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Temporal evolution of the anthropogenic CO_2 and acidification of the northwestern Mediterranean Sea, from the mid-1990s to the mid-2000s

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Since the beginning of the industrial era, humankind consumption of fossil fuels at increasing rates has led to increases in atmospheric CO_2 concentrations by approximately 105 ppm. In the same time, the Mediterranean coastal regions experienced a brutal population growth, from 94 million habitants in 1950 to 274 million in 2000, generating a strong anthropogenic pressure on the Mediterranean marine ecosystems. To follow the man-induced changes on the Mediterranean carbonate system properties (pH; total alkalinity, AT; total inorganic carbon CT, and CO_2 partial pressure, pCO_2), an entire body-research has recently emerged in order to quantify both the present and future penetration of anthropogenic carbon (CANT) in the Mediterranean Sea and the inferred acidification of its waters.
From monthly observations accumulated over more than a decade (from 1993 to 2005) at DYFAMED time-series station (DYnamique des Flux Atmosphériques en MEDiterranée) located in the central part of the Ligurian Sea, Touratier and Goyet (2009) have estimated the temporal evolution of CANT of the western Mediterranean Sea. This study highlights that concentrations of anthropogenic CO_2 are much higher at DYFAMED site (> 50 mol.kg-1) than those found in the Atlantic Ocean. Our study, conducted with measurements performed at 10 meters depth from 1995 to 2011 at the same location, allowed us to investigate the temporal evolution of CANT into the upper seawater layer. Our results indicate an averaged annual CANT increase of 3 μmol.kg-1 and a linked pH drop of 0.0032 per year confirming the ongoing acidification of the Mediterranean water masses. These results suggest the vulnerability and the endangerment of the Mediterranean ecosystems by the massive human-induced CO_2 emissions.

Touratier F. and C. Goyet (2009). Decadal evolution of anthropogenic CO_2 in the north western Mediterranean Sea (at the Dyfamed site) from the mid-1990's to the mid-2000's. Deep Sea Research Part I, 56, 1708–1716