Geophysical Research Abstracts
Vol. 20, EGU2018-3003, 2018
EGU General Assembly 2018

Characterizing dissolved and particulate carbon dynamics along with air-water CO_2 flux in a subtropical coupled mangrove-seagrass ecosystem

Anirban Akhand (1), Kenta Watanabe (1), Tatsuki Tokoro (1), Abhra Chanda (2), and Tomohiro Kuwae (1)

(1) Port and Airport Research Institute, Coastal and Estuarine Environment Research Group, 3-1-1, Nagase, Yokosuka 239-0826, Kanagawa, Japan (anirban.akhand@gmail.com), (2) School of Oceanographic Studies, Jadavpur University, 188 Raja S. C. Mullick Road, Kolkata 700032, India

Carbon dynamics of the vegetated coastal ecosystems mainly comprising the mangroves, seagrasses and salt marshes (collectively known as 'blue carbon') has recently gained attraction owing to their high carbon sequestration potential. Mangroves and seagrasses often co-exist; the mangroves thriving in the coastal periphery and the seagrasses remaining submerged in the nearby coastal waters lying in vicinity to the mangroves. The present study was conducted in a subtropical region of the East China Sea (Iriomote Islands, Japan). In this study we simultaneously analyzed the dissolved and particulate carbon in the coastal waters dominated by mangroves and seagrass lying adjacent to each other. Partial pressure of CO_2 in the surface water [pCO_2(water)] was directly measured throughout two days and air-water CO_2 flux was estimated (by bulk formula method) simultaneously during July, 2017. pCO_2(water) in the mangrove waters ranged between 394 and 2667 μatm having a mean of 906 $\pm$ 572 μatm, whereas, in the seagrass waters ($\sim$1 km apart from the mangroves) the pCO_2(water) varied between 183 and 1096 with a mean value of 480 $\pm$ 88 μatm. Variability of pCO_2(water) and its magnitude was much higher in the mangrove waters compared to seagrass waters. This variability was also reflected in the air-water CO_2 fluxes. The mangrove waters acted as a source of CO_2 with a mean rate of 405 $\pm$ 464 μmol m-2 h-1 which is usually the case observed in various mangrove dominated waters throughout the world. However, the seagrass dominated water, which is usually found to be a net sink of CO_2 in most of the studies has also acted as a mild source of CO_2 in this region. Though the seagrass waters acted as a sink of CO_2 during some time of the diel cycle, on the whole it acted as a net source of CO_2 with a mean rate of 57 $\pm$ 71 μmol m-2 h-1. However, the magnitude of mean CO_2 efflux from seagrass waters was $\sim$5.7 times lower than that observed in the mangrove waters. The main reason that can be attributed behind such a behavior of seagrass waters could be the mangrove derived enrichment of dissolved organic carbon (DOC), particulate organic carbon (POC) and dissolved inorganic carbon (DIC) in the seagrass water column. Evidently the DOC as well as POC concentration was much higher in the mangrove waters (104 $\pm$ 20 μM and 30 $\pm$ 9 μM, respectively) compared to seagrass (78 $\pm$ 17 μM and 17 $\pm$ 7 μM, respectively). DOC exhibited predominance in organic carbon over POC in both the ecosystems having a DOC/POC value of $\sim$3 to 4. Like DOC and POC, a decrease in DIC concentration was also observed in seagrass waters (1,933 $\pm$ 59 μmol kg-1) than mangroves (2,074 $\pm$ 408 μmol kg-1). These observations altogether portrays that the mangrove waters are acting as a strong source of CO_2 which is commonly found in all corners of the world, however, the seagrass waters are also acting as mild source of CO_2 which is not so commonly observed.