eosc | Blue-Cloud2026

BlueCloud VLab: Coastal currents from observations

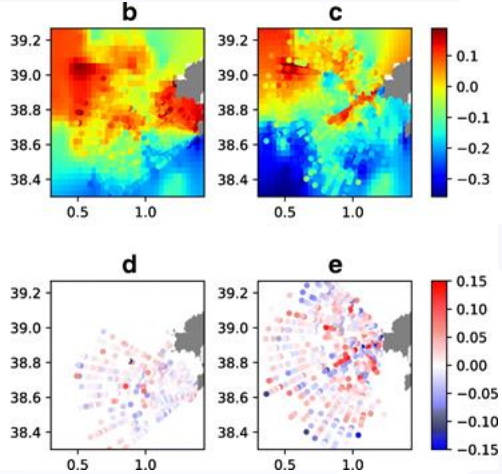
Partners involved: GHER-Liège, CMCC, SOCIB

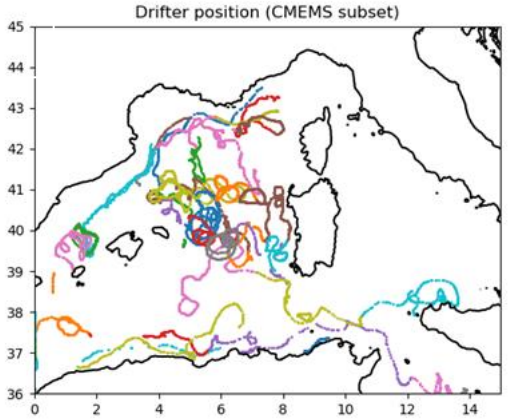
Funded by the European Union

Observations related to surface currents

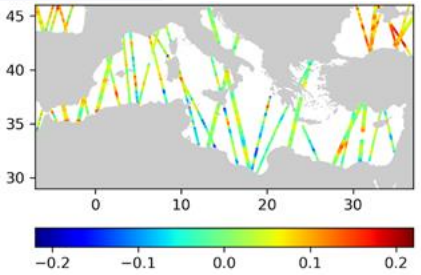
- Integrate direct and indirect current measurements from different data sources
- A new service to generate integrated ocean surface current maps from
  - High Frequency (HF) radar
  - Drifter data
  - Geostrophic currents from altimetry data
- Sea surface height related to surface geostrophic currents

High Frequency radars





Altimetry (2017-06-07)



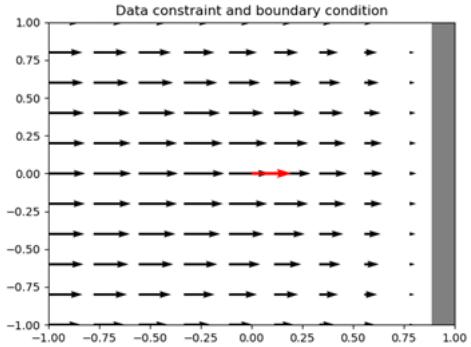
Goal of the demonstrator

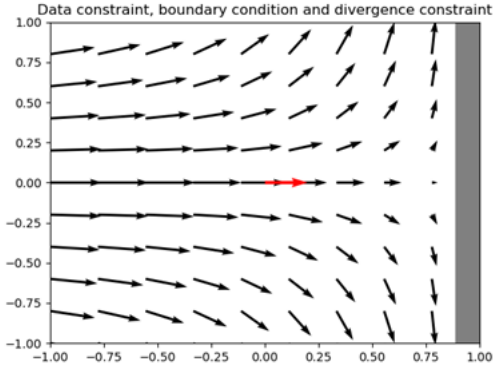
- Different data sources will have a **different accuracy** which will be taken into account.
- The demonstrator will provide an easy way to use the analysis techniques without installation and with a set of data sources already preconfigured.
- The main output of this demonstrator is a service in the form of **easily customizable Jupyter notebooks** that allow a user to generate surface currents maps for a usen-chosen region.
- Following FAIR best practices, an emphasis will be given on a **full reproducible workflow**
  - version number of the used software
  - also of the complete dependency tree of software
- Providing ways to easily replicate the exact environment and documenting in a machine-readable format the provenance of the input data.
- The service will generate netCDF files (following the current **CF conventions**) which has been an **OGC standard** since 2011.

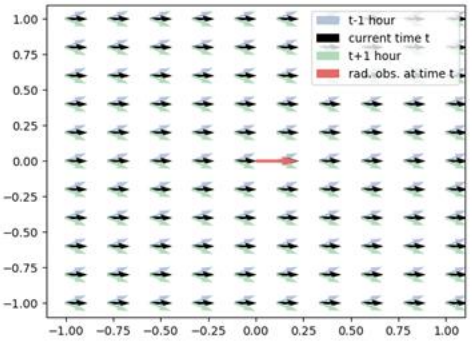
Data interpolating variational analysis

- Based on DIVAnd (data interpolating variational analysis in n dimensions) for HF radar https://doi.org/10.1007/s10236-020-01432-x
- Several constraints will be taken into account:
  - Presence of the coastline
  - Horizontal divergence
  - Temporal coherence
  - Momentum balance
- Code open source (GPL) implemented in Julia

https://github.com/gher-uliege/DIVAnd_HFRadar.jl

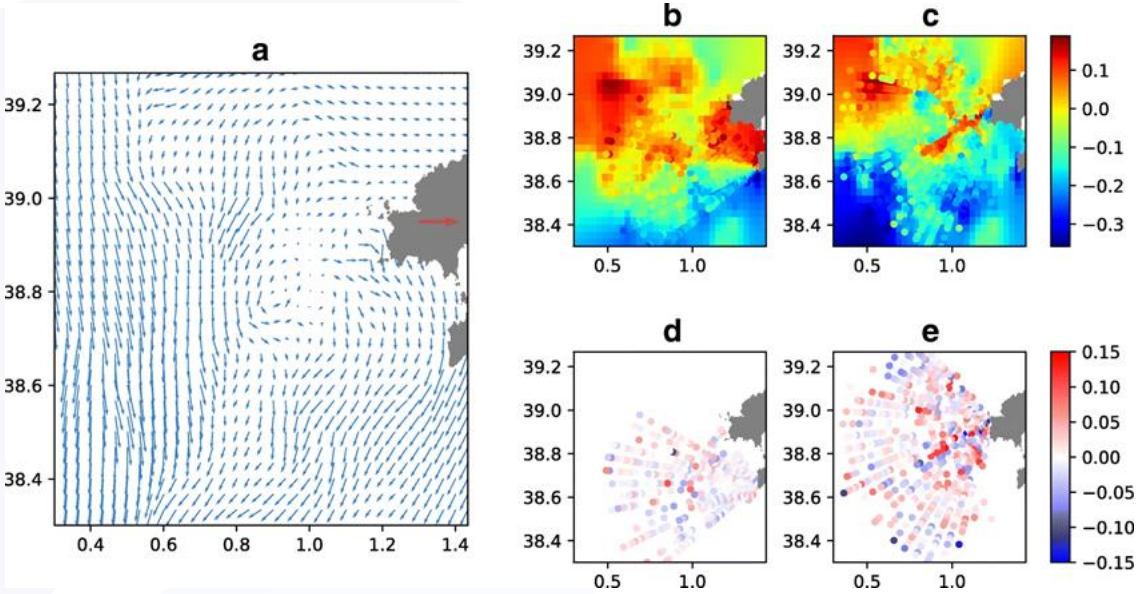




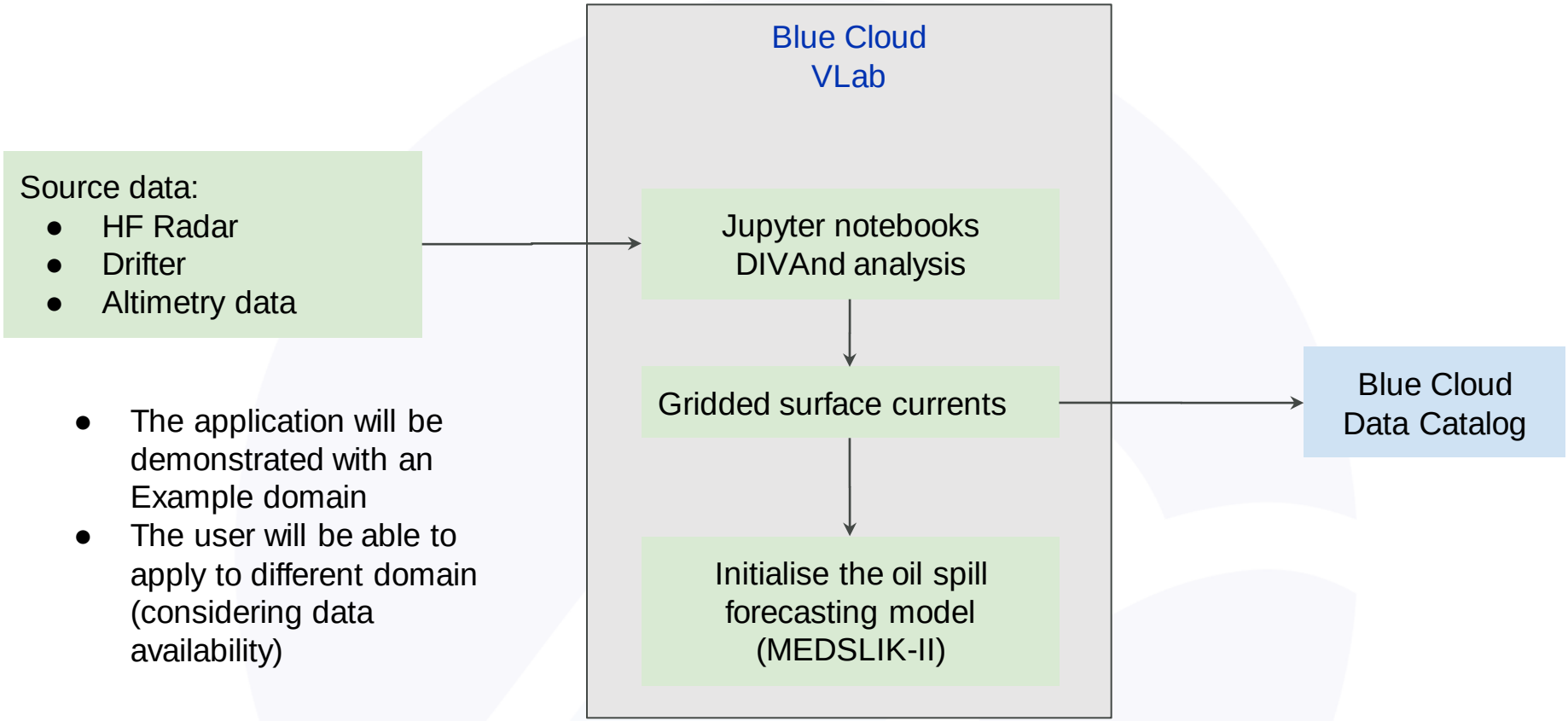


Previous tests

- Previous experiments using only HF radar data
- HF radar measurements data from SOCIB (Spain)
- Validated with drifter data
- Results compared favourably to other techniques like OMA (Open-Boundary Modal Analysis)



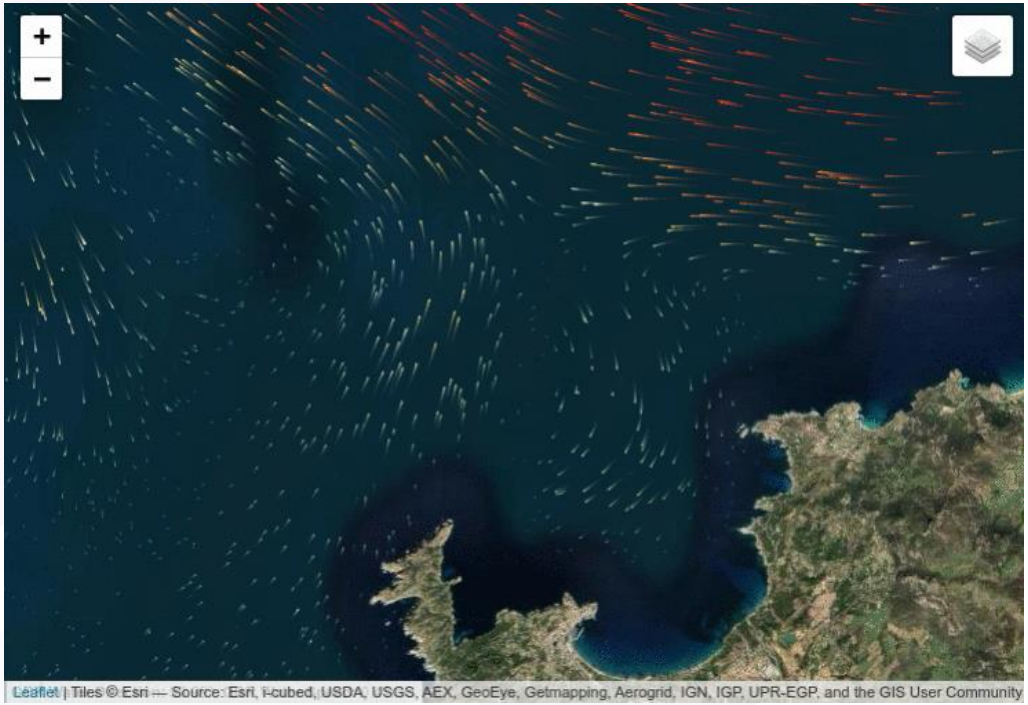
Data workflow



- The application will be demonstrated with an Example domain
- The user will be able to apply to different domain (considering data availability)

Visualisation

- Also Lagrangian simulations based on these currents maps to the movements of artificial drifters at a user-chosen location (assuming suitable data coverage).
- Visualisation using leaflet-velocity giving a broad range of interested users an intuitive understanding of the ocean circulation.
- Visualization will be part of the jupyter notebook



MEDSLIK-II oil spill model

Lagrangian model

Predicts spill transport
(due to waves, wind drag and 3D current fields + turbulent fluctuations)

And oil weathering
(evaporation, emulsification, dispersion in water column, adhesion to coast)

No matter whether if is a point source spill or an “aged” satellite-derived spill

MEDSLIK-II oil spill model

open source

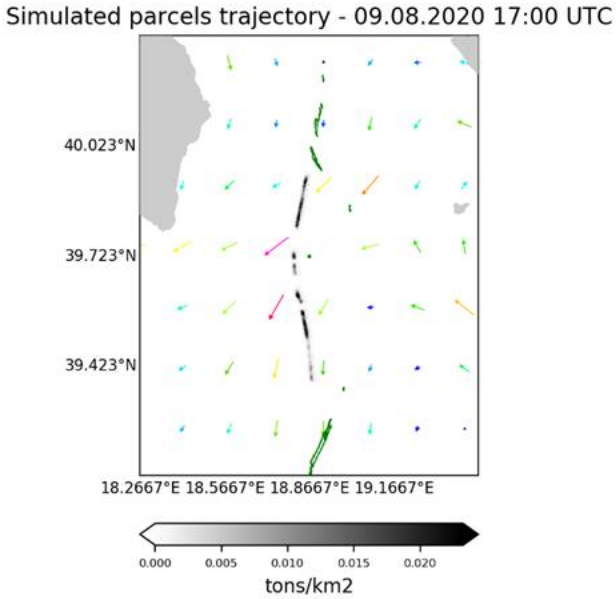
free of charge

Dowload from
http://medslik-ii.org/

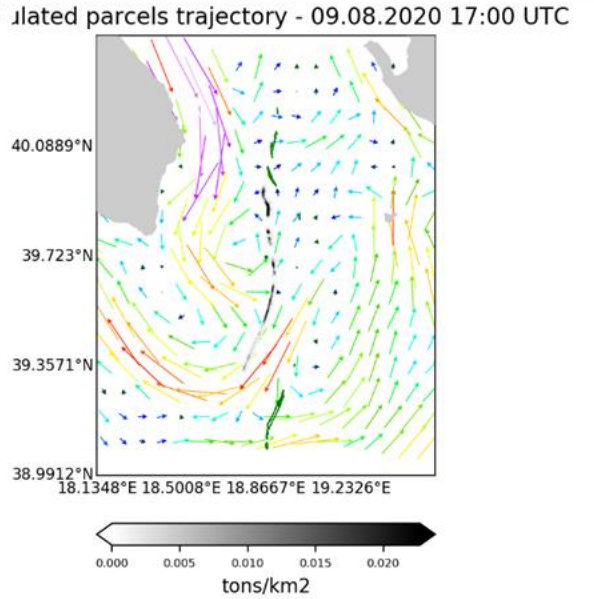
Go for
Di Domenicis et al., (2013)

Oil spill forecasting at multiple spatial resolutions

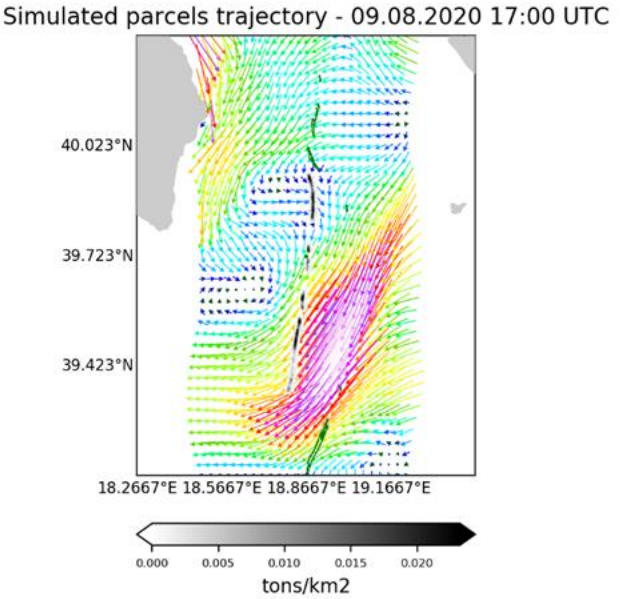
MERCAT + ECMWF (1% wind drift)



MFS + ECMWF (1% wind drift)



SANIFS + ECMWF (1% wind drift)



Gray-scaled points represent oil spill parcels. Green-filled spill corresponds to satellite detection at 16:39 UTC.

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