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Water masses variability in the eastern Fram Strait explored through oceanographic mooring data and the CMEMS dataset

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The interaction between North Atlantic and Arctic Ocean waters plays a key role in climate variability and in
driving the global thermohaline circulation. In the past decades, an increased heat input to the Arctic has
occurred which is considered of high climatic relevance as, e.g., it contributes to enhancing sea ice melting.
In this frame, the progressive northward extension of the Atlantic signal within the Arctic domain known as
Arctic Atlantification is one of the most dramatic environmental local changes of the last decades.
In this study we used in situ data and the Copernicus Marine Environment Monitoring Service (CMEMS)
reanalysis dataset to explore spatial and temporal variability of water masses on different time-scales and
depths in the eastern Fram Strait. In that area, warm and salty Atlantic Water (AW) enters the Arctic Ocean
through the West Spitsbergen Current (WSC). Time series of potential temperature, salinity and potential
density obtained from CMEMS reanalysis in the surface, upper-intermediate and deep layers referring to the
period 1991-2019 have been considered. High-frequency observations gathered from an oceanographic
mooring maintained by the National Institute of Oceanography and Applied Geophysics (OGS) in
collaboration with the Italian National Research Council - Institute of Polar Science (CNR-ISP) have been
used to assess the reliability of CMEMS data in reproducing ocean dynamics in the deep layer (ca 900-1000
m depth) of the SW offshore Svalbard area. The mooring system has been collecting data since June 2014.
In this contribution, we will show how the CMEMS data compared with in situ measurements as far as

seasonal and interannual variations as well as long-term trends are concerned. We will also discuss how
CMEMS reanalyses show differences in resolving ocean dynamics at different depths. Particularly, the severe
limitations in reproducing thermohaline variability at depths greater than 700 m. Finally, we will illustrate how
our results highlight strengths and limitations of CMEMS reanalyses, underscoring the importance of
optimizing measurements in a strategic area for studying climate change impacts in the Arctic and sub-Arctic
regions.