Geophysical Research Abstracts
Vol. 19, EGU2017-11127, 2017
EGU General Assembly 2017

On the influence of waves on air-sea CO_2 gas transfer in the coastal zone

Francisco Javier Ocampo-Torres and Lucía Gutiérrez-Loza
CICESE, Physical Oceanography, Ensenada, Mexico (ocampo@cicese.mx)

As part of the "Sea Surface Roughness as Air-Sea Interaction Control" project, we study the influence of wave-associated processes controlling turbulent CO_2 fluxes through the air-sea interface in a coastal region, at the Northwest of Baja California, México. The conducted field campaign allowed us with a full year dataset (May 2014-April 2015) of high quality data of CO_2 fluxes (FCO_2) estimated through Eddy Covariance (EC). Ocean surface waves were also recorded using an Acoustic Doppler Current Profiler (Workhorse Sentinel, Teledyne RD Instruments) located at 10 m depth about 350 m away from the shore were the EC tower was located. The study area was found to be a sink of CO_2 under moderate wind and wave conditions with a mean flux of -1.32 μmol/m2s [1]. The linear correlation between the wind speed and FCO_2 was found rather weak, suggesting that other physical processes besides wind may also be important for the gas exchange modulation at coastal waters at these temporal scales. Recent results on the other hand, through quantile regression analysis computed between FCO_2 and a) wind speed, b) significant wave height, c) wave steepness and d) water temperature, allowed us to identify the significant wave height as the best correlated variable. However, the correlation varied with the probability distribution characteristics of FCO_2, with the regression slope presenting both positive and negative values. The latter implies that in the coastal areas, the presence of swell is the key factor that promotes the intensification of the fluxes into and from the ocean. In fact, making use of the water temperature as indicator of the CO_2 concentration in the water phase, the behavior of the relationship between the FCO_2 and the significant wave height might be partially explained. Further analysis showed that the characteristics of wind speed and water temperature determine the direction in which the FCO_2 occur. This work is a contribution from RugDiSMar project (CONACYT 155793), and support from CB-2015-01-255377 project is also acknowledge.

References.
[1] Gutiérrez-Loza, L., and F. J. Ocampo-Torres (2016). Air-sea CO_2 fluxes measured by eddy covariance in a coastal station in Baja California, México. IOP Conf. Series: Earth and Environmental Science 35 (2016) 012012 doi:10.1088/1755-1315/35/1/012012