

# Wave forecasting and its use for real-time wave energy device control

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Dublin, 02/02/2018

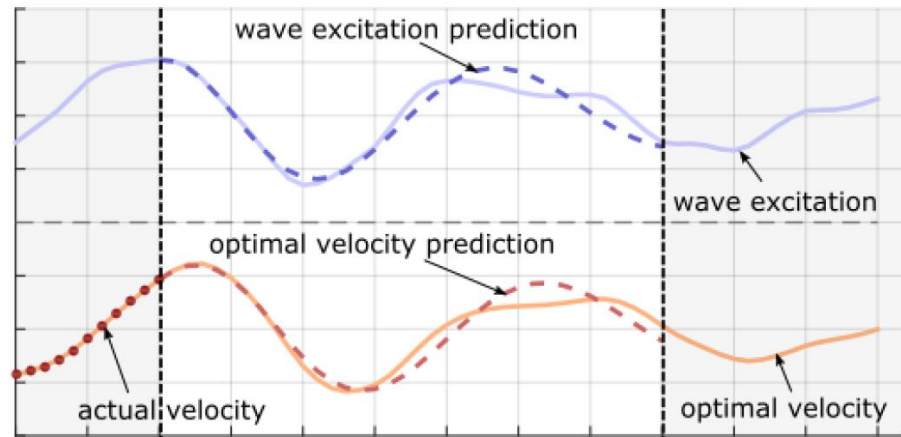
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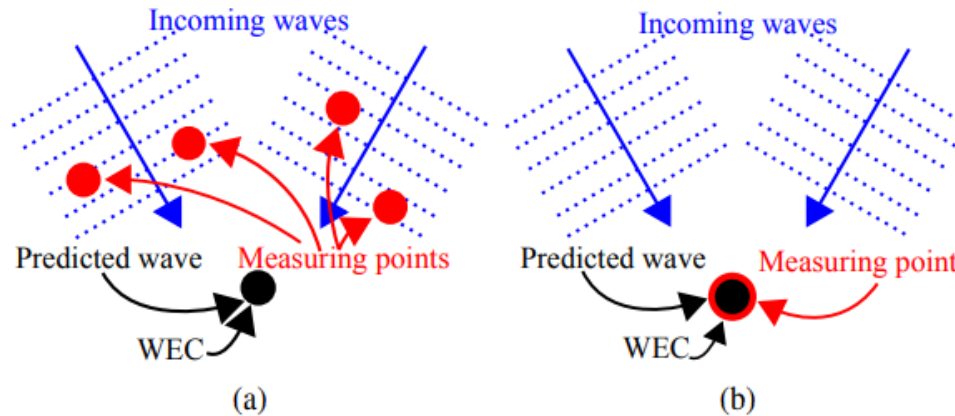
# Short-term wave forecasting: why?

Maximise wave energy absorption through real-time control

➡ Requires real-time prediction of the next incoming waves!



# Short-term wave forecasting: how?



## Up-wave approach versus time-series approach

Physical model

Statistical model

Time horizon ++

Time horizon --

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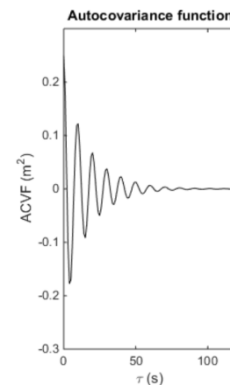
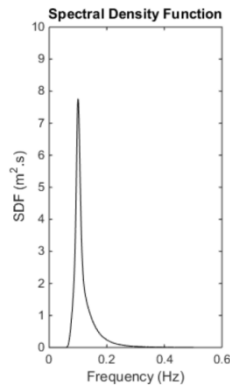
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- Unlike existing approaches we make use of the **statistical information** contained in the **wave spectrum**
- Statistical model that can be used either in an up-wave or time-series configuration

# Using the wave spectrum for wave elevation forecasts

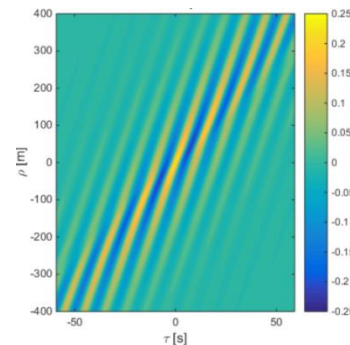
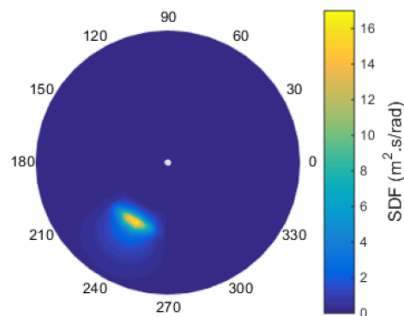
- From the wave spectrum we compute how wave measurements and predictions are correlated to each other
- From there we get the best possible predictor

Time series



Optimal predictor

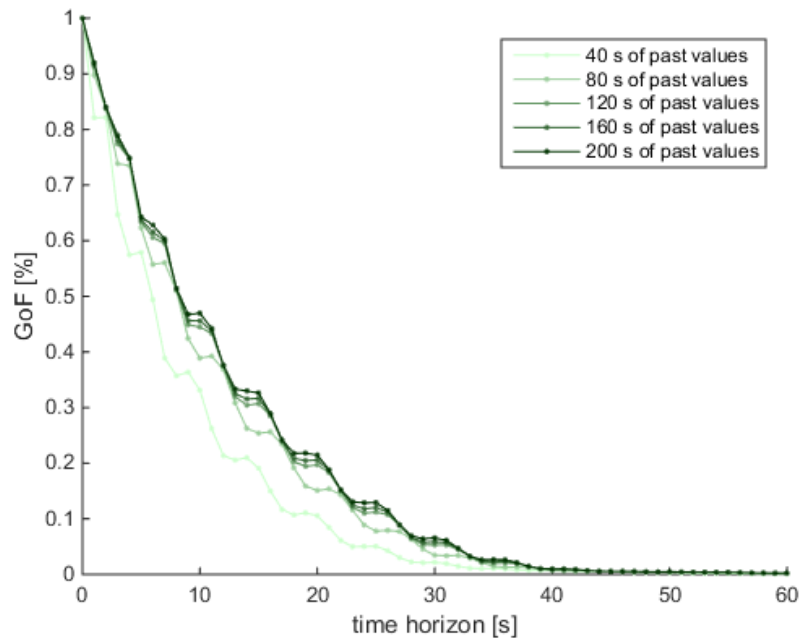
Up-wave



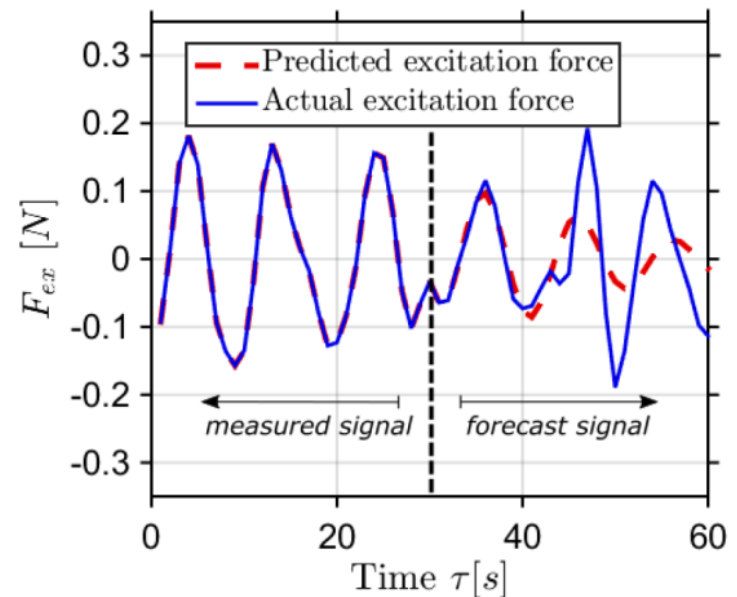
Optimal predictor

# Examples: time-series approach

- Even the optimal time-series approach performs quite poorly!



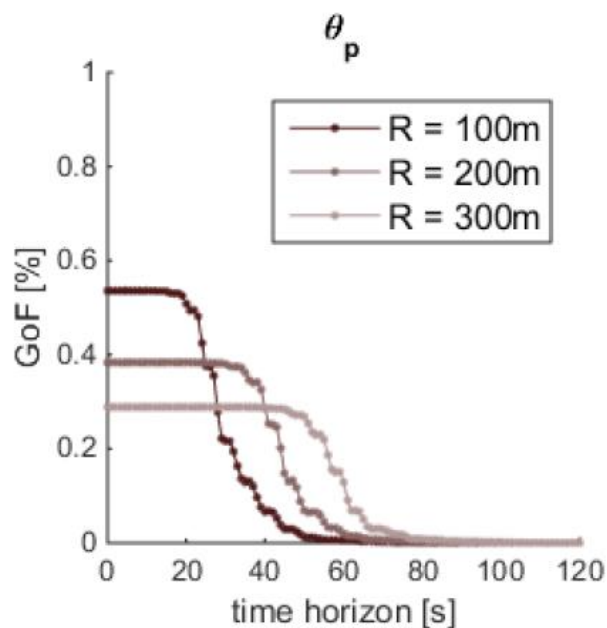
Forecast accuracy



Actual vs forecast signal

# Examples: up-wave approach

- Using only one up-wave probe at different distances

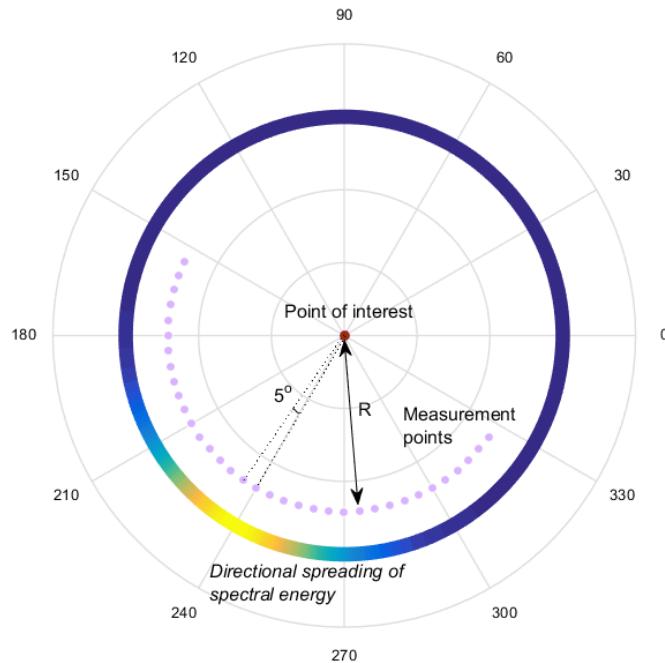


- Long up-wave distance is good for the forecasting horizon
- Wave directional spreading is bad
- Wave directional spreading is worse for longer up-wave distances

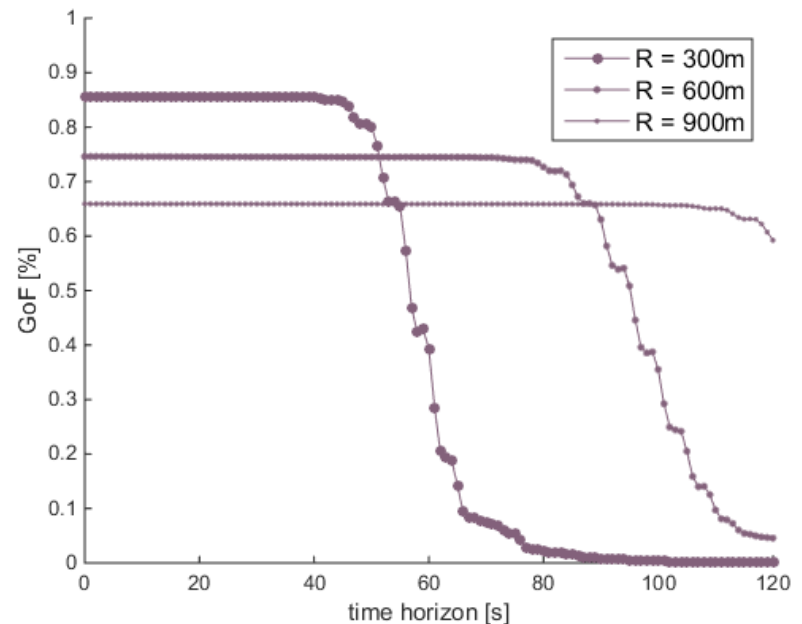
Forecast accuracy

# Examples: up-wave approach

- Many more probes shall be used!



Measurement layout



Forecast accuracy

**What measurement technology???**

# THANK YOU

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