Towards uncertainty estimation for operational forecast products - a multi-model-ensemble approach for the North and Baltic Sea

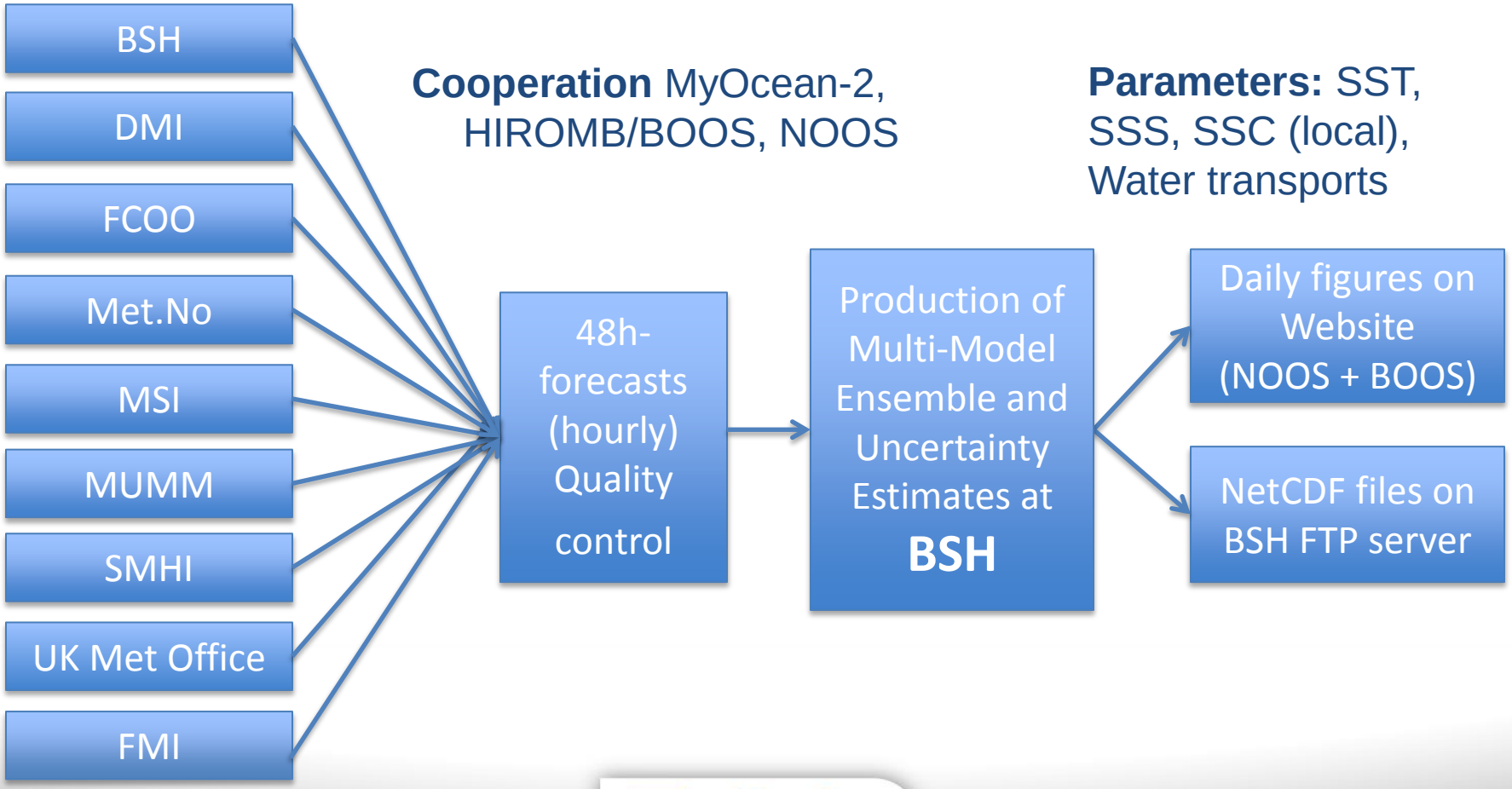
Inga Golbeck, Xin Li, Frank Janssen

Federal Maritime and Hydrographic Agency, Germany

EGU, Vienna, 29.04.14

MME – Who ? How?

- (Major) differences in model forecasting for future scenarios
- Multi-Model Ensemble (MME) provides basis for development of uncertainty estimates

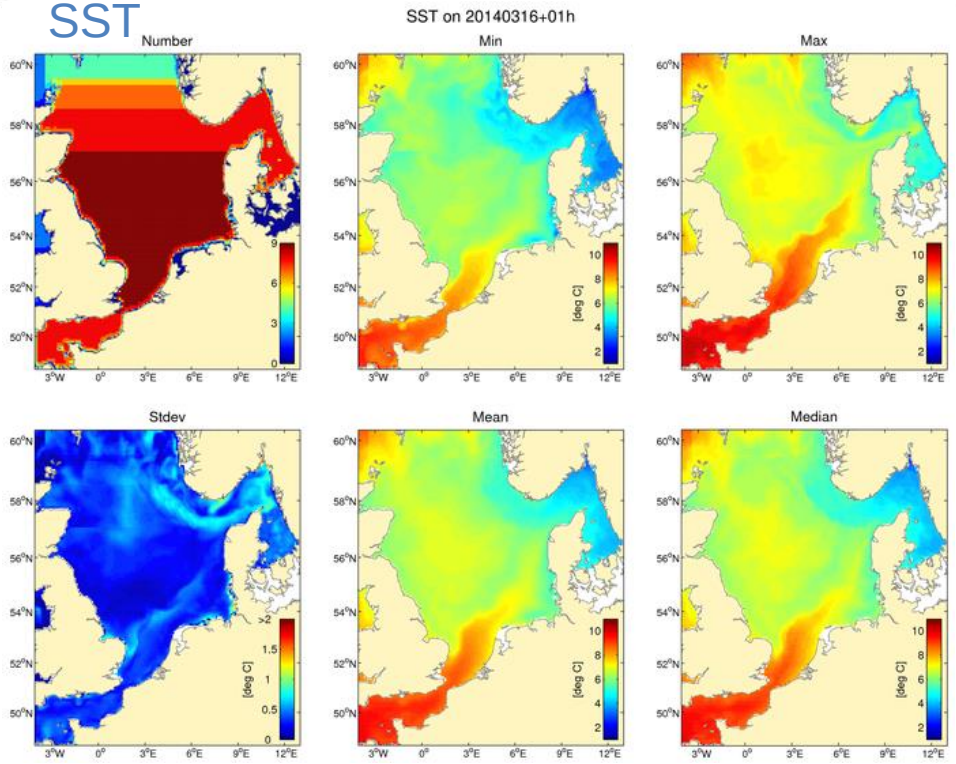


Inga.Golbeck@bsh.de

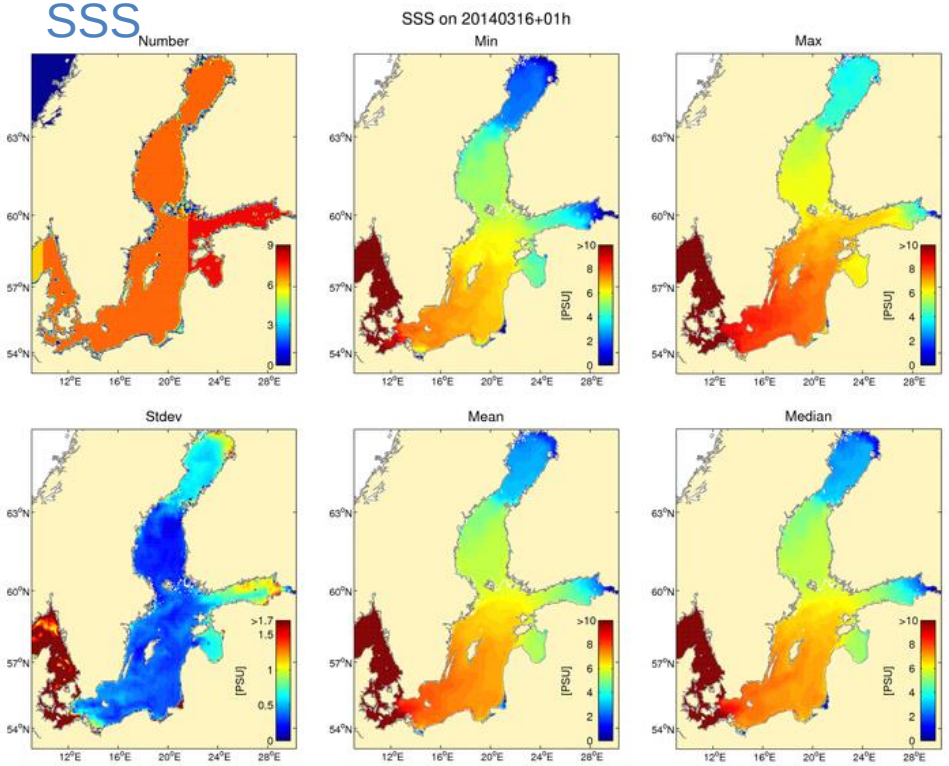
New MME products for SST and SSS

Figures are daily updated on the NOOS and BOOS websites
Reference grids from MyOcean-2 products

SST



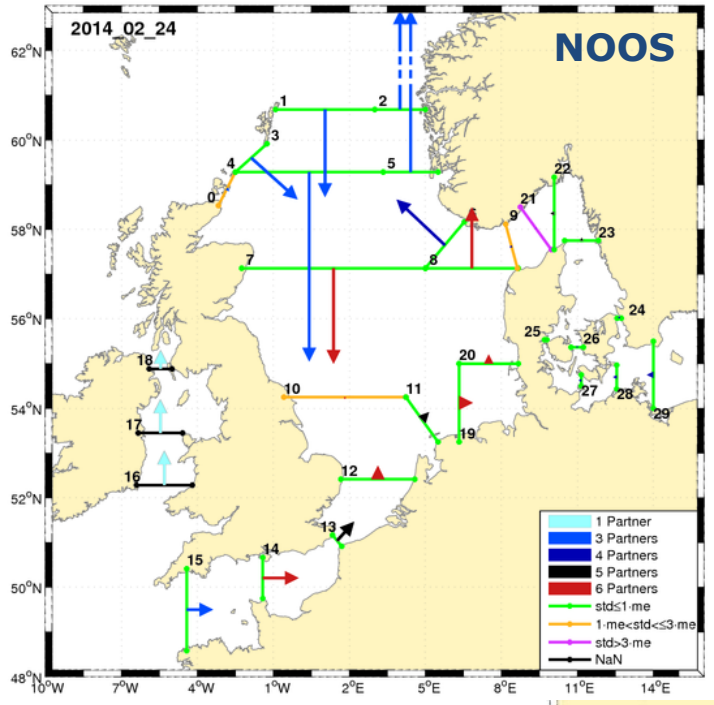
SSS



NOOS website:
http://www.noos.cc/index.php?id=mme

BOOS website:
http://www.boos.org/index.php?id=mme

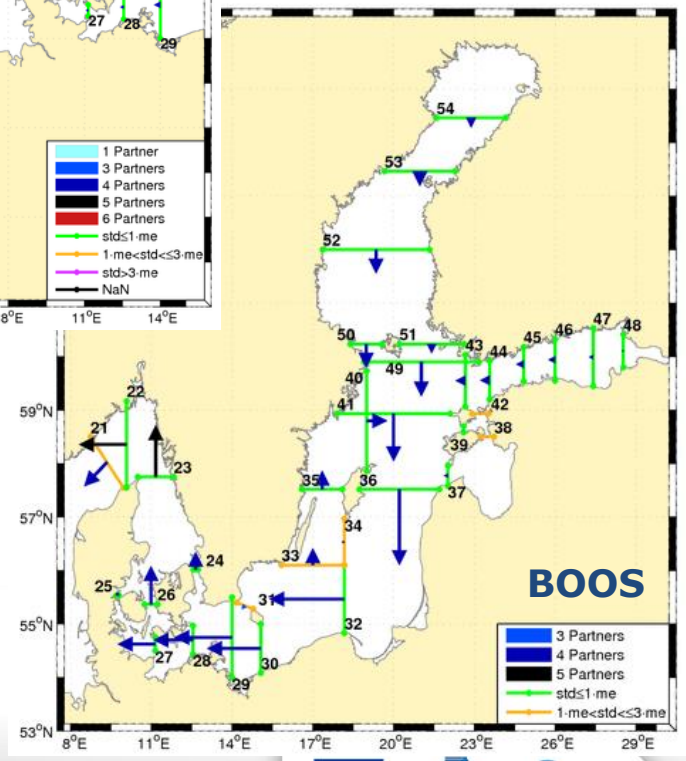
MME water transports

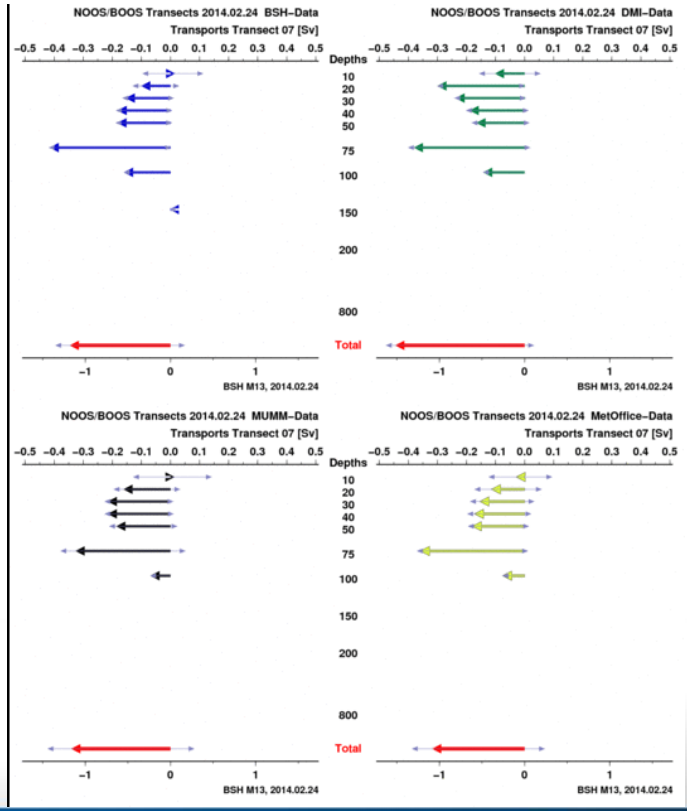


- Ensemble production for estimation of uncertainty between models
- Calculation of variation coefficient (Brown, 1998)
- Subdivision into three classes:

CV ≤ 1 **1 < CV ≤ 3** **CV >3**

$$CV = \frac{std}{mean}$$





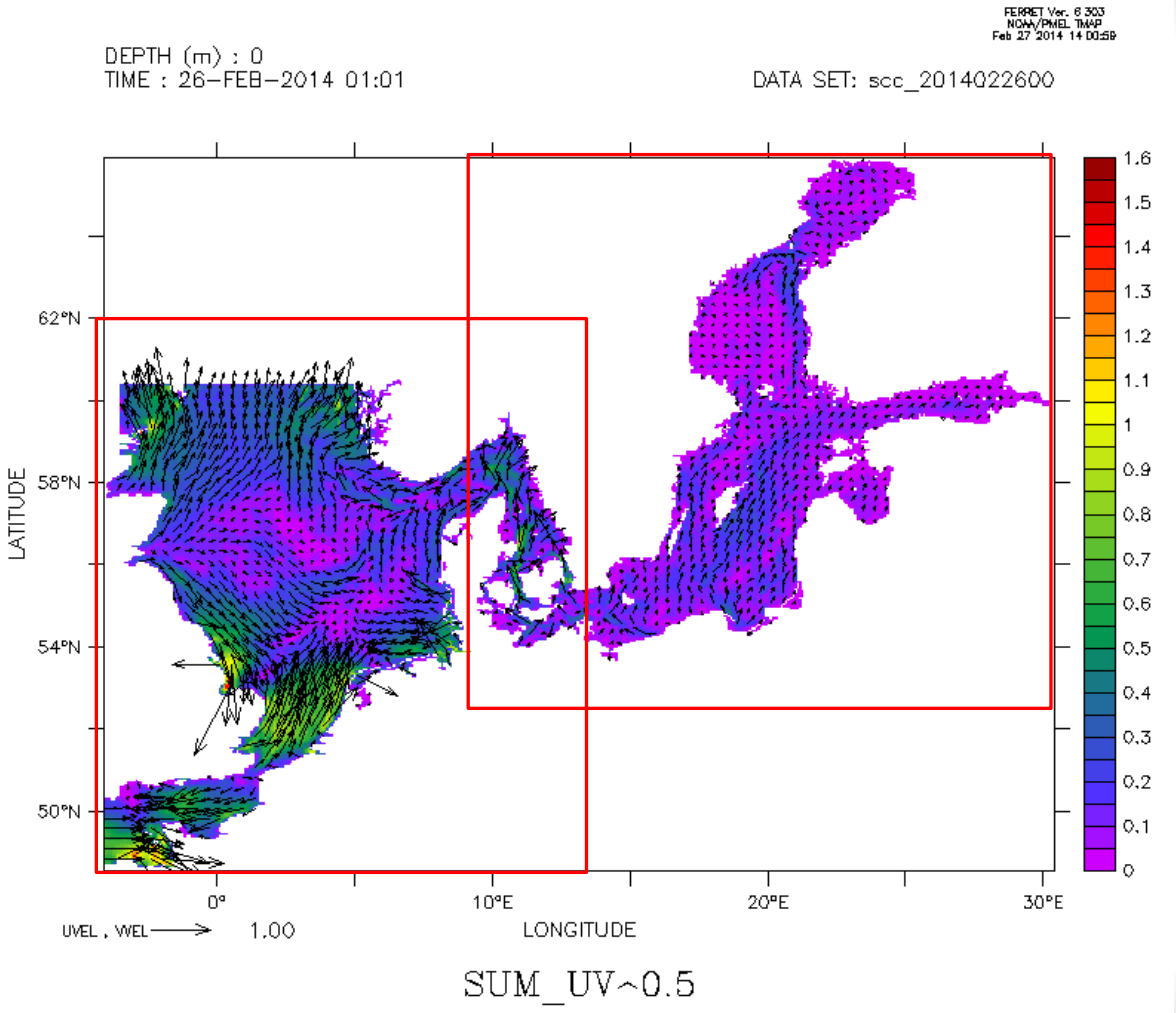
Figures available on NOOS & BOOS website

Inga.Golbeck@bsh.de

Sea surface currents

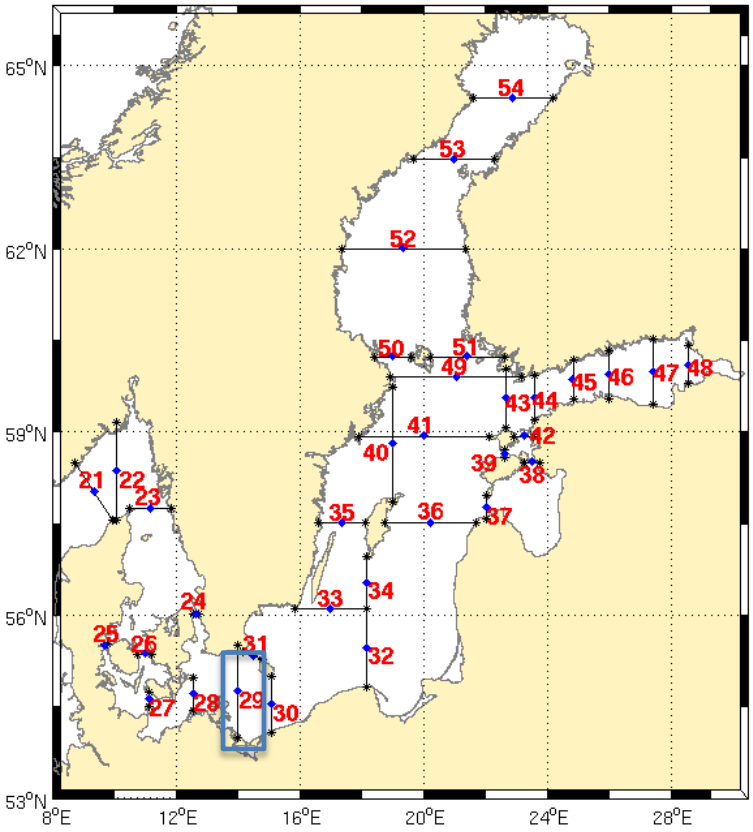
- Comparison of sea surface currents at specific points with **Progressive Vector Diagrams (PVD)**
- NOOS and BOOS transects situated in hydrodynamic important areas

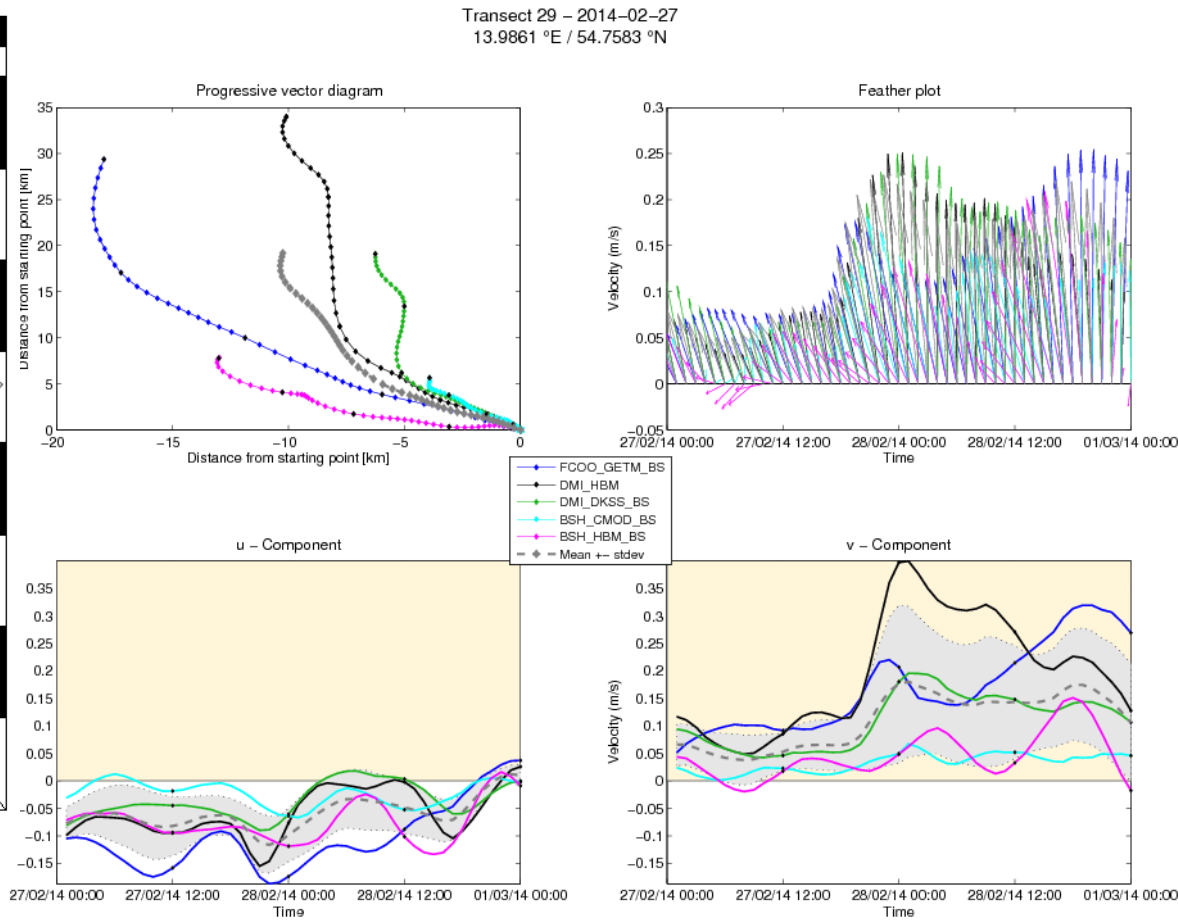
➢ **Interpolation** of 2D current data onto common grid (reference grid MyOcean-2 products)



Example PVD – Baltic Sea

- **PVD**: **Trajectory of a particle** over forecast period of 48 hours
- Mean of each current component ± standard deviation, mean PVD





Figures available on
NOOS & BOOS website

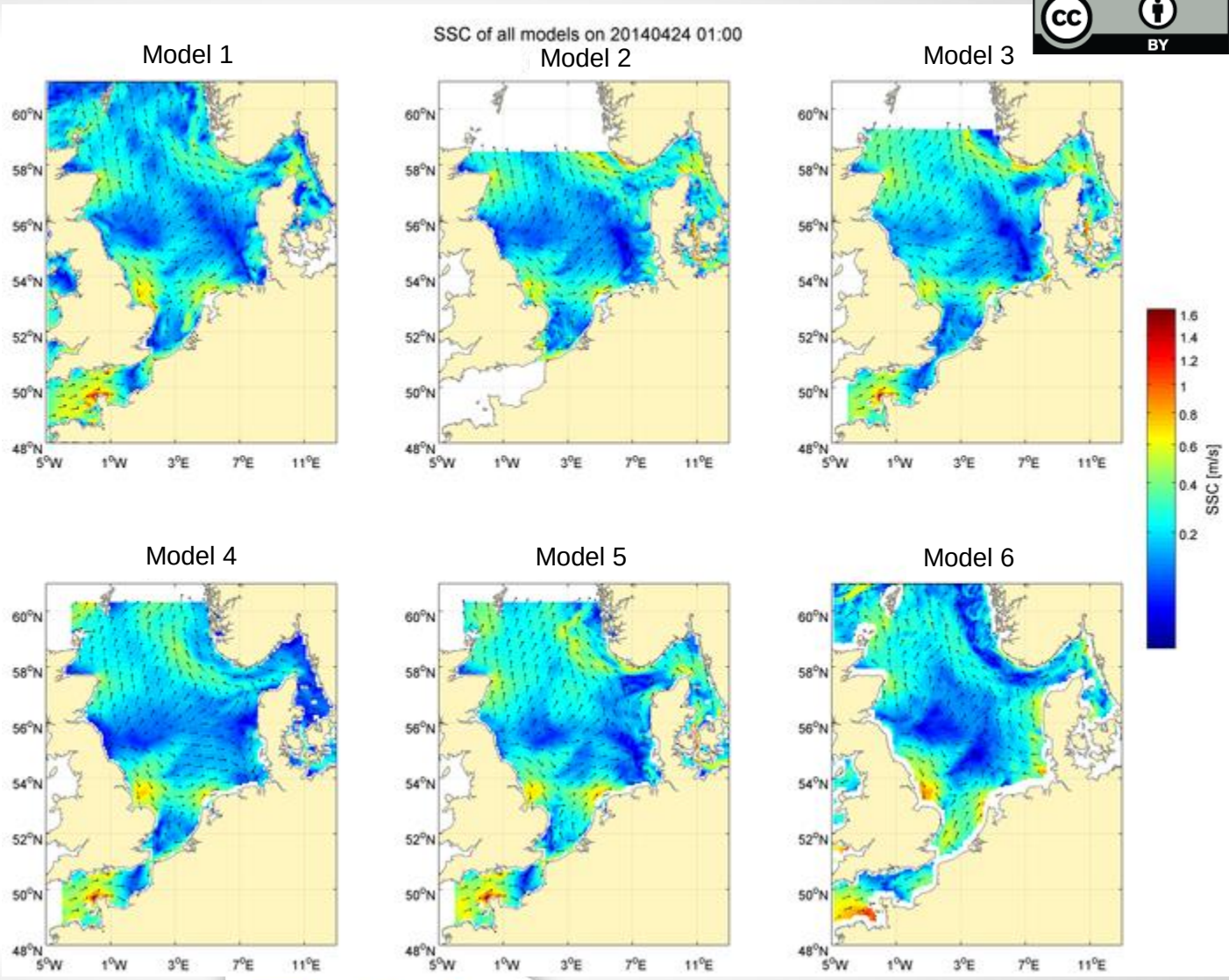
Inga.Golbeck@bsh.de

MME for SSC – North Sea

Quality of model forecast

Important for drift calculation (maritime accident, oil), leisure (Sailing)

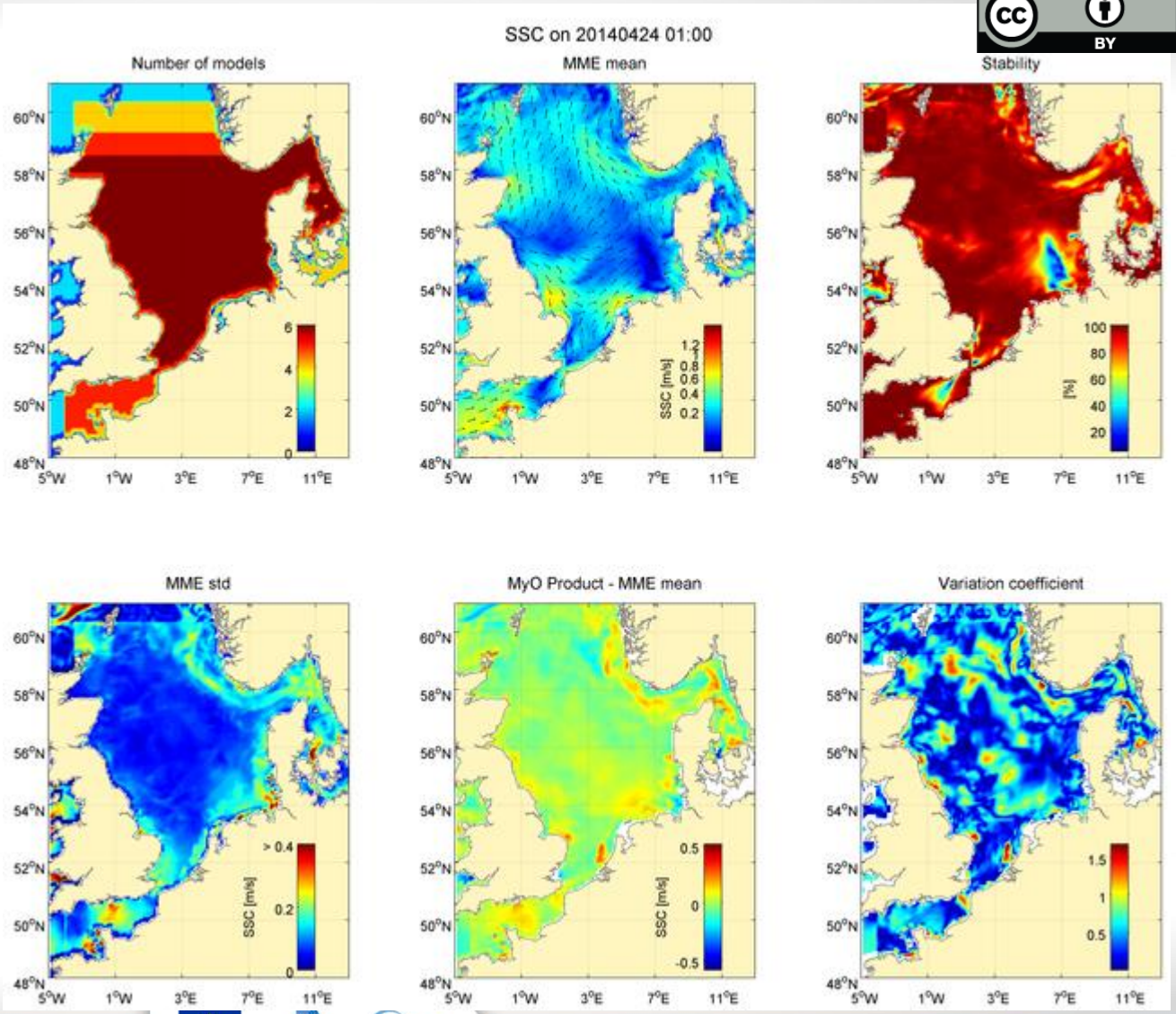
– **Trial version**: so far 6 models used for MME



MME for SSC – North Sea

- Number of models
- MME mean
- MME standard deviation

- Stability = Ratio of vector mean current to mean magnitude
- Difference MyOcean product – MME mean
- Variation coefficient = Ratio of difference to MME std



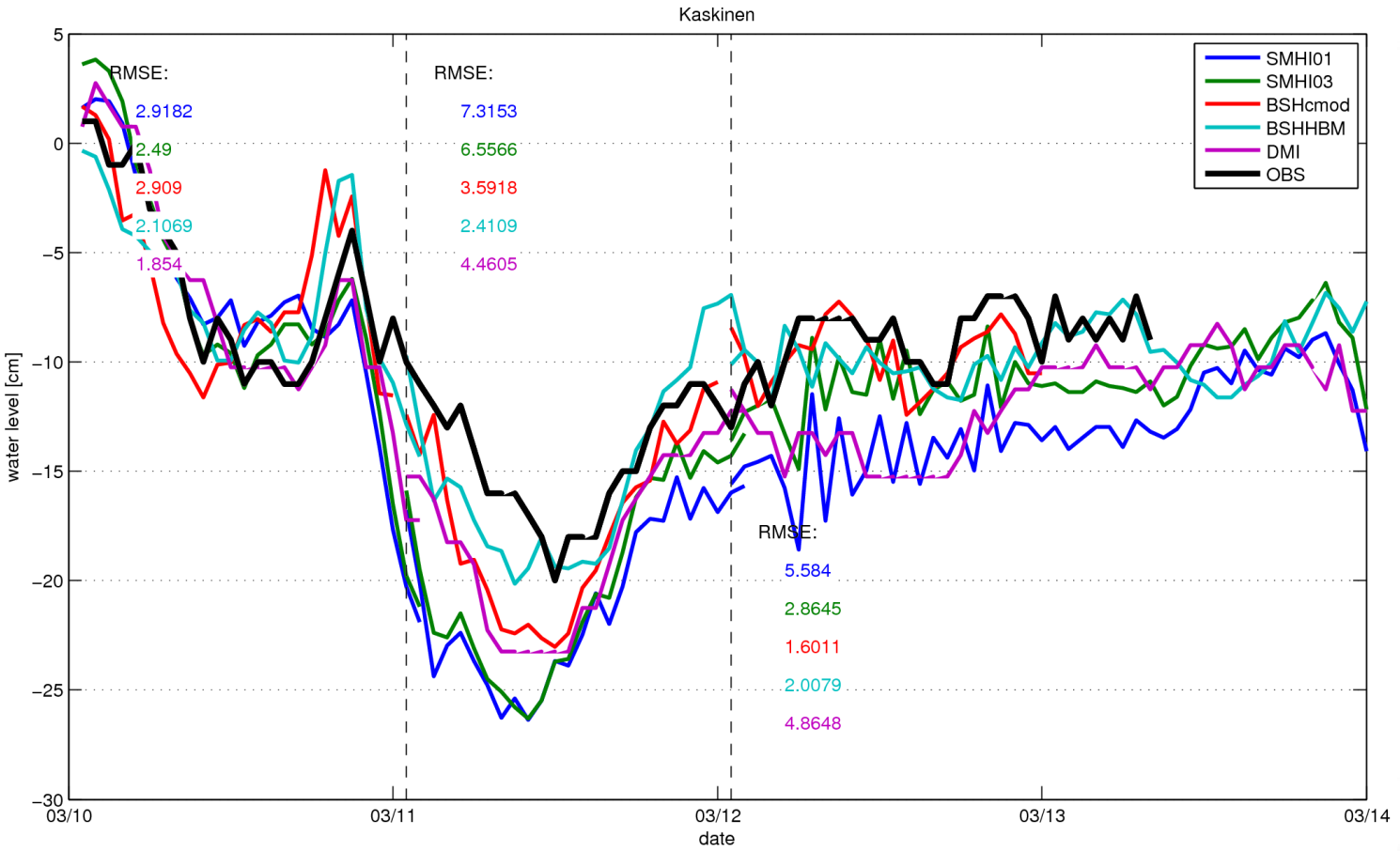
Inga.Golbeck@bsh.de

MME for water level at BOOS stations

Ensemble forecast of water level at 24 stations

Daily unbiased 48h model forecast from 5 models

Error estimates for each 24h segment



Inga.Golbeck@bsh.de

Conclusion / Outlook

- Uncertainty estimates provide useful information to aid the evaluation of model forecasts performance
- MME provides basis for development of uncertainty estimates

- Include **more parameters**: i.e. sea ice cover
- Focus on **bottom fields** (salinity, temperature)
- Implement **weighting methods** to develop more complex measures
- Use **observational data** for validation purpose