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Ocean eddies drive the export of salt out of the subtropical gyres: insights from the DRAKKAR 1/12 degree global model

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The spatial distribution of salinity in the ocean results from exchanges with the atmosphere and land (evaporation, precipitation and runoff) as well as transports by the ocean circulation. The eddy contribution to the oceanic meridional transport of salt is quantified for the first time at the global scale in an eddy resolving ocean model at 1/12 degree (DRAKKAR ORCA12 model, based on the NEMO modelling platform). We propose a decomposition of the meridional salt transport which clarifies the link between distribution of salt and freshwater forcing, without defining a "freshwater anomaly" based on an arbitrary reference salinity. The method consists in a decomposition of the meridional transport into i) transport by the time-longitude-depth mean velocity, ii) transport by time-mean velocity recirculations and iii) transport by transient eddy perturbations. The latter is especially large at the northern and southern boundary of the subtropical gyres, where the eddy contribution is comparable in size to the salt transport by the time-mean recirculations. The hierarchy of DRAKKAR simulations demonstrate the sensitivity of eddy transport to the spatial resolution of the model. This eddy transport has to be taken into account when building scenarios for the evolution of ocean salinity in a changing climate.