

# VALIDATION OF STORM SURGE FORECASTS FOR THE DUTCH COAST

Hans de Vries

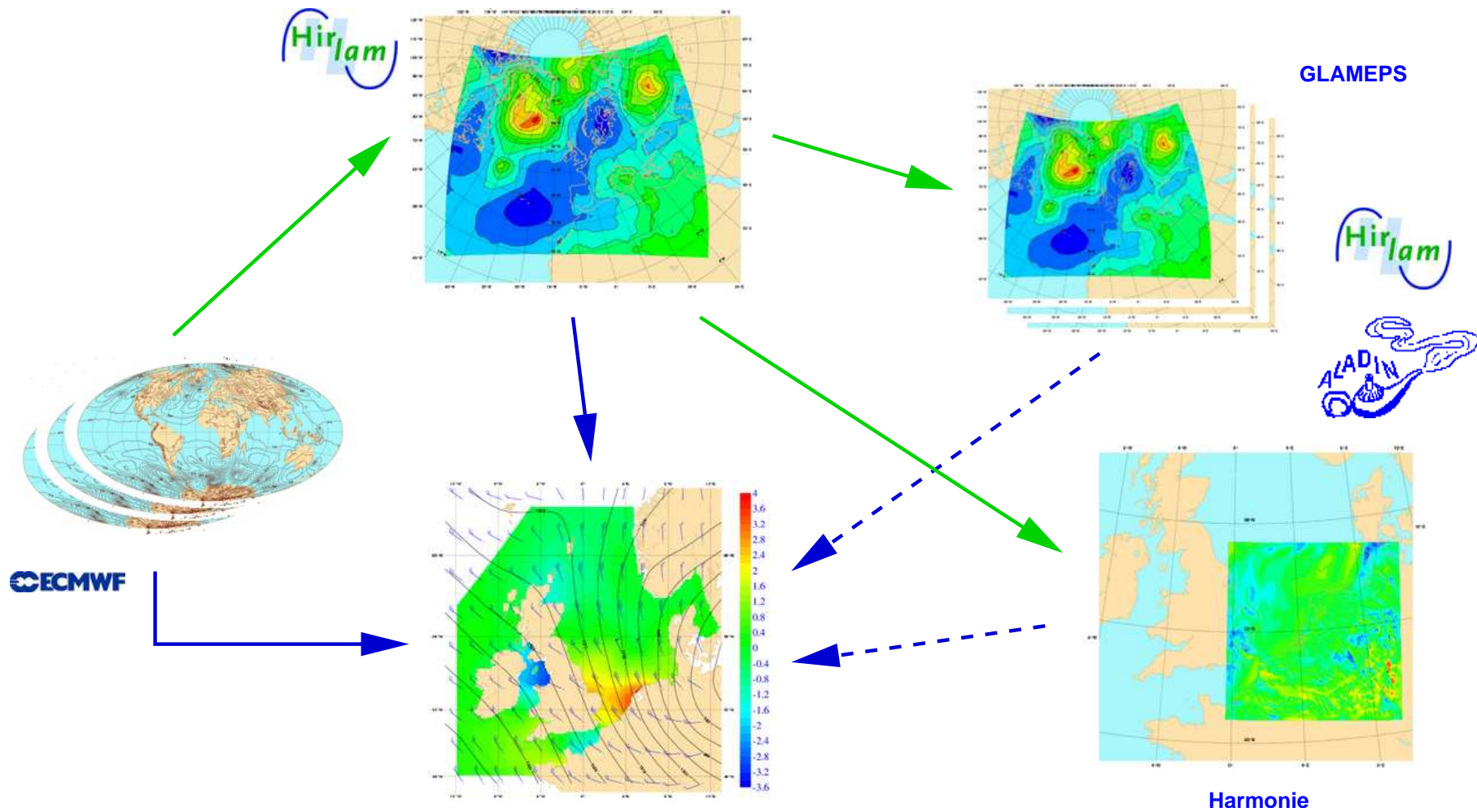
KNMI, Weather Service  
Research and Development

[Hans.de.Vries@knmi.nl](mailto:Hans.de.Vries@knmi.nl)





# Overview





# Validation aspects

## Models

- Atmosphere
- Storm surge

## Fit for purpose

## Model stage

- Model setup and calibration
- Operational forecasts

## Parameter

- Astronomical tide
- Surge

## Situation

- Day-to-day forecasts
- Extreme events

## Type of forecast

- Deterministic forecasts
- Probability forecasts

# Observations

## In-situ

Atmosphere	SYNOP/SHIP/TEMP Aircraft data
Storm surge	Tide gauges

## Remote sensing

Atmosphere	Scatterometer Radar Lidar
Storm surge	Altimeter

## Caveat

- Accuracy
- Representativeness



# Models

## Atmosphere

KNMI Hirlam	Limited area	$t_f < 48$ h	Deterministic
ECMWF IFS	Global	$t_f < 240$ h	Ensemble

## Storm surge

WAQUA/DCSM

- Rijkswaterstaat
- Deltares
- KNMI

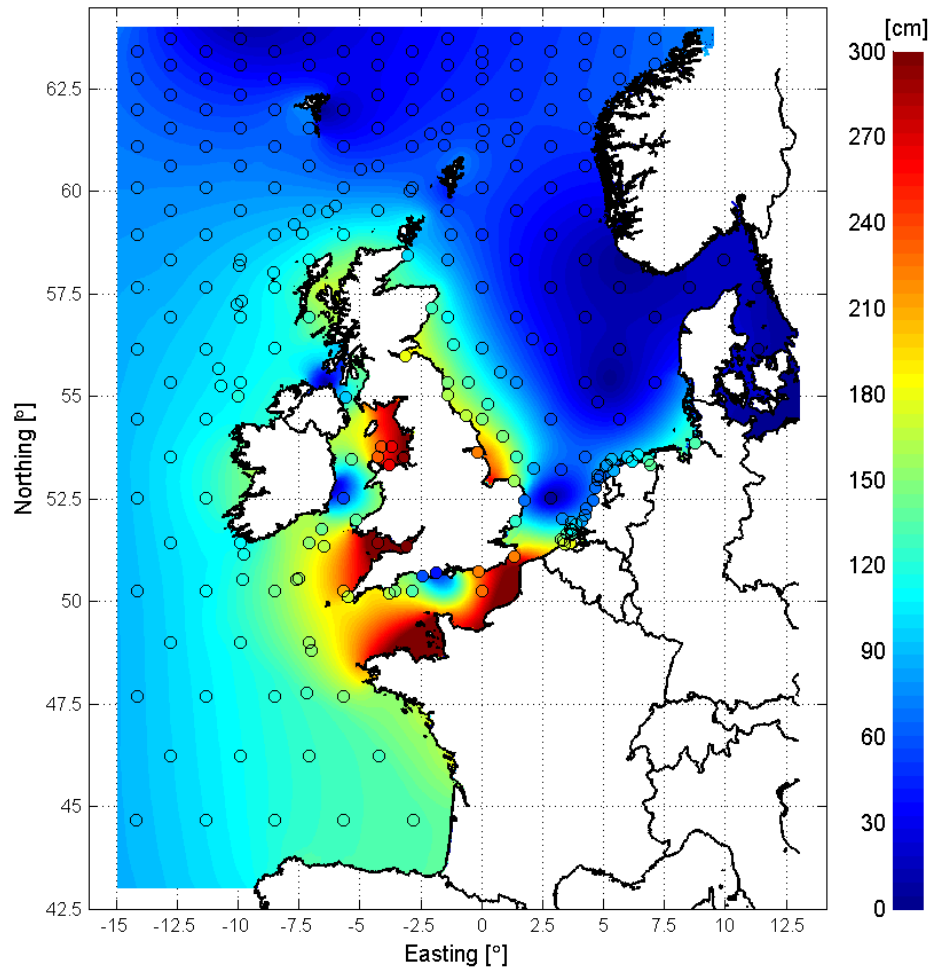
*Dutch Continental Shelf Model*

Version 5 (8 km, 1998)  $\longrightarrow$  Version 6 (2 km)

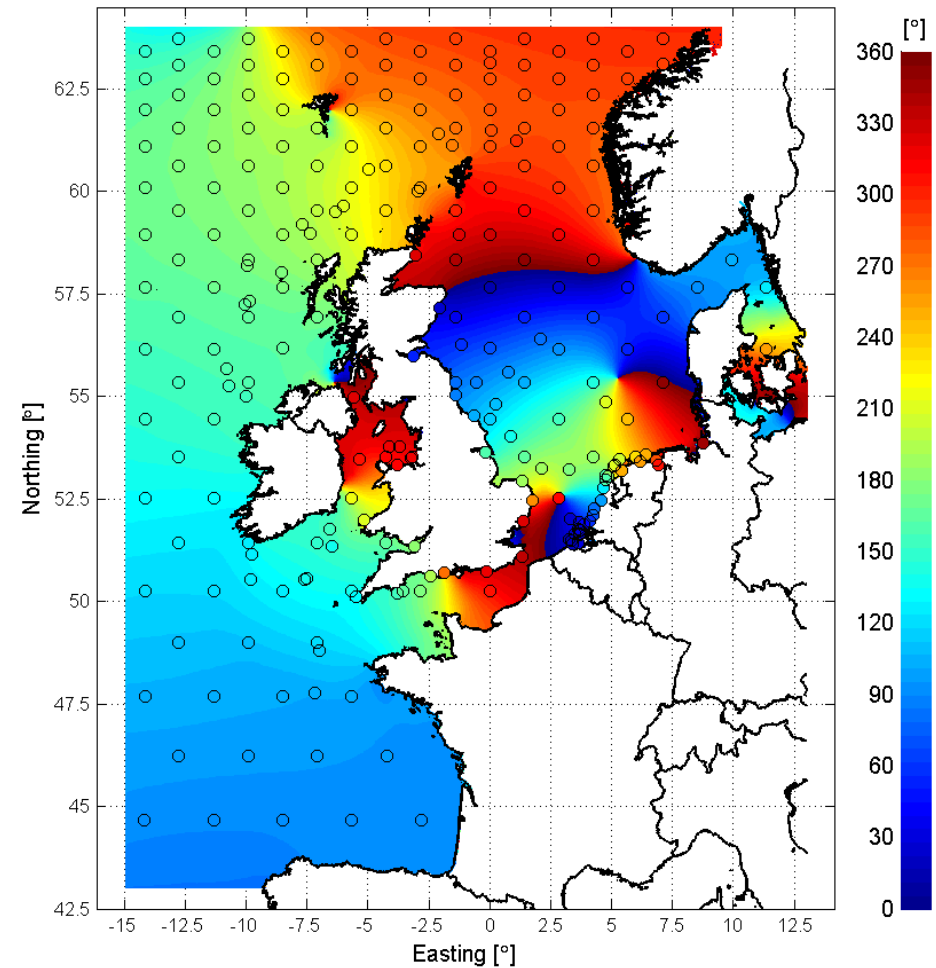
# Model setup and calibration

## Astronomical tide

Amplitude for constituent: M2 (RMSE = 9.3 cm)

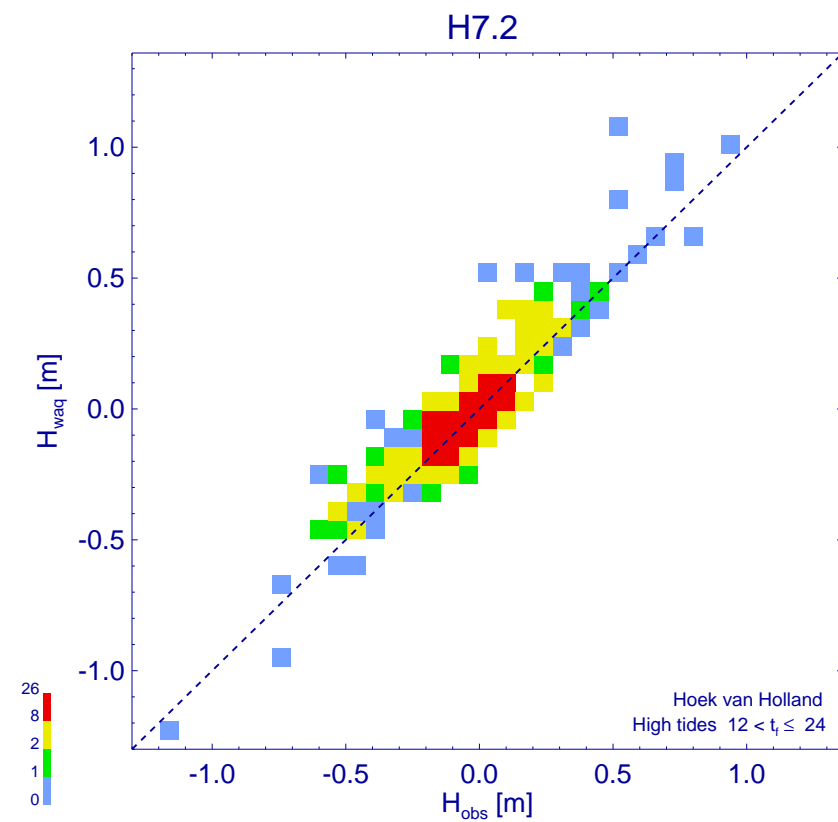
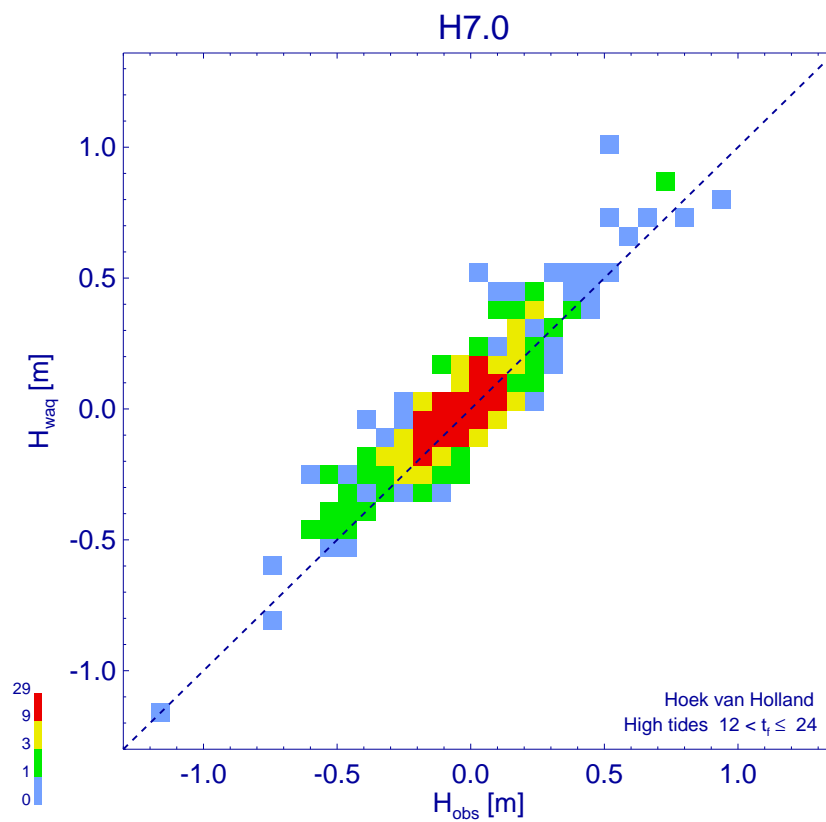


Phase for constituent: M2 (RMSE = 7.3 °)



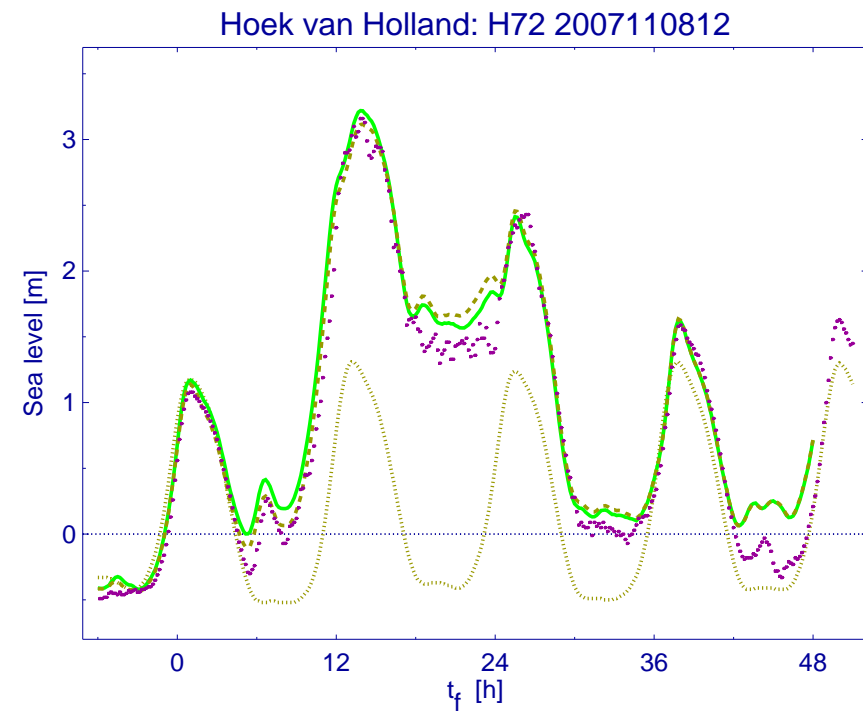
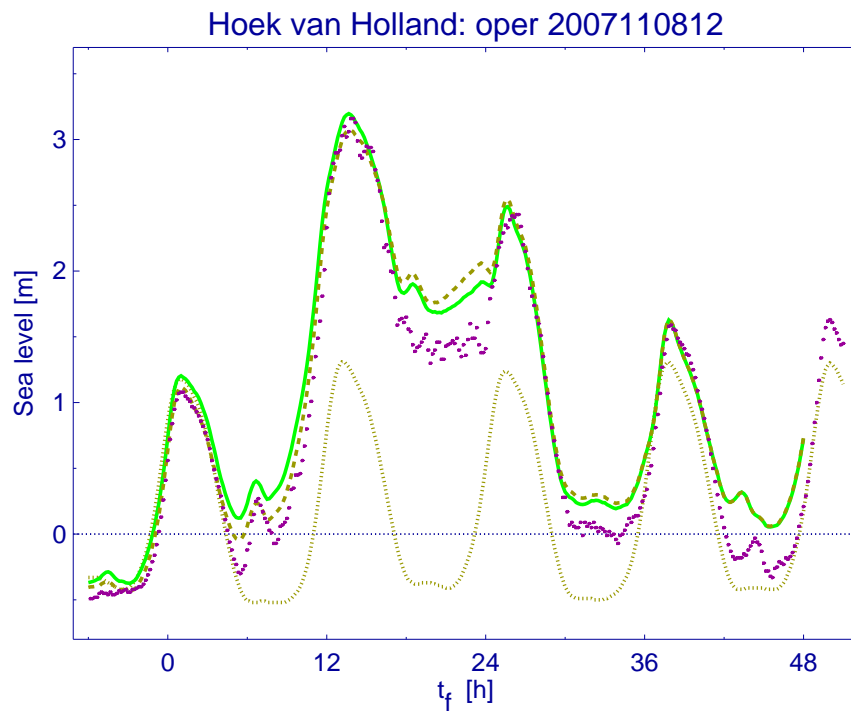
# Model setup and calibration

## Storm surge



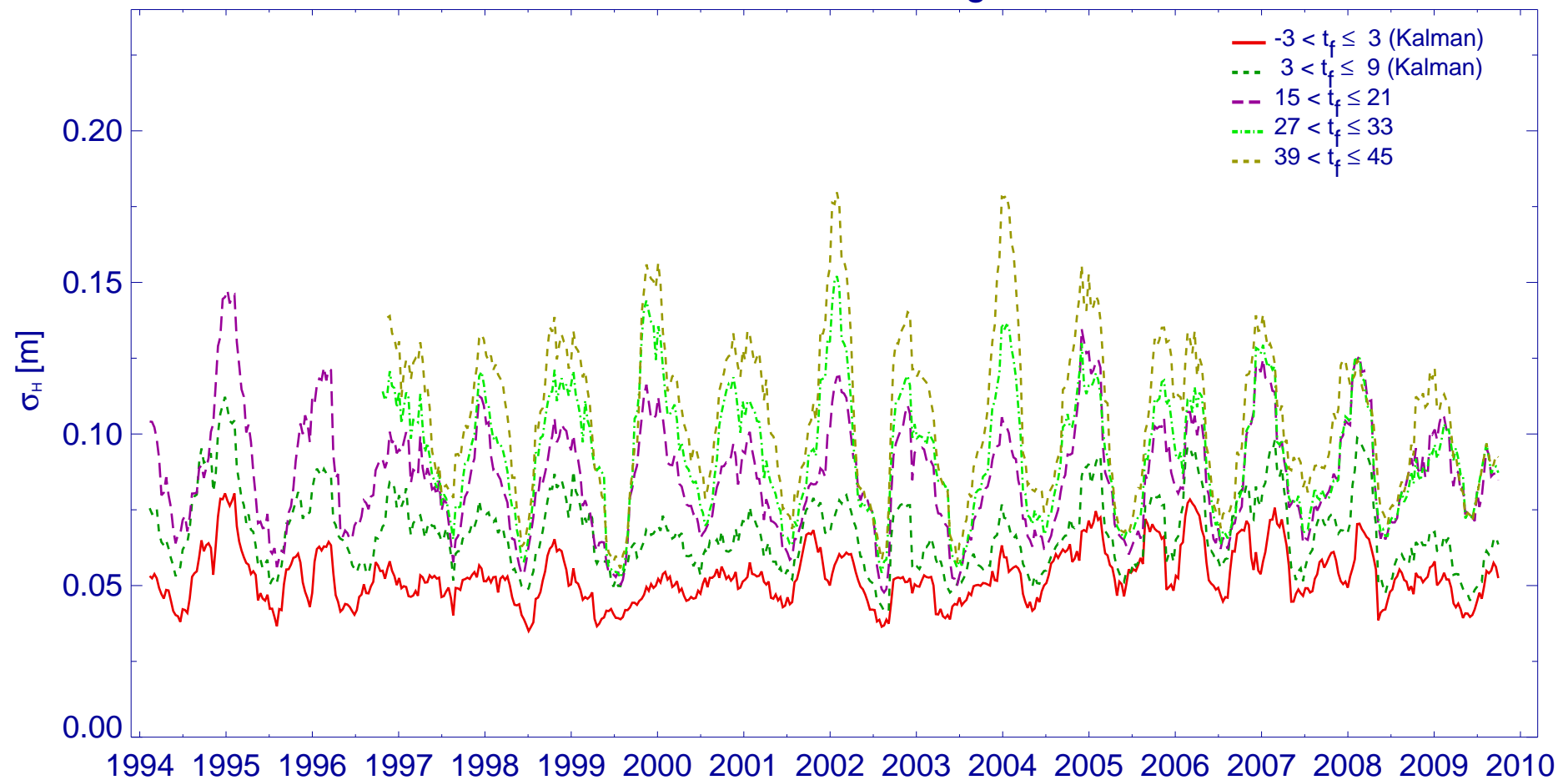
# Model setup and calibration

## Storm surge event



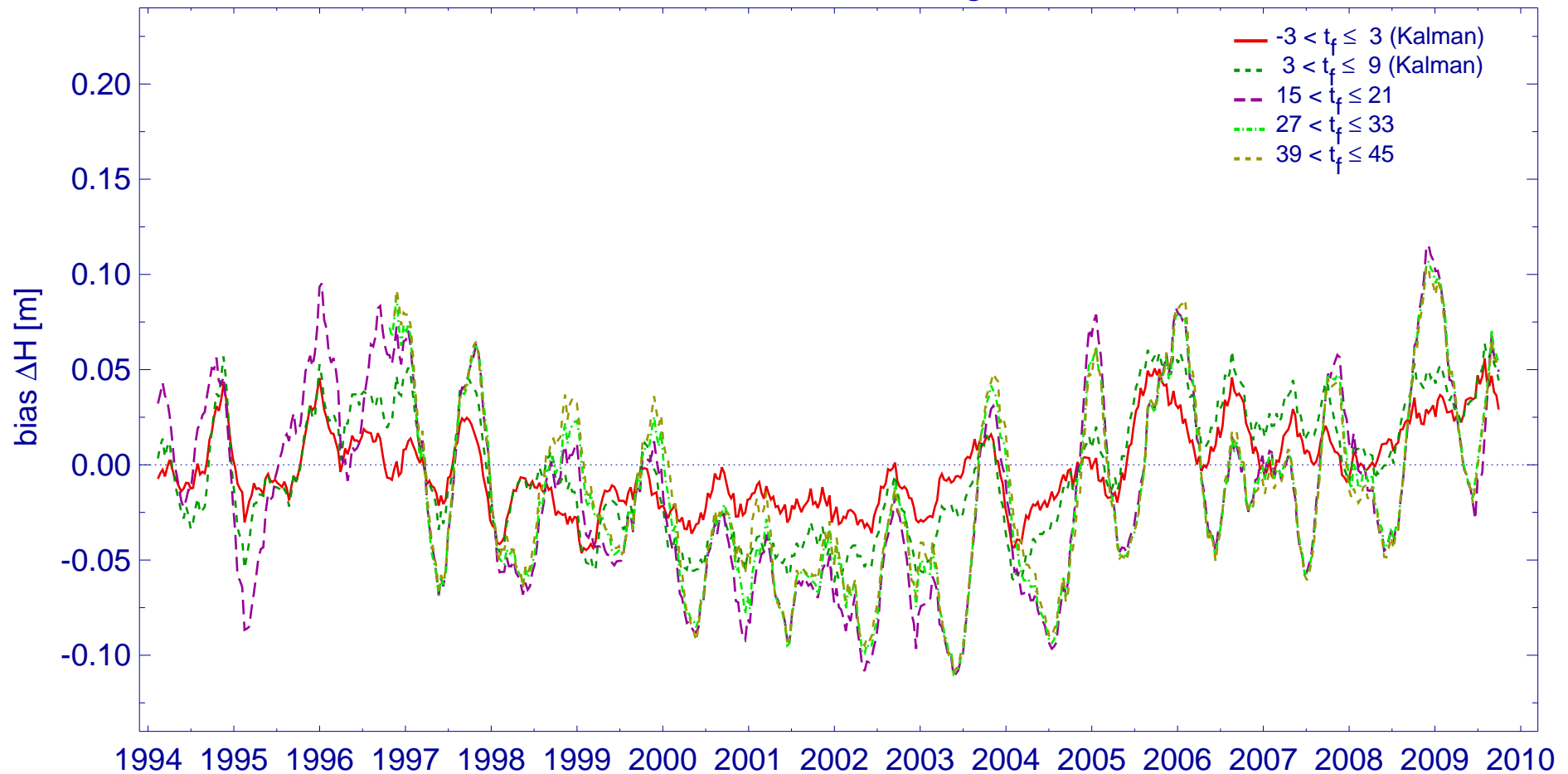
# Operational forecasts: Verification

Hoek van Holland: High tides



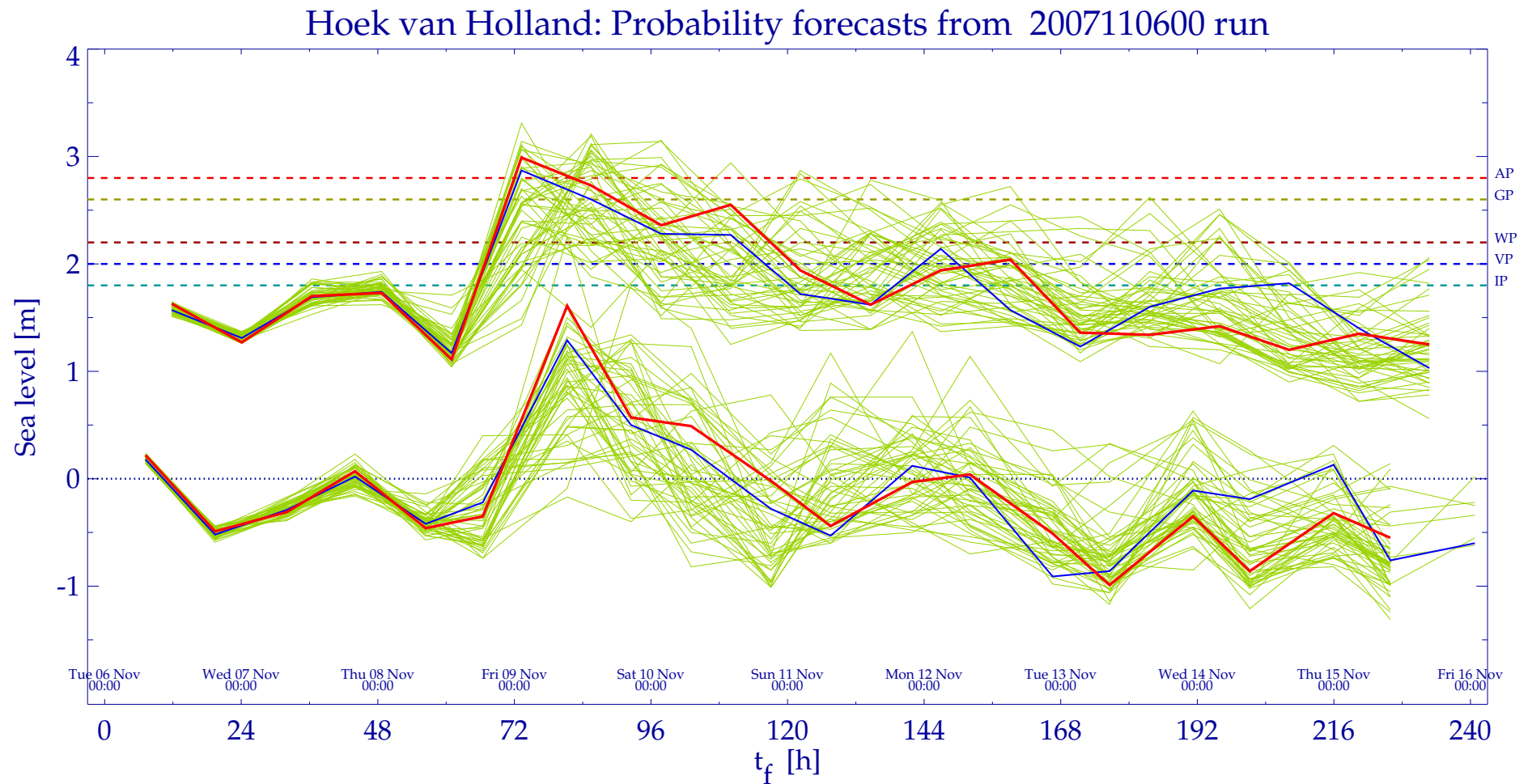
# Operational forecasts: Verification

Hoek van Holland: High tides



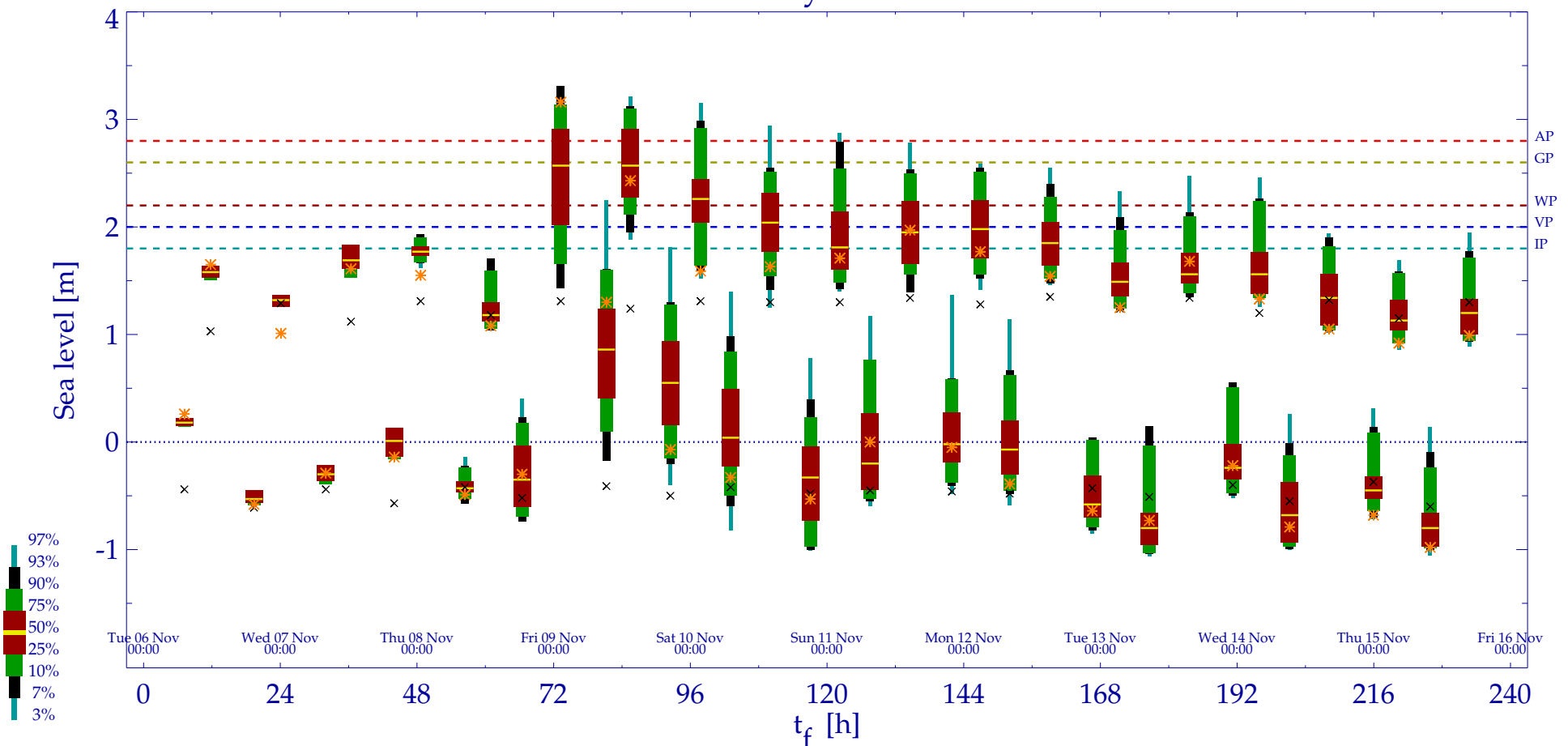


# Probability forecasts

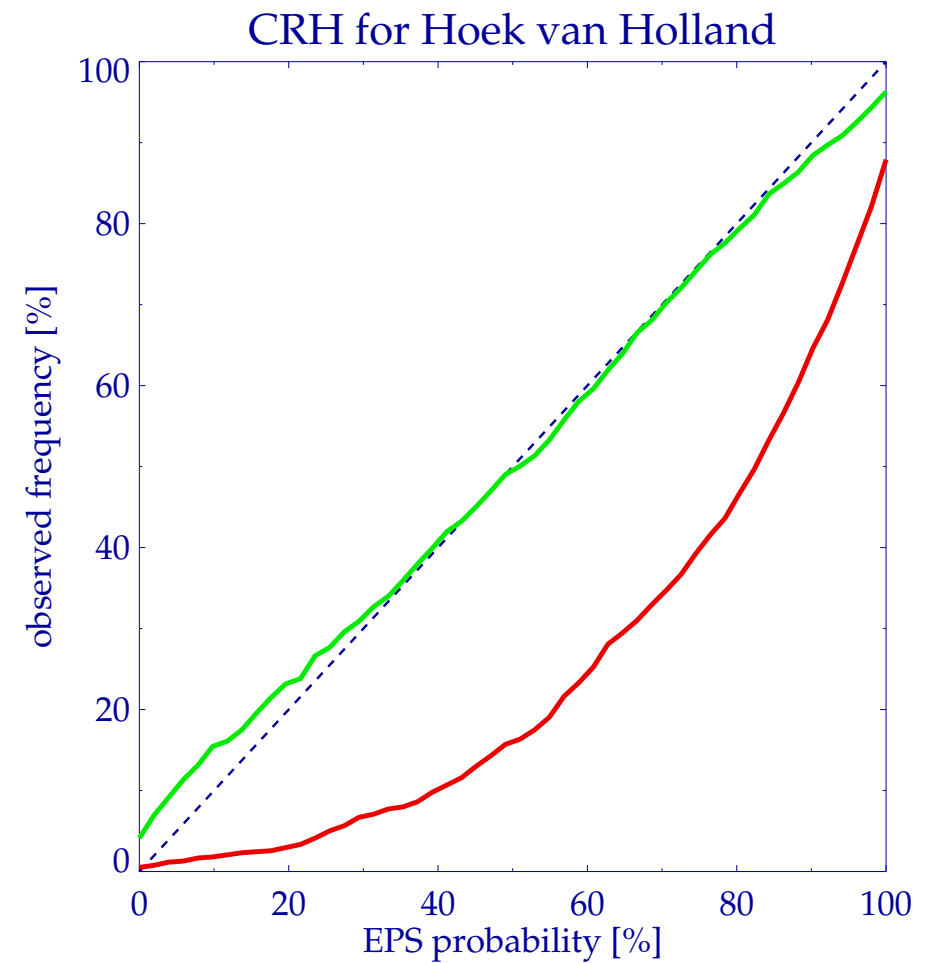
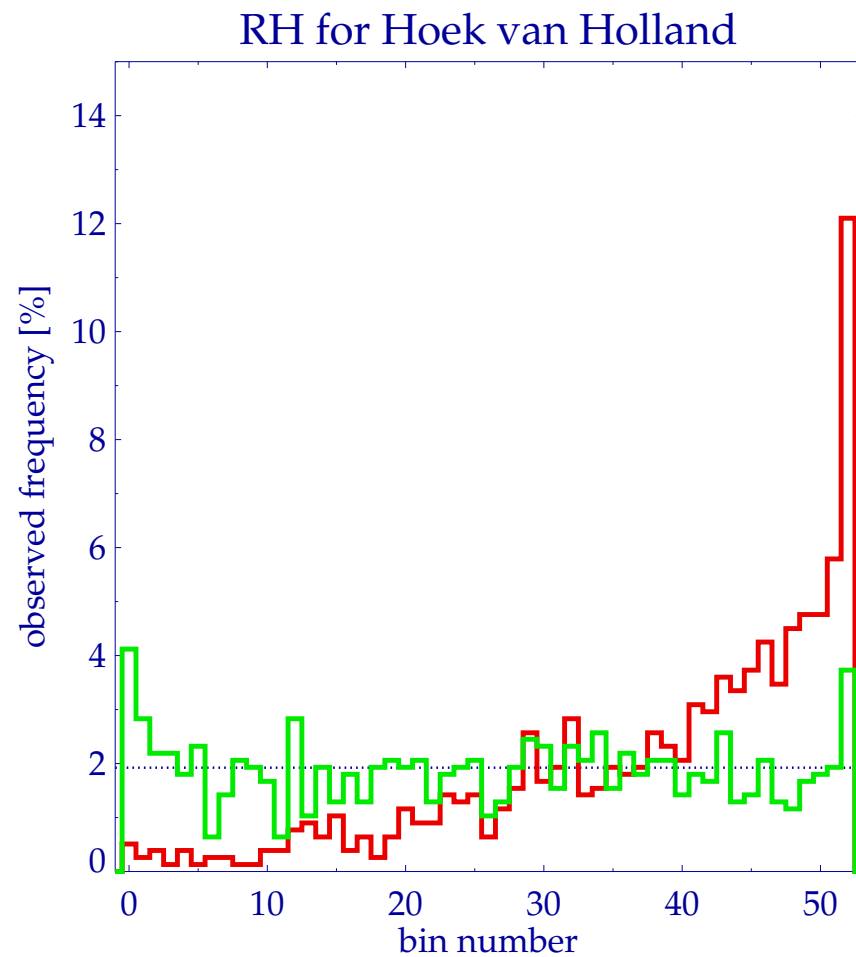


# Probability forecasts

Hoek van Holland: Probability forecasts from 2007110600 run

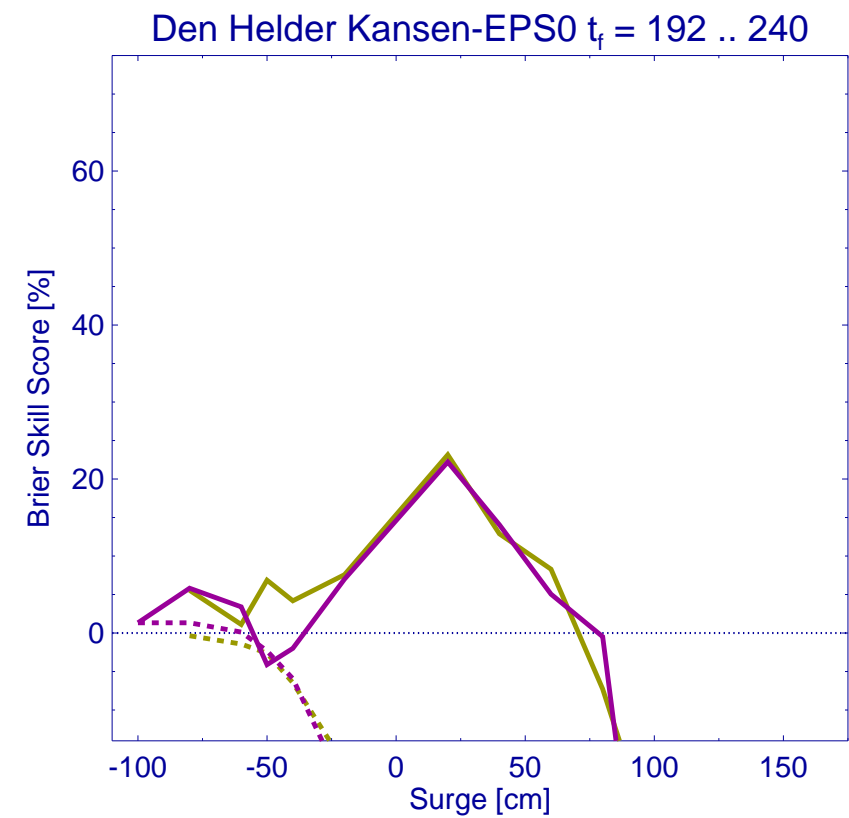
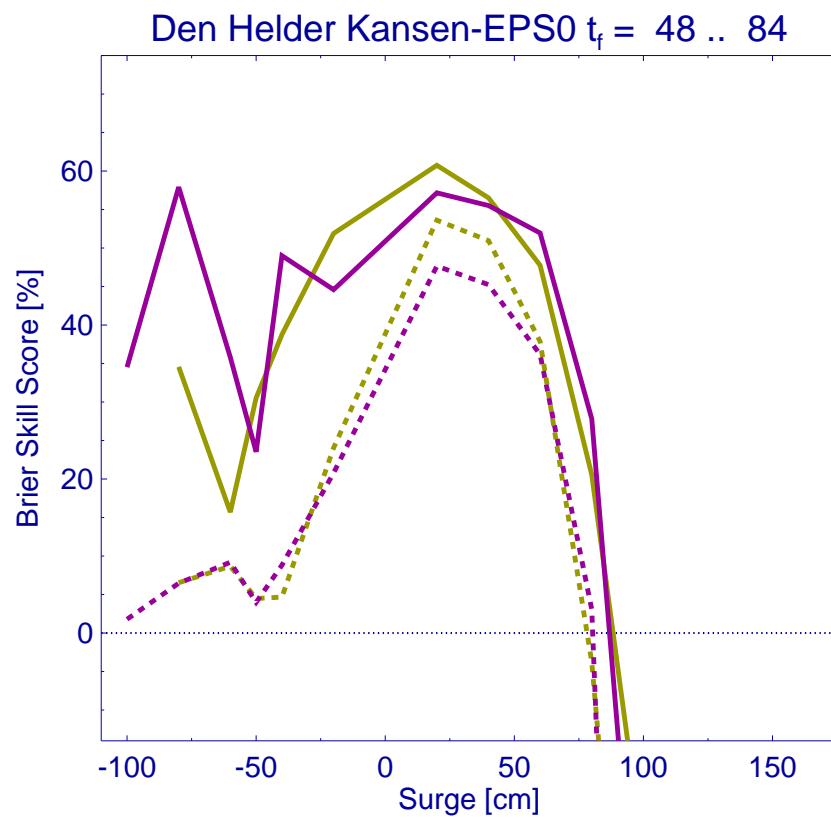


# Probability forecasts

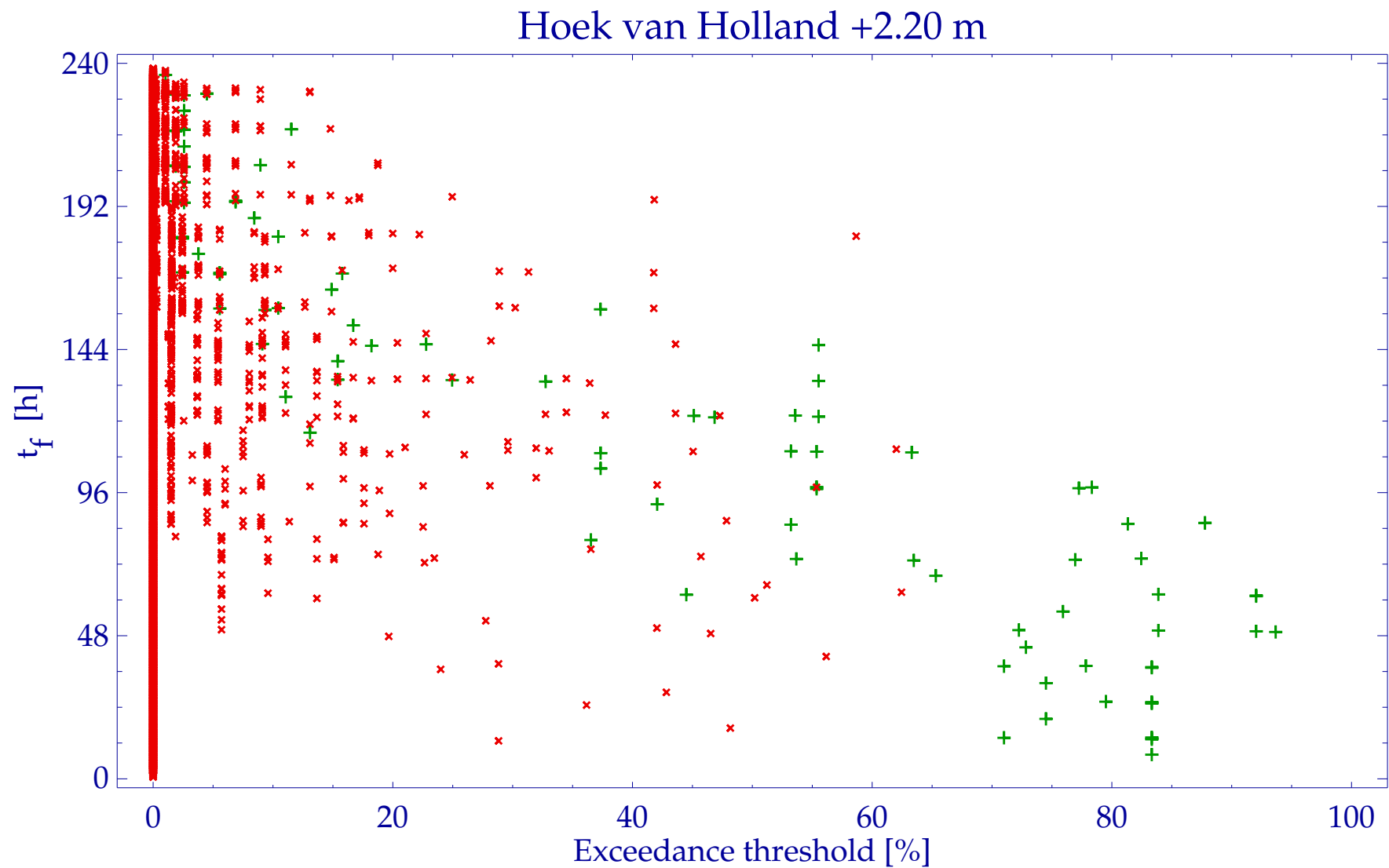


# Probability forecasts

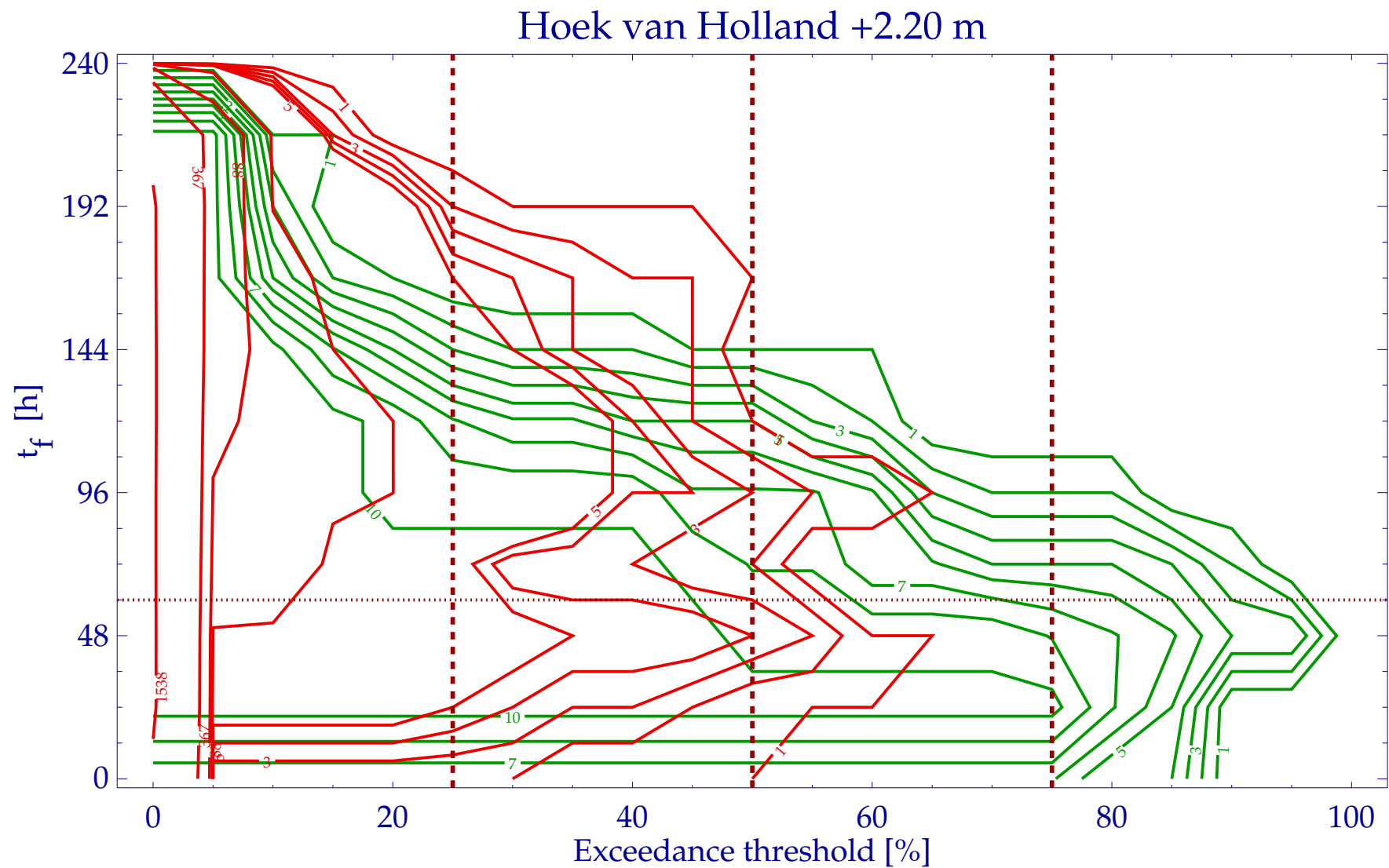
## Brier skill scores



# Probability forecasts



# Probability forecasts





*Thank you*