



Anthropogenic CO₂ in the Gulf of Cadiz

N. Aït-Ameur and C. Goyet

Laboratoire de Biophysique et Dynamique des Systèmes Intégrés, Université de Perpignan,
France. (nameur@univ-perp.fr / Fax : 0033468662144 / Phone : 0033468661744 /
cgoyet@univ-perp.fr / Fax : 0033468662144 / Phone : 0033468662087).

Water circulation through the Strait of Gibraltar influences both the Mediterranean environment and the North Atlantic Ocean circulation. The Gulf of Cadiz is the main site where Atlantic and Mediterranean waters mix together. Here we present a first estimation of the contribution of the Gulf of Cadiz in the sequestration of the Anthropogenic carbon. During a SEMANE cruise (16-22 July 2002), two parameters of the carbonate systems (Total dissolved inorganic carbon TCO₂ and Total alkalinity TA) were measured along three sections in the Gulf of Cadiz between the strait of Gibraltar and Cap S^t Vincent. Anthropogenic CO₂ concentrations and CO₂ flux across the air-sea interface were then estimated. The chemical properties allows us to characterize the different water masses in this region and in particular to identify the Inflowing Atlantic waters as well as the outflowing Mediterranean waters. The Mediterranean sea water presents the highest value in TA 2568 $\mu\text{mol.kg}^{-1}$ and in TCO₂ 2321 $\mu\text{mol.kg}^{-1}$ compared to the surrounding waters, 2400 $\mu\text{mol.kg}^{-1}$ and 2109 $\mu\text{mol.kg}^{-1}$ for TA and TCO₂ respectively in the surface Atlantic water. The net TCO₂ outflowing in the Gulf of Cadiz from the Mediterranean waters ranged from $3.06 \cdot 10^{12}$ to $5.00 \cdot 10^{12}$ mol.C.yr⁻¹. In July 2002, the surface water in the Gulf of Cadiz was acting as a slight source of CO₂ for the atmosphere with a net flux of 1.14 ± 0.39 mmol.m⁻².day⁻¹. Anthropogenic CO₂ concentrations in the two cores (Atlantic and Mediterranean waters) clearly show an export of anthropogenic carbon from the Mediterranean Sea to the Atlantic Ocean. The outflowing Mediterranean Sea waters contribute to about 5.28% of the total storage of anthropogenic carbon of the Atlantic Ocean, which in turn stores more than 33% of the global Ocean anthropogenic carbon.