Meteorologisk institutt

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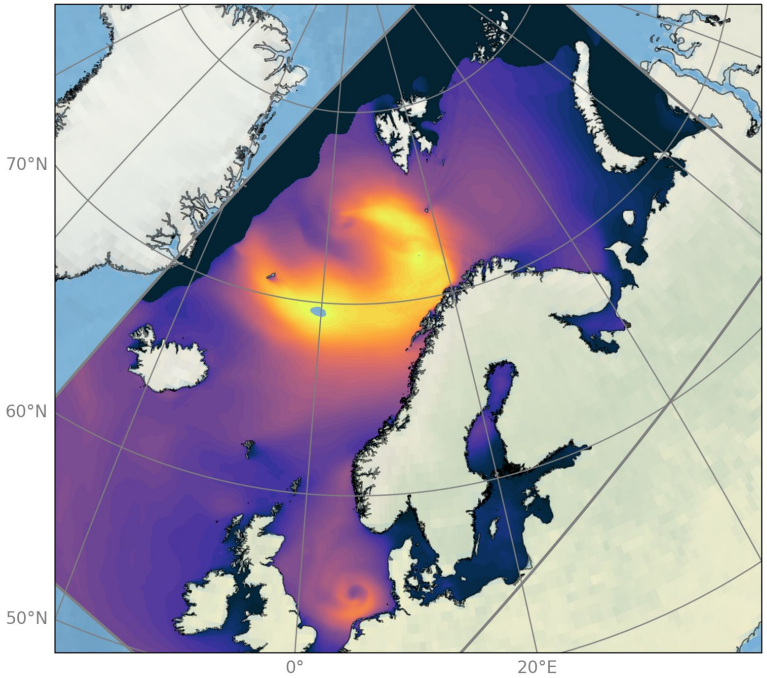
wavy
a package for effortless wave model validation

P. Bohlinger, *F. Collas, G. Hope, L. R. Hole, D. M. Nguyen, Ø. Breivik*



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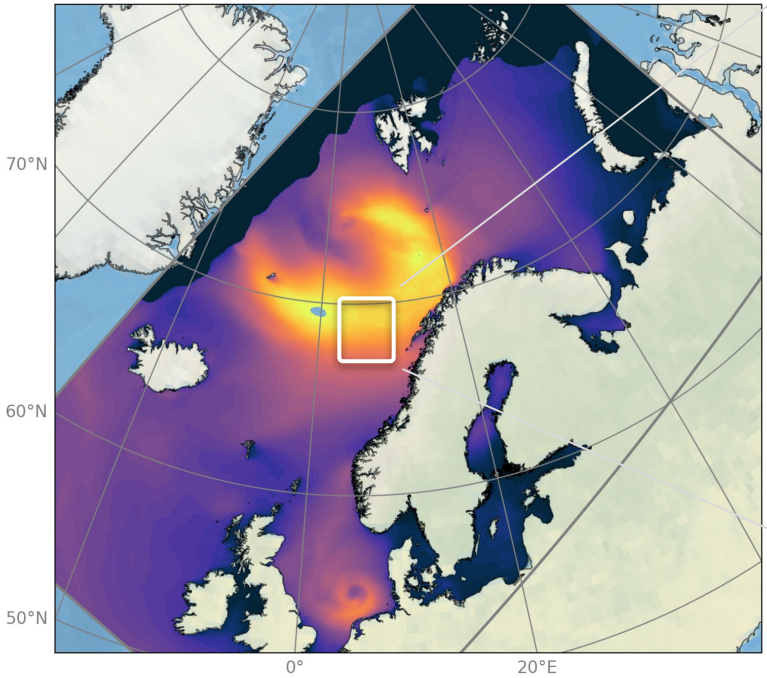
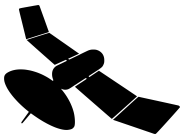
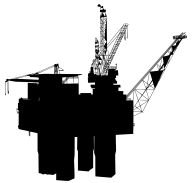
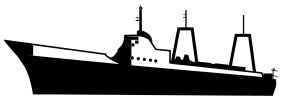
Validate?









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What you could do …

wavyopen

```
$ mamba install wavyopen
```


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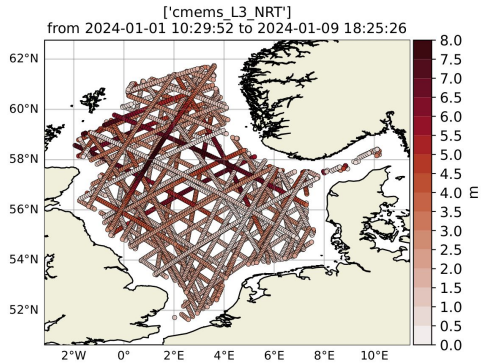
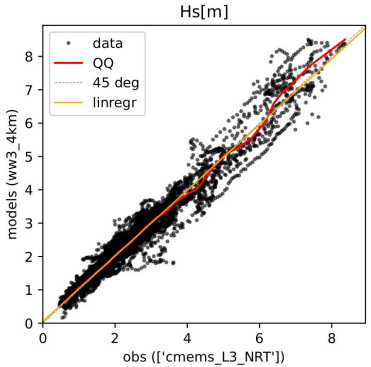
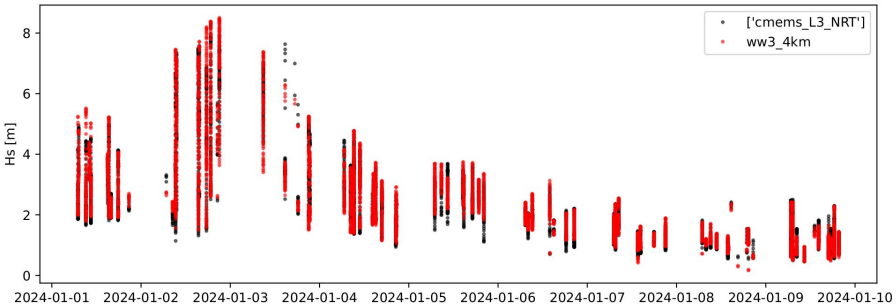
What you could do …

```python
from wavy import ms, cc, gc
from wavy.grid_stats import apply_metric

# --- retrieve satellite multisat ---------------------------------- #
missions = ['s3a', 's3b', 'c2', 'j3', 's6a',
            'cfo', 'h2b', 'h2c', 'al', 'swon']

# retrieval
mso = ms(sd='2024-01-01', ed='2024-01-10',
         name=missions, region='NorthSea')

# filter
msof = mso.filter_landMask().filter_distance_to_coast(llim=50000)

# quicklook
msof.quicklook(m=True)

# --- collocate data with model ------------------------------------ #
cco = cc(model='ww3_4km', oco=msof, leadtime='best').populate()

# std linear regression
cco.quicklook(ts=True, sc=True,
              std_regression_line=True,
              std_regression_col='orange')
```







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conda-forge / packages / **wavyopen** 0.4.1

Copernicus CMEMS Product Quality Documents QuID

- Arctic Ocean Wave Hindcast system, ARCTIC_MULTIYEAR_WAV_002_013, https://doi.org/10.48670/moi-00008
- Arctic Ocean Wave Analysis and Forecast, ARCTIC_ANALYSIS_FORECAST_WAV_002_014, https://doi.org/10.48670/moi-00002

Internal usage at MET Norway

- operational validation of wave models
- project based validation of wave models
- operational and project based tuning of wave models

Public operational validation tasks using wavy

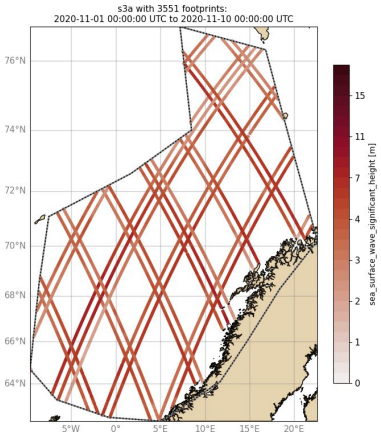
Operational model validation for the Copernicus CMEMS product ARCTIC_ANALYSIS_FORECAST_WAV_002_014 (https://cmems.met.no/ARC-MFC/Wave3kmValidation/index.html)

PhD thesis with wavy

Fabien Collas, since 2023: Working with triple collocation, calibration, and extremes.

Master thesis using wavy

Judith Thu Ølberg, 2023: Wave Measurements Using Ship Mounted Sensors as part of the One Ocean Expedition, University of Bergen, https://hdl.handle.net/11250/3071001.



wavy-based operational validation and education via capacity building project SAREPTA

- Vietnam Meteorological and Hydrological Administration (VNMHA)
- VNU University of Science (a part of Vietnam National University). The Department of Meteorology, Hydrology and Oceanography uses the **wavy** to validate and calibrate wave models.
- The Marine Dynamics and Environment Center (MDEC)
- Mozambique (workshops)

Projects wavy is/was contributing to

- Copernicus - CMEMS/ARC MFC (Arctic Monitoring Forecasting Centre) [EU]
- FORESEE - Young Research Talents Grant [NFR - Norwegian Research Council]
- COSY - Project on coastal altimetry from the [NOSA - Norwegian Space Agency]
- B-WAVES - National Project [NFR]
- SAREPTA - Large capacity building project (https://bistand.met.no/) [NORAD - The Norwegian Agency for Development Cooperation]
- One Ocean Expedition - UN Decade of Ocean Science for Sustainable Development

Scientific papers that used wavy

- Hope, G., Seldal, T., Rabault, J., Bryhni, H., Bohlinger, P., Björkqvist, J.-V., and Coauthors, 2025: SFY—A Lightweight, High-Frequency, and Phase-Resolving Wave Buoy for Coastal Waters. J. Atmos. Oceanic Technol., 42, 133–154, https://doi.org/10.1175/JTECH-D-23-0170.1.
- Altiparmaki, O., Breivik, Ø., Aouf, L., Bohlinger, P., Johannessen, J. A., Collard, F., and Coauthors (2024). Influence of ocean currents on wave modeling and satellite observations: Insights from the one ocean expedition. Journal of Geophysical Research: Oceans, 129, e2024JC021581. https://doi.org/10.1029/2024JC021581
- Ølberg, J.T., Bohlinger, P., Breivik, Ø., and Coauthors (2024). Wave measurements using open source ship mounted ultrasonic altimeter and motion correction system during the one ocean circumnavigation. Ocean Engineering, 292, https://doi.org/10.1016/j.oceaneng.2023.116586.
- Rabault, J., and Coauthors (2022). Openmetbuoy-v2021: An easy-to-build, affordable, customizable, open-source instrument for oceanographic measurements of drift and waves in sea ice and the open ocean. Geosciences, 12 (3).
- Breivik, Ø., and Coauthors (2022). The impact of a reduced high-wind charnock parameter on wave growth with application to the north sea, the norwegian sea and the arctic ocean. Journal of Geophysical Research: Oceans, e2021JC018196.
- Halsne, T., Bohlinger, P., Christensen, K.H., Carrasco, A., Breivik, Ø. (2022). Resolving regions known for intense wave–current interaction using spectral wave models: A case study in the energetic flow fields of Northern Norway, Ocean Modelling,Volume 176.
- Thomas, E. E., Müller, M., Bohlinger, P., Batrak, Y., & Szapiro, N. (2021). A Kilometer-Scale tem for the European Arctic. Weather and

er, M. (2019). A novel approach to computing super lidation, Ocean Modelling, 139, 404.

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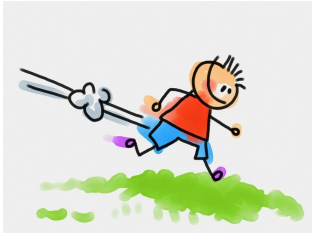
- ❑ model validation (metocean)
- ❑ triple collocation
- ❑ coastal satellite products

Drop by!



wavyopen