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Deriving ocean climatologies with multivariate coupling

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In situ measurements of ocean properties are generally sparsely distributed and thus undersample the ocean variability. Deriving ocean climatologies is a challenging task especially for biological and chemical parameters where the number of data is, by an order of magnitude, smaller than for physical parameters. However, physical and biogeochemical parameters are related through the ocean dynamics. In particular fronts visible in physical parameters are often related to gradients in biogeochemical parameters. Ocean climatologies are generally derived for different variables independently. For biogeochemical parameters, only the very large-scale variability can be derived for poorly sampled areas. Here we present a method to derive multivariate analysis taking the relationship between physical and biogeochemical variables into account. The benefit of this procedure is showed by using model data for salinity, nitrate and phosphate of the Mediterranean Sea. The model fields are sampled at the locations of true observations (extracted from the World Ocean Database 2013) and the analysed fields are compared to the original model fields. The multivariate analysis result in a reduction of the RMS error and to a better representation of the gradients.