Evaluating a dynamically modelled river discharge as input for ocean systems through the monitoring of the ocean state from reanalysis

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As part of the phase 2 of the CMEMS Service Evolution, the BRONCO project (Benefits of dynamically modelled River discharge input for OceaN and COupled atmosphere-land-ocean systems) led to the creation of a new river discharge dataset that can be used as input for the NEMO ocean model. River runoffs into the ocean are taken from a global river discharge reanalysis dataset produced by the CEMS Global Flood Awareness System (GloFAS) driven by ERA5 forcing and called GloFAS-ERA5. This new reanalysis dataset has been evaluated using the latest ECMWF ocean analysis system - Ocean5 - over the 1979-2017 period. Comparisons to ocean observations, showed improved ocean state in the Atlantic Ocean in areas affected by large rivers such as the Amazon, the Mississippi and the St Lawrence, but also in the Mediterranean and the Baltic seas. Positive impact on the representation of the Atlantic Meridional Overturning Circulation is also seen. However, degradation of the ocean state can be detected over the Maritime Continent and on the west coast of Central America and Alaska. Such degradation of the ocean state can be alleviated via a retuning of the GloFAS-ERA5 river runoffs. The need for retuning suggests the existence of biases in the GloFAS-ERA5 reanalysis. Further investigation allowed to attribute those biases to spurious signals in both precipitation and snowmelt in the ERA5 atmospheric reanalysis. This result suggests that, the ocean analysis system can help evaluate the water cycle over land in atmospheric reanalysis products through river-ocean coupling further showcasing the value of an Earth system approach to reanalysis.