Towards NOOS-Drift, a multi-models ensemble system to assess and improve drift forecast accuracy

S. Legrand[(1)], K.-F. Dagestad [(2)] , P. Daniel [(3)],
M. Kapel[(1)], S. Orsi[(1)], N. Youdjou[(1)], L.R. Hole[(2)] and J.-C. Setaro [(3)]

(1) Royal Belgian Institute of Natural Sciences, Operational Directorate Natural Environment, Brussels, Belgium

(2) Norwegian Meteorological Institute, Department of Oceanography and Marine Meteorology, Bergen, Norway

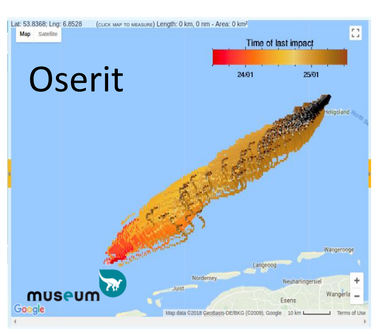
(3) Météo-France, Marine and Oceanographic Department, Toulouse, France

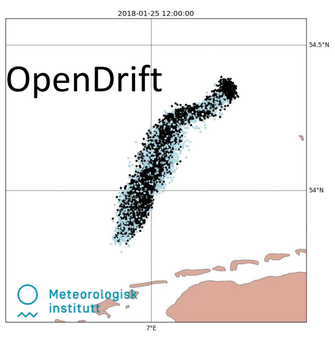
Introduction

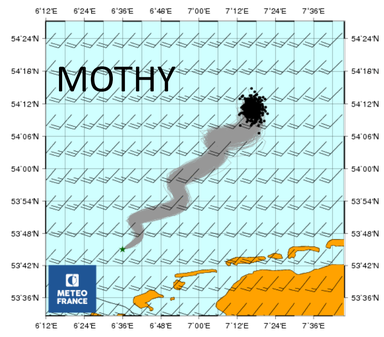
Drift models are multi-purpose tools that can forecast the drift trajectory of any objects, substances or resources that are drifting at the sea surface or in the water column. Typically activated several hundreds to several thousands of times per year and per country, drift models are among the most valuable tools in the day to day management of the coastal and marine environment, marine resources and maritime safety. However, in order to better assess risk and impacts, **the end-users benefiting from these drift services also request to get accurate and reliable estimation of the uncertainty in the drift forecast.**

Multi-models analysis to estimate drift forecast uncertainty

Before NOOS-Drift



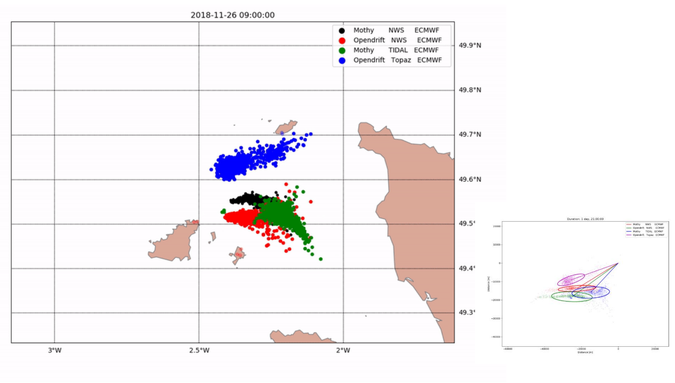


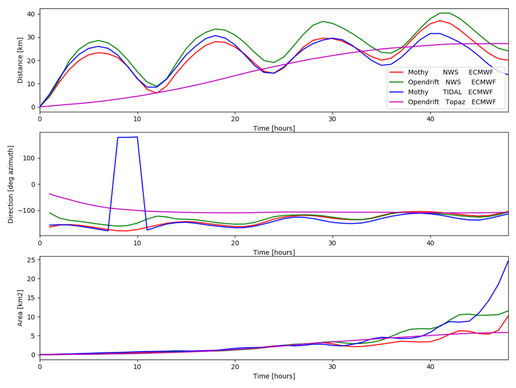


- No standard model output file format
- No unified visualization leads to difficulties to interpret model results
- No quantified metrics available to estimate drift forecast uncertainty.

NOOS-Drift preliminary results

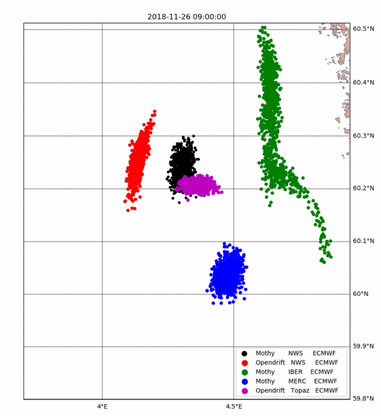
- A standard model output file format defined
- Unified visualization possible
- Multi-Models Ensemble Analysis performed on best-fit ellipsis
- Analysis is performed at each output time step
- Metrics readily defined from distance to the source, angle to source and area of the ellipsis

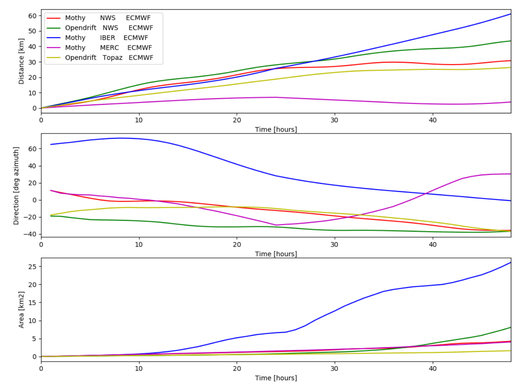




Example off French Britany, English Channel

All model results in good agreement despite one forcing without tide





Example along Norwegian Trench

Diverging results - All simulations drift mainly in same direction but at different speed

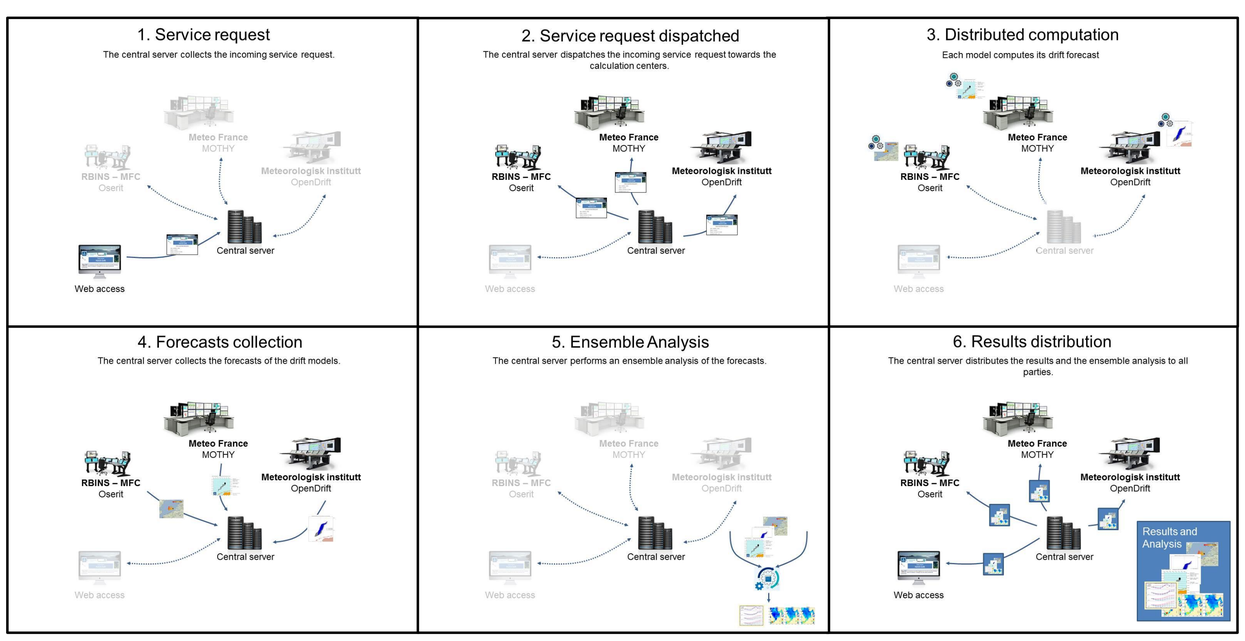
NOOS-Drift Service

Service objectives:

- ✓ To activate all models at once;
- ✓ To develop a set of quantified indicators on drift trajectory accuracy, estimated from the spread of the different drift models forecast connected to NOOS-Drift;
- ✓ To discriminate which differences are due to different trajectory models and which are due to different forcing data;
- ✓ To help identify possible outliers;
- ✓ To improve the end-users trust in the drift model results and help guide them in their decision making process, a real need expressed by users

Service domain :

- ✓ The whole European North West Shelf Seas, with a focus on the territorial waters and exclusive economic zones of Belgium, France and Norway.
- ✓ NOOS members from Denmark, Germany, The Netherlands and Ireland have already expressed interest to join the system once developed and validated.



Acknowledgment This study is being conducted using **E.U. Copernicus Marine Service Information**.

https://odnature.naturalsciences.be/noosdrift/
slegrand@naturalsciences.be