

# → ATLANTIC FROM SPACE WORKSHOP

23–25 January 2019  
National Oceanography Centre  
Southampton, UK

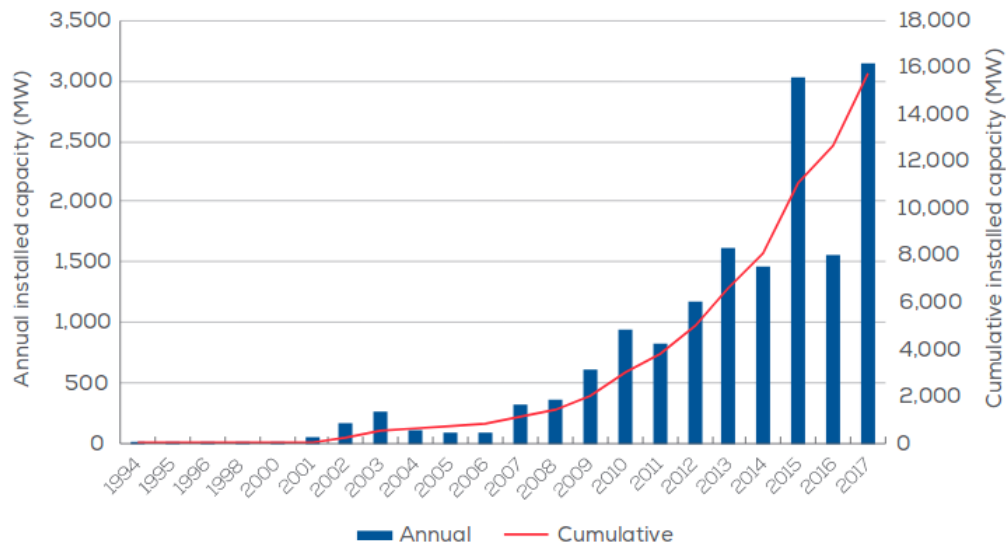
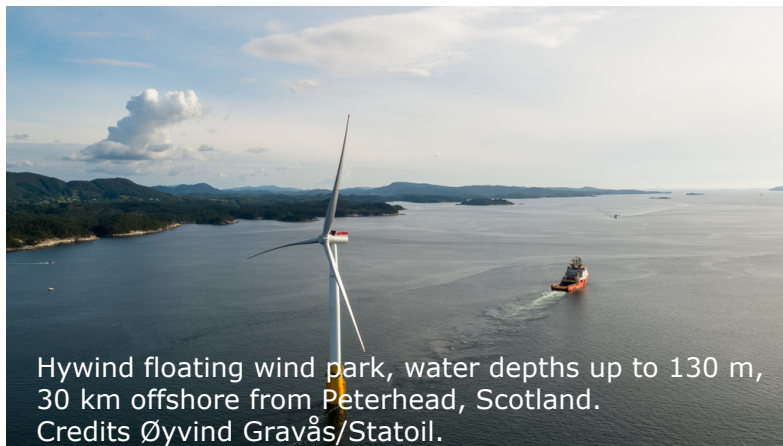
Wave climate analysis for  
the North Sea

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DTU Wind Energy, Technical University of Denmark, Risø campus

# Motivation

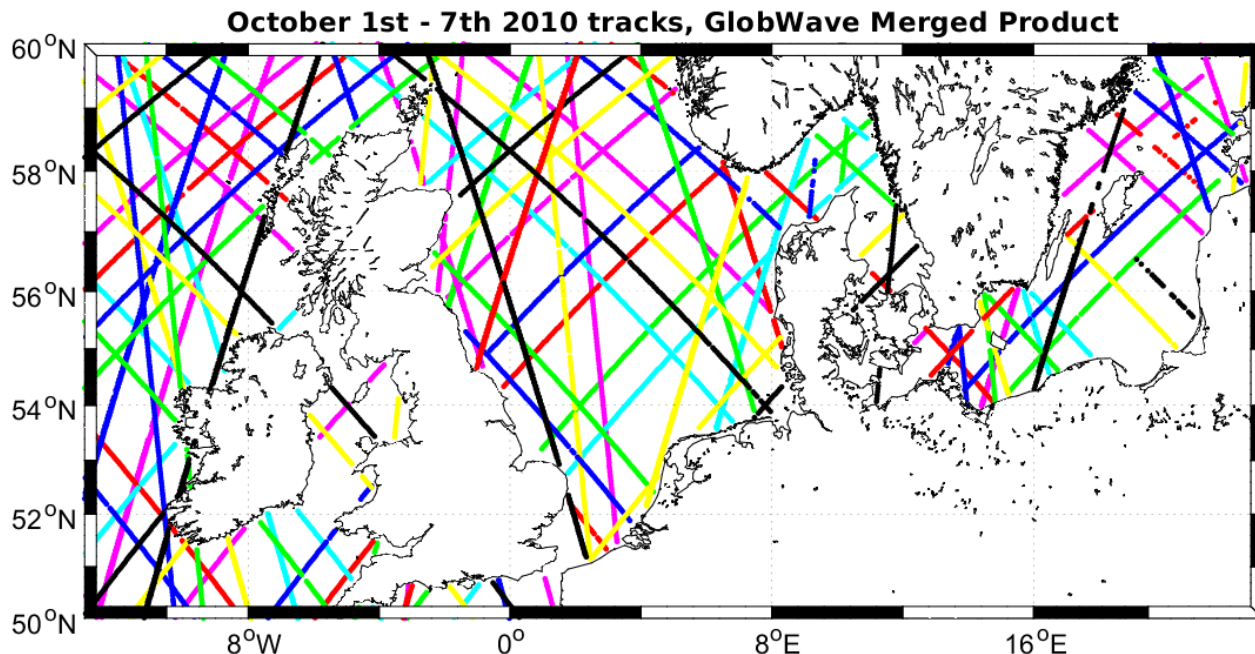
- 15.8 GW offshore wind energy installed
- By 2020, a total of 20 GW offshore in Europe
- Approx 80% of European offshore resources located in 60m depths - or deeper
- Offshore wind less competitive due to higher costs in:
  - Installation
  - Operation
  - Maintenance



# Altimeter Hs

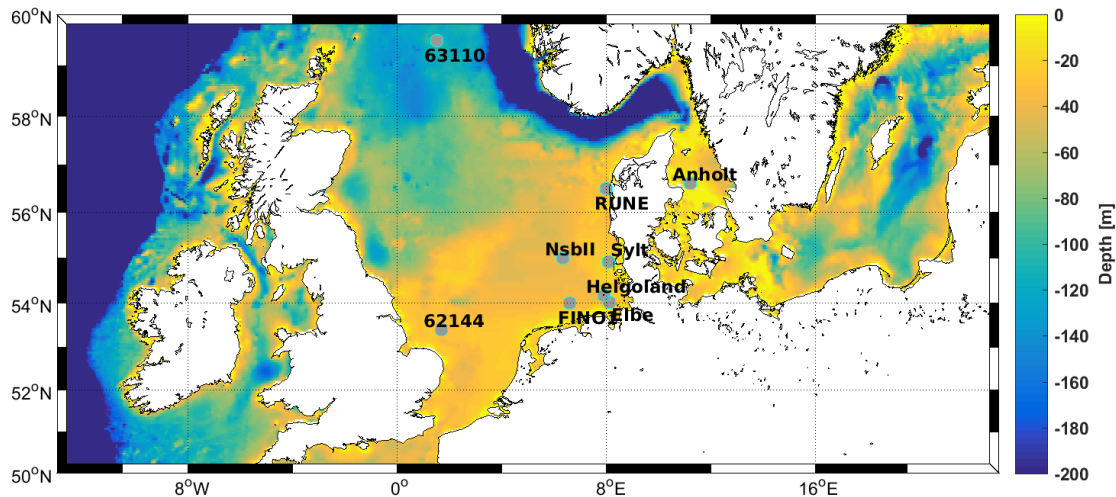
- ESA GlobWave
- Merged global product
- 9-missions
- Period used: 2000-2016
- Product version 11.4

- Data available from  
<ftp://ftp.ifremer.fr/ifremer/cersat/products/swath/altimeters/waves/data/>



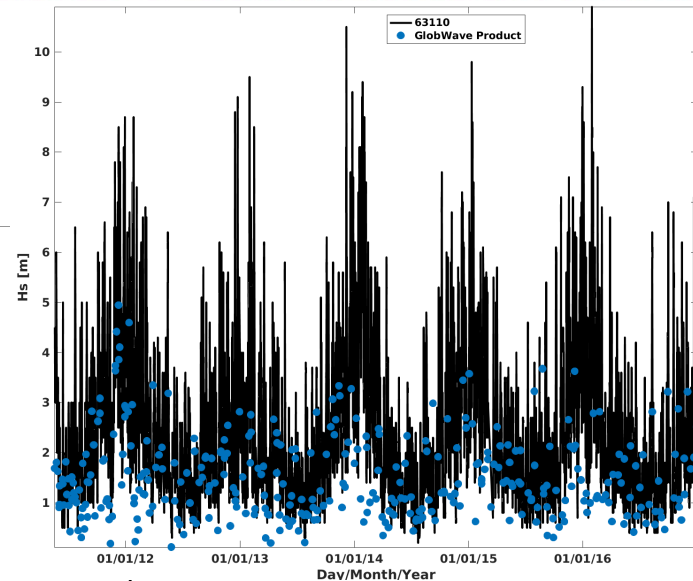
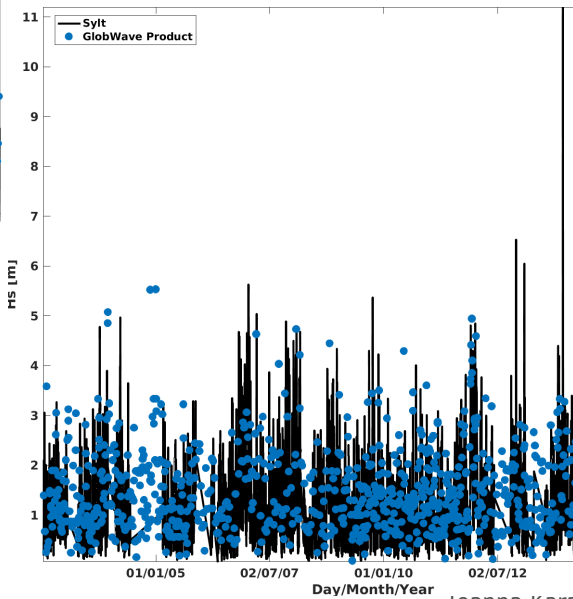
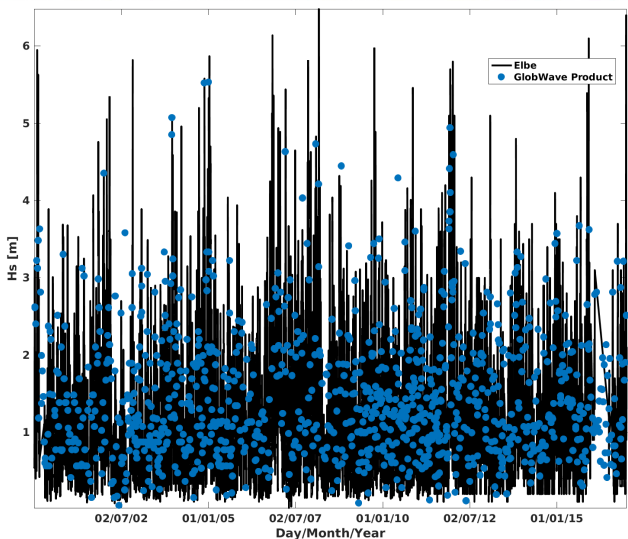
# In situ measurements

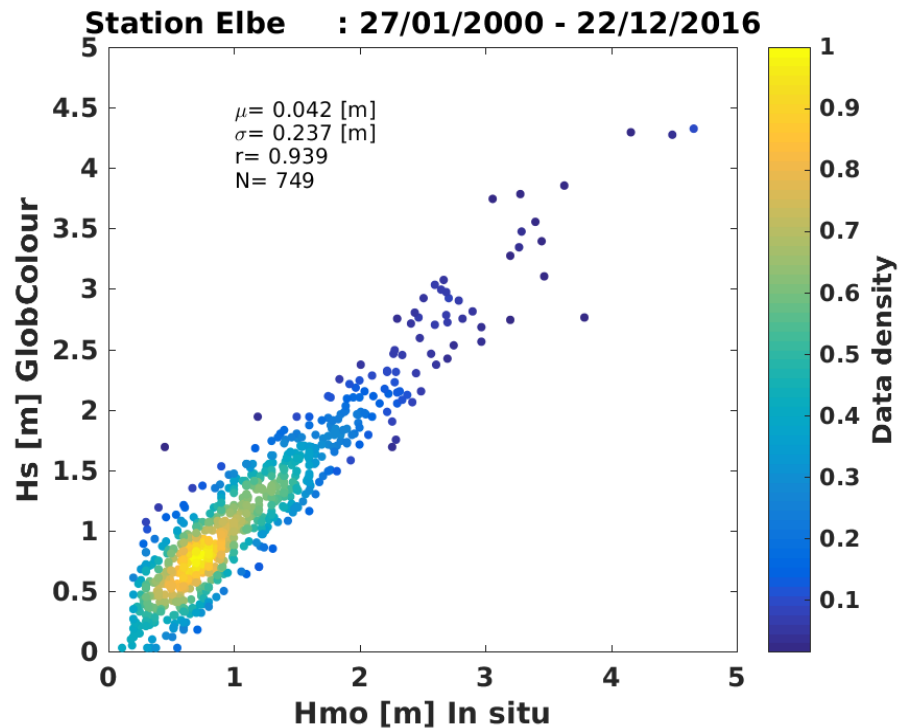
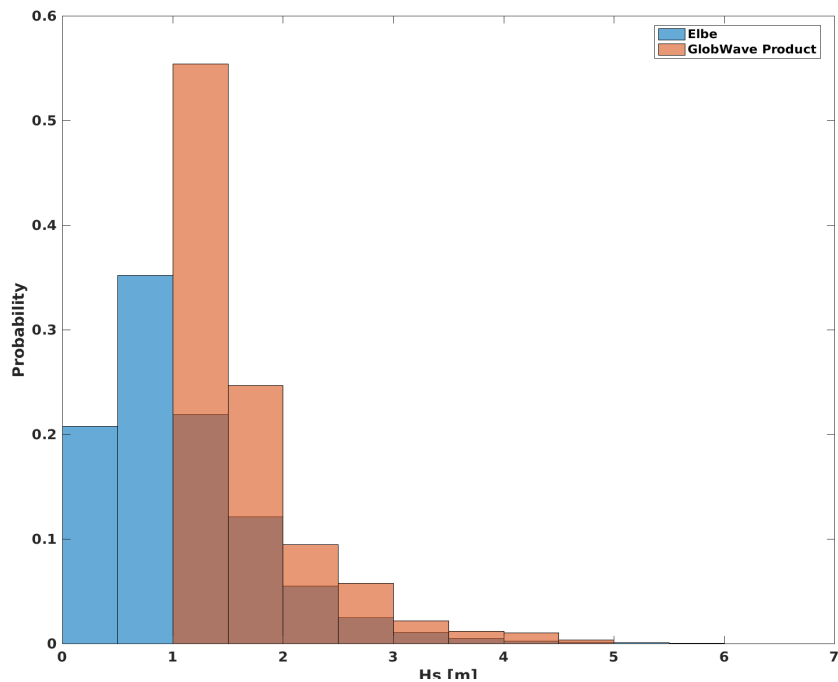
- MARNET buoy network  
([https://www.bsh.de/EN/TOPICS/Observation\\_systems/MARNET\\_monitoring\\_network/MARNET\\_monitoring\\_network\\_node.html](https://www.bsh.de/EN/TOPICS/Observation_systems/MARNET_monitoring_network/MARNET_monitoring_network_node.html))
- Anholt offshore wind farm data
- CMEMS data
- RUNE campaign data

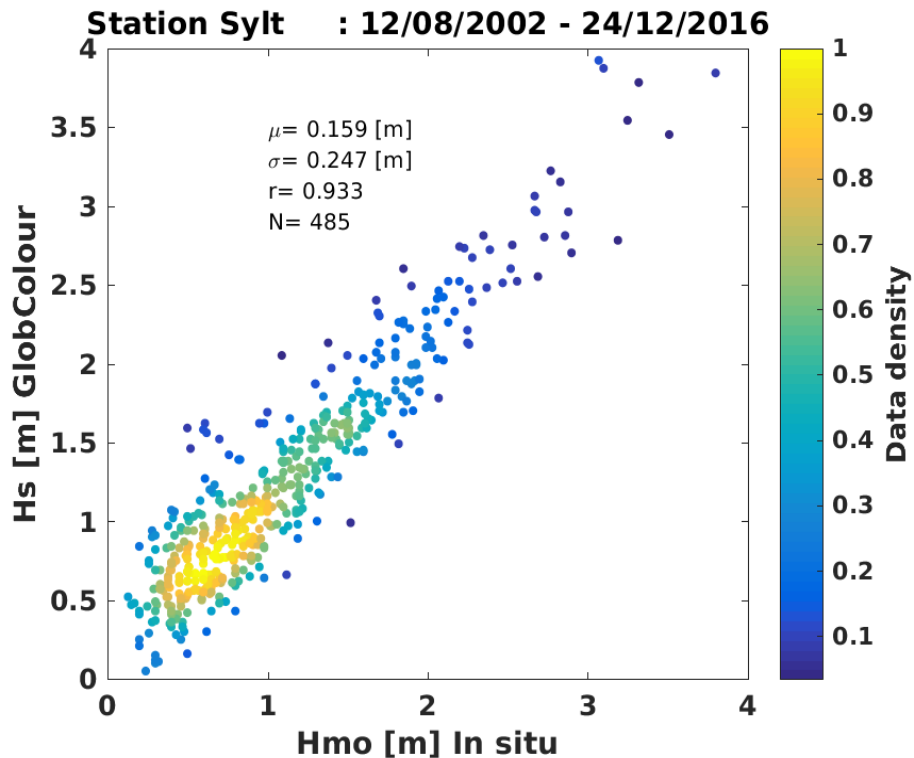
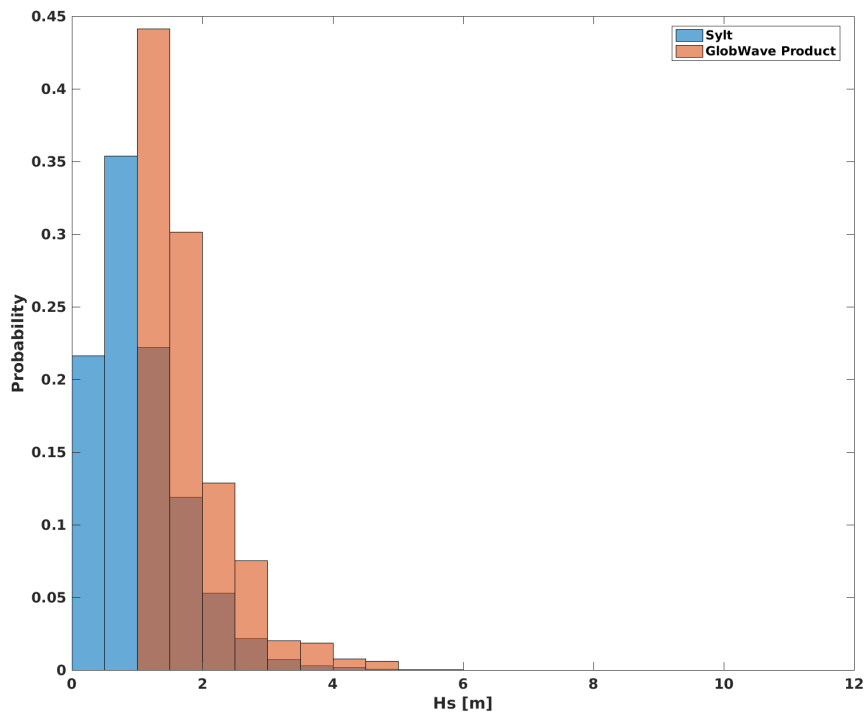


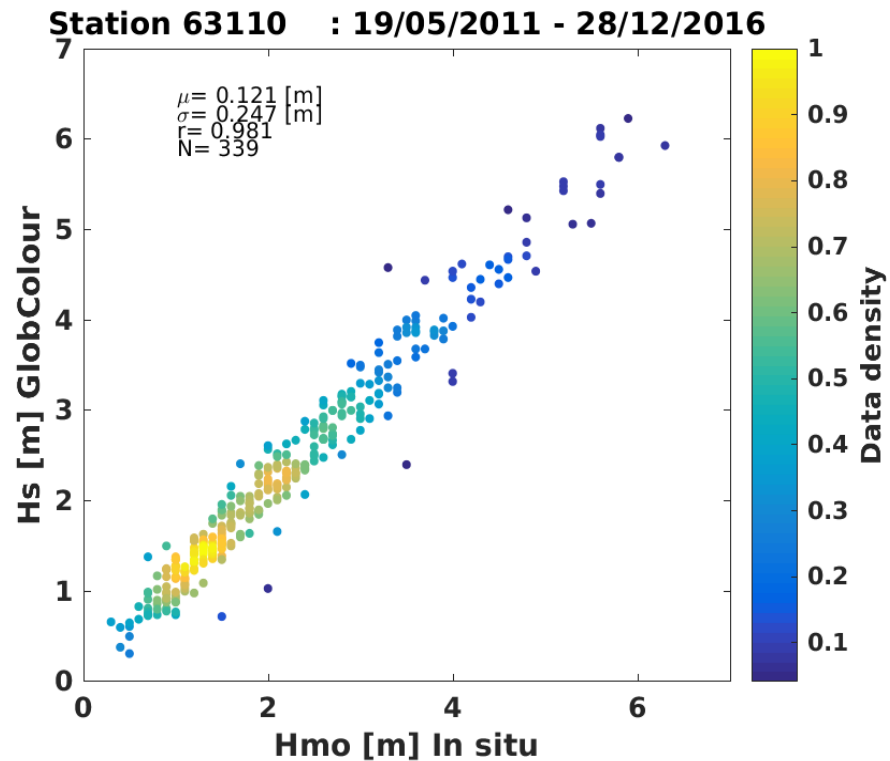
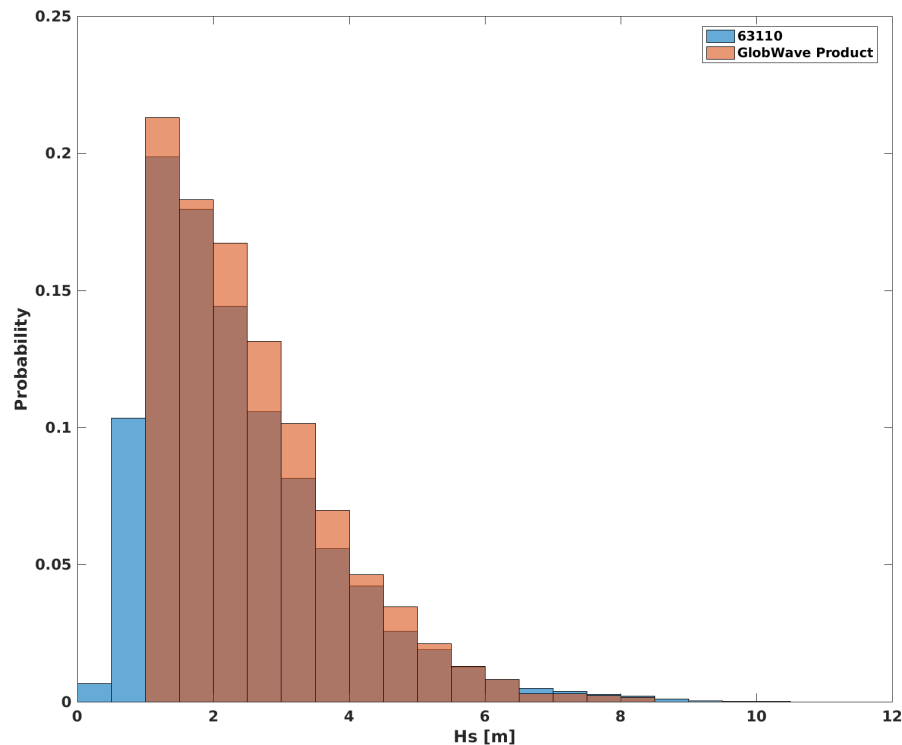
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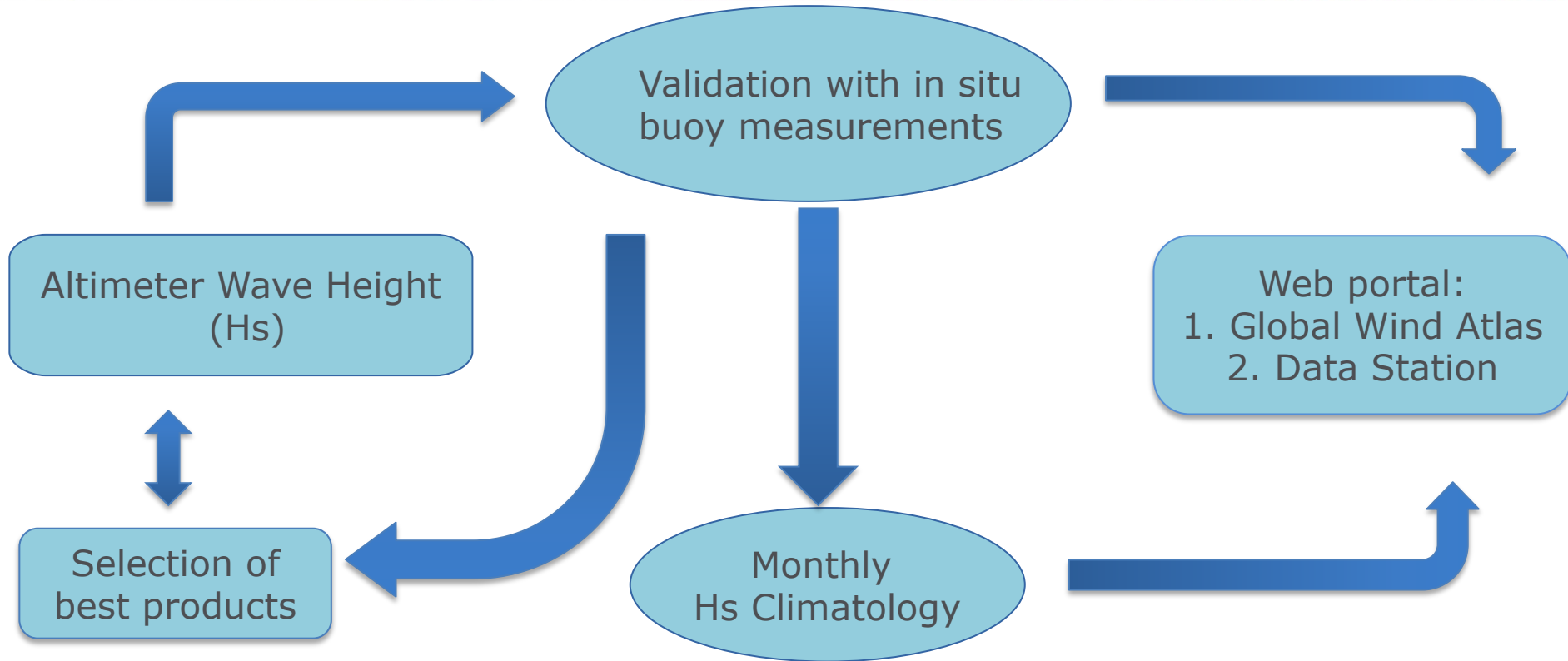
# Time-series







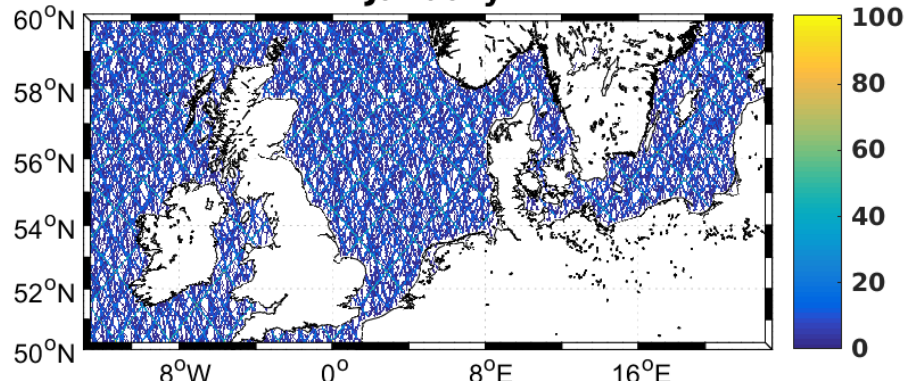




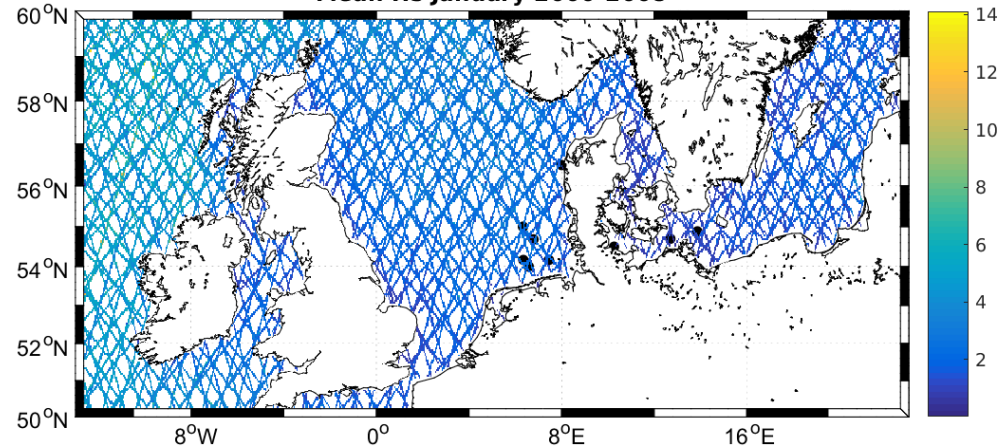
# Monthly “climatology”

- Average values over months

**N January**

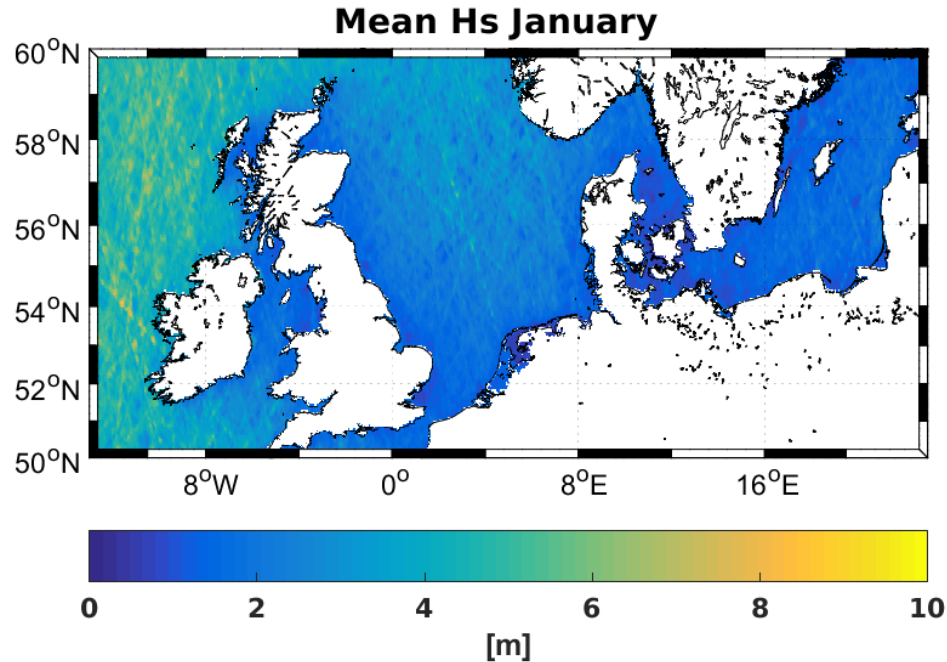


**Mean Hs January 2000-2008**

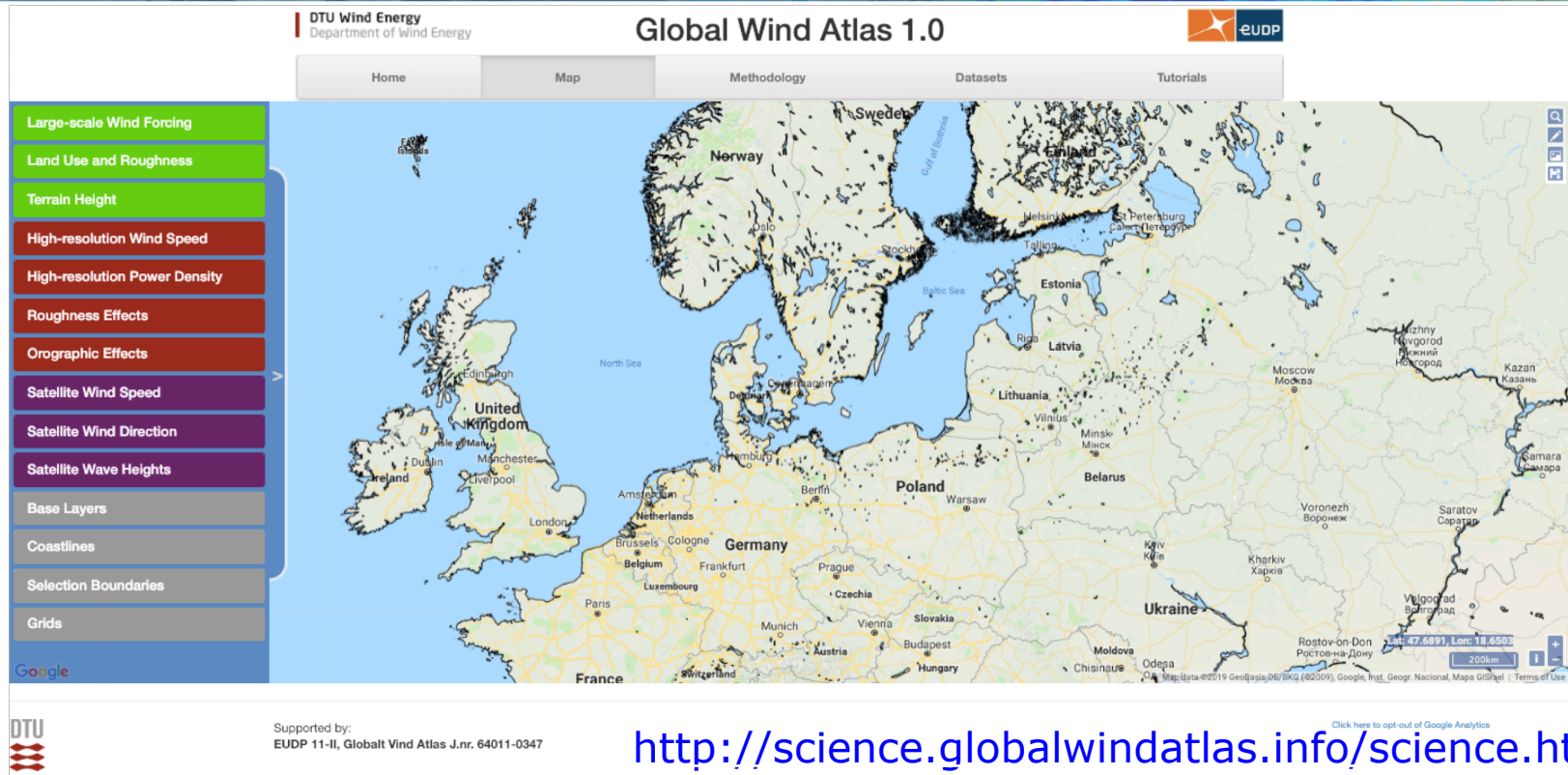


# Monthly “climatology”

- Apply nearest neighbour smoothing



# Global Wind Atlas



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European Space Agency



- GlobWave global SWP product used
- Validation with in situ stations showed biases from 0 to 0.122 m
- Standard deviation ranged from 0.19 to 0.36 m
- Correlation  $r$ : 0.83 to 0.98
- Histograms indicate overestimation of  $H_s > 1\text{m}$
- Monthly values averaged for  $H_s$  climatology
- Simple smoothing applied for gap-filling

- More missions → higher coverage
- OI appropriate scheme for gap-filling
- Long-term joint wind-wave distributions
- “Weather windows” analyses

