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The carbon dioxide system in the deep convection region of the Gulf of Lions (northwestern Mediterranean).

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The Gulf of Lions in the northwestern Mediterranean Sea is one of the few regions in the world where open ocean deep convection occurs. Convective mixing leads to deep water formation and to the development of a late winter - early spring phytoplankton bloom after stratification. Despite its likely influence on carbon fluxes, whether this process contributes to a sink/source of atmospheric CO2 has not been elucidated yet. Here we report on the distribution of the variables of the carbon dioxide system in the region of deep convection located around 41.5º N 4º E in the NW Mediterranean Sea. Sampling was done in late winter - early spring (March 4 to 24), spring (April 28 to May 15) and late summer (September 13 to 23). Continuous measurements of temperature, salinity, pH and partial pressure of CO2 in surface water were performed all along the surveys. A number of stations (12, 14 and 9, respectively for each one of the surveys) were sampled. CTD and rossete casts reached down to the bottom (about 2000 m) and collected water samples from 12 depths for pH, alkalinity and dissolved inorganic carbon analysis. We found variability in the distributions of pH (7.89 - 8.03), alkalinity (2540 - 2580 μmol kg-1) and dissolved inorganic carbon concentrations (2200 - 2400 μmol kg-1). This variability is related to the distribution of different water masses in the area and to biological processes. The partial pressure of CO2 ranged between 304 and 435μatm in surface water, depending on the season. Surface waters were undersaturated in CO2 in late winter and spring, indicating a transfer of CO2 from the atmosphere to the sea during these periods.