Geophysical Research Abstracts
Vol. 17, EGU2015-13337, 2015
EGU General Assembly 2015

The CO_2 system in the Mediterranean Sea inferred from a 3D coupled physical-biogeochemical model

Caroline Ulses (1), Fayçal Kessouri (1), Claude Estournel (1), Patrick Marsaleix (1), Jonathan Beuvier (2,3), Samuel Somot (3), Frank Touratier (4), Catherine Goyet (4), Laurent Coppola (5,6), Emilie Diamond (5,6), and Nicolas Metzl (7)

(1) Laboratoire d'Aerologie, Université Toulouse III, CNRS, 14 avenue Edouard Belin, 31400 Toulouse, France (caroline.ulses@aero.obs-mip.fr), (2) Mercator Ocean, Parc Technologique du Canal 8-10 rue Hermès, 31520 Ramonville Saint-Agne, France, (3) Centre National de Recherches Météorologiques–Groupe d'Etude de l'Atmosphère Météorologique, URA Météo-France/CNRS, Toulouse, France, (4) CEFREM, CNRS - University of Perpignan UMR 5110, 52 avenue Paul Alduy, 66860 Perpignan, France , (5) Sorbonne Universités, UPMC Université Paris 06, UMR 7093, LOV, Observatoire océanologique, F06230, Villefranche/mer, France , (6) CNRS, UMR 7093, LOV, Observatoire océanologique, F06230, Villefranche/mer, France, (7) LOCEAN-IPSL, CNRS Institut Pierre Simon Laplace Universite P. et M. Curie - Case 100

The semi-enclosed Mediterranean Sea characterized by short residence times is considered as a region particularly sensitive to natural and anthropogenic forcing. Due to scarce CO_2 measurements in the whole basin, the CO_2 system, for instance the air–sea CO_2 exchanges and the effects of the increase of atmospheric CO_2, are poorly characterized. 3D physical-biogeochemical coupled models are unique tools that can provide integrated view and gain understanding in the temporal and spatial variation of the CO_2 system variables (dissolved inorganic carbon, total alkalinity, partial pressure of CO_2 and pH).
An extended version of the biogeochemical model Eco3m-S (Auger et al., 2014), that describes the cycles of carbon, nitrogen, phosphorus and silica, was forced by a regional circulation model (Beuvier et al., 2012) to investigate the CO_2 system in the Mediterranean Sea over a 13-years period (2001-2013). First, the quality of the modelling was evaluated through comparisons with satellite and in situ observations collected in the whole basin over the study period (Touratier and Goyet, 2009; 2011 ; Rivaro et al., 2010 ; Pujo-Pay et al., 2011 ; Alvarez et al, 2014). The model reasonably reproduced the various biological regimes (north-western phytoplanctonic bloom regime, oligotrophic eastern regime, etc.) as well as the recorded spatial distribution and temporal variations of the carbonate system variables. The coupled model was then used to estimate the air-sea pCO_2 exchanges and the transport of DIC and TA towards the Atlantic Ocean at the Strait of Gibraltar.