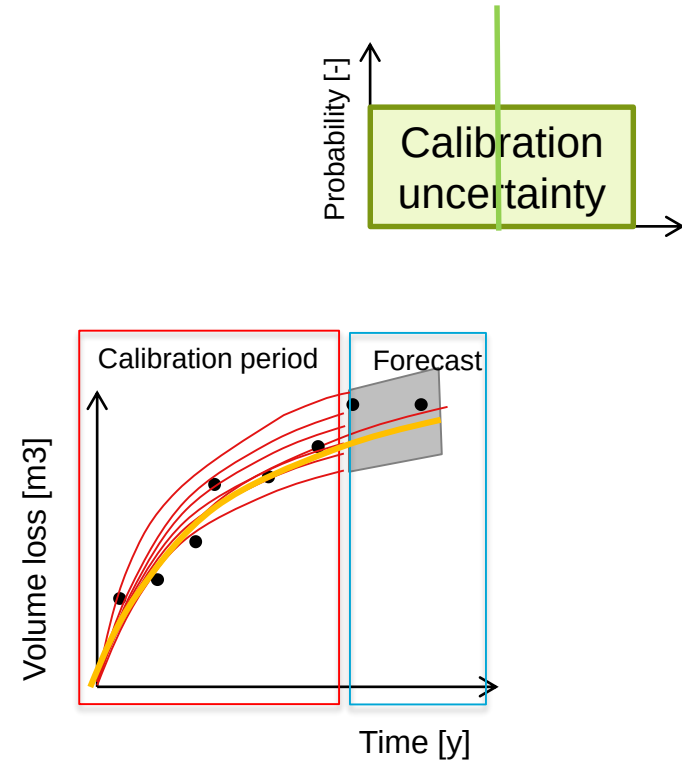
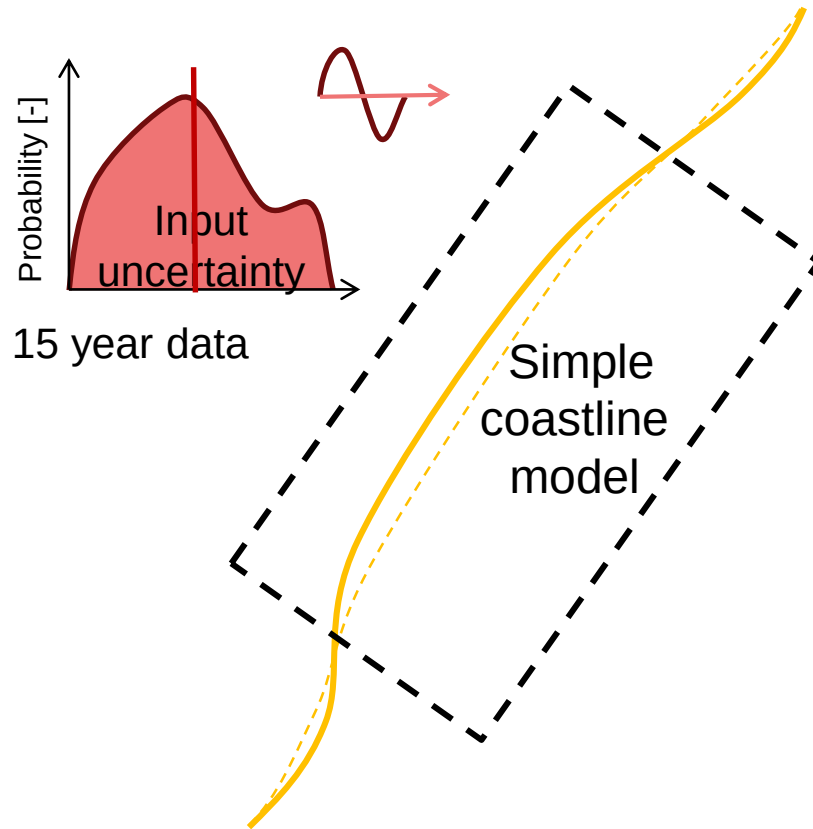
- Asymmetric shape
- **Mean** $\neq$ **median** (50%)
- $s1 \neq s2$
- **Det** $\neq$ **Mean** in case of correlation



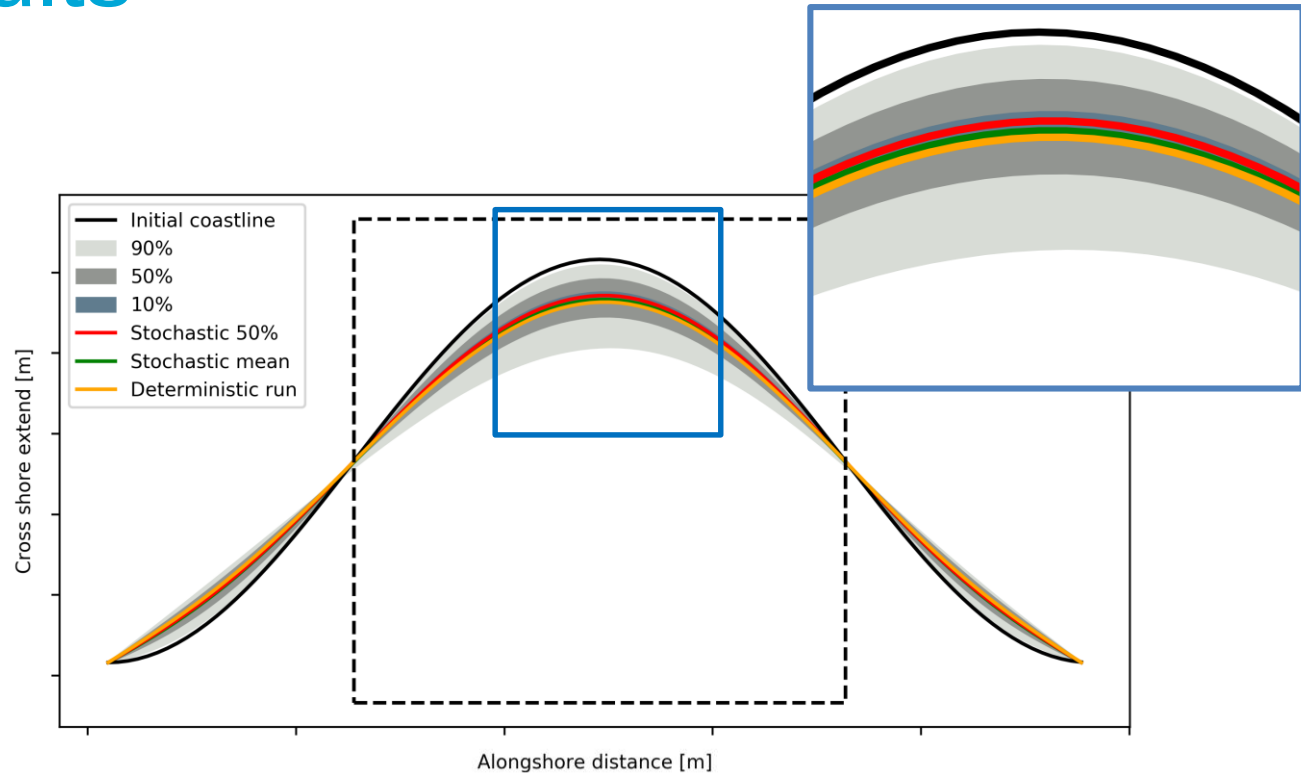
Quantification/propagation?



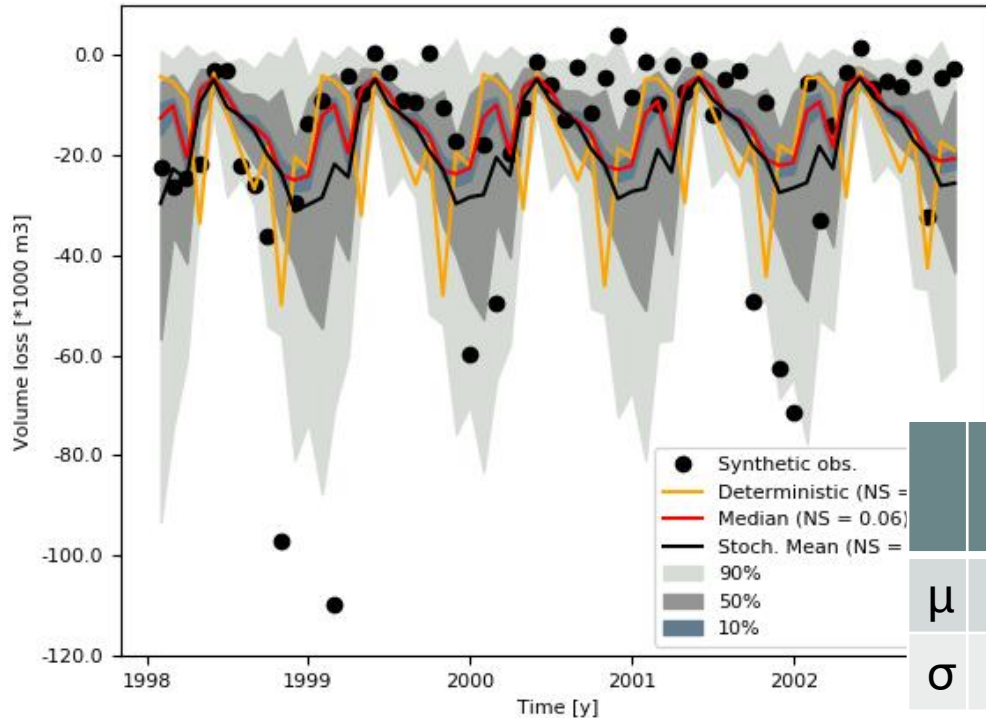
Approach



Results



Results



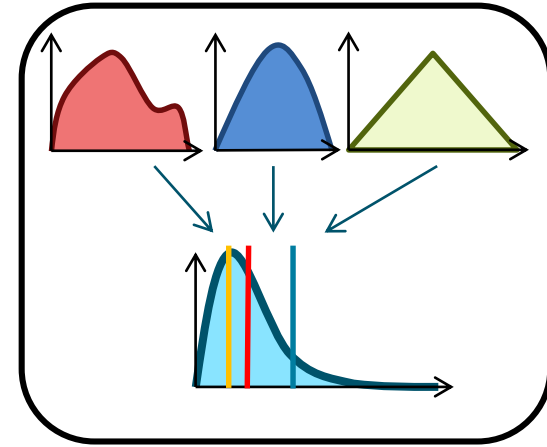
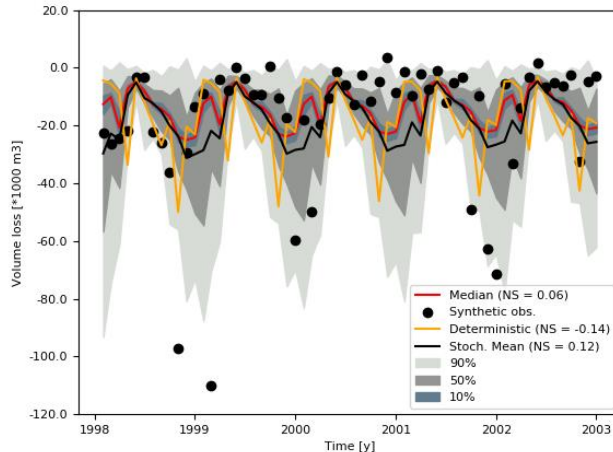
Percentile	Points inside
P90	87%
P50	44%
P10	8%

	Synth. Obs.	Stoch. Meth.	Det. Meth.
μ	18,000	18,000	17,000
σ	23,000	19,000	-

Conclusions

Deterministic $\neq$ mean!

Distribution is asymmetric



Same effects visible
for synthetic case!

PRO-COAST: *Probabilistic
assessment of large-scale sandy
interventions in the coastal zone*



hoogheemraadschap
**Hollands
Noorderkwartier**

