Geophysical Research Abstracts, Vol. 8, 03916, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03916

Non-linear parametrization of oceanic pCO2 in the North Atlantic

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The aim of this work is to use advanced statistical methods to improve the interpolation of marine pCO2 maps of the North Atlantic using both in-situ and remotely sensed data. The selected method relies on neural networks which are very useful to deal with sparse data and to account for non-linear relationships between the various parameters. Sea Surface Temperature (SST) controls marine pCO2 to the first order. Remotely sensed SST is thus often as the only parameter to interpolate pCO2 maps from sparse in-situ measurements. It is useful to quantify the importance of other "oceanic" parameters on the accuracy of pCO2 estimates. In particular, we expect other remotely sensed quantities such as the chlorophyll-a concentration (CHL) or modeled parameters such as the mixed-layer depth (MLD) to provide additional information to improve the interpolation of pCO2 maps. We used VOS measurements and remotely sensed data to study the impact of CHL and MLD on pCO2 retrieval. pCO2 values come from historical measurements performed during 1994-1995 period in the North Atlantic (10W-85W;10N-58N). Annual monthly AVHRR SST maps, SeaWiFS CHL data and MLD from the model of de Boyer et al. (2004) are used. A regression is applied to linearly relate the SST, CHL and MLD to the pCO2. Both CHL and MLD have a small but significant impact on the accuracy of the retrieved pCO2. This demonstrates that multiple regressions on these parameters will likely improve the interpolation of marine pCO2 maps. These parameters are used as inputs of the neural networks, pCO2 being the output. Monthly maps obtained with NN will be compared and discussed with those obtained with the multiple linear regression.