# Using Copernicus Marine Service surface wind products to explore ocean extremes

RIANNE GIESEN[1], AD STOFFELEN[1]

[1] *Royal Netherlands Meteorological Institute (KNMI), The Netherlands*

The ocean surface wind is a key parameter in ocean extremes like storm surges, (extra)tropical storms and marine heatwaves. It is therefore crucial to accurately represent the wind forcing in physical ocean model simulations of such events. A comparison of scatterometer observations and global numerical weather prediction (NWP) model wind fields revealed substantial local systematic errors in wind vector components and spatial derivatives. The widespread use of NWP model winds in the computation of ocean surface processes implies that these biases propagate into modelled air-sea fluxes, surface waves and coastal water levels.

Temporally-averaged gridded differences between geolocated scatterometer wind data and NWP wind fields can be used to correct for persistent local NWP wind vector biases. By combining these scatterometer-based bias corrections with global, hourly NWP wind fields, high-resolution wind forcing products can be created for the ocean modelling community and other users.

In 2022, new hourly and monthly Level-4 (L4) surface wind products were introduced in the Copernicus Marine Service catalogue. These products include global bias-corrected 10-m stress-equivalent wind, surface wind stress fields and spatial derivatives. The bias corrections are calculated from Copernicus Marine Service Level-3 (L3) wind products for a combination of scatterometers and their collocated European Centre for Medium-range Weather Forecasts (ECMWF) model winds. In 2024, the L4 timeseries will be extended backward to 1991, covering a period of more than 30 years. Compared to the uncorrected ECMWF winds, the L4 winds correspond better to moored buoy observations and independent scatterometer observations. Like any Copernicus Marine Service product, the wind products are freely and openly available for all operational, commercial and research applications.

We will present the Copernicus Marine Service L3 and L4 wind products and show applications of these products for ocean extremes. The products have for instance been used to examine the underestimation of forecasted water levels during extreme flooding events in Venice and to assess global changes in extreme winds. Particular attention will be given to differences between observed scatterometer winds and NWP model winds and the imposed effects on ocean extremes.