Cross-boundary Exchanges of Carbon and Nitrogen in the Marginal Seas

Chen-Tung Arthur Chen

Institute of Marine Geology and Chemistry, National Sun Yat-sen University, Kaohsiung 804, Taiwan, Republic of China. ctchen@mail.nsysu.edu.tw

Continental marginal zones are characterized as those areas where rivers, lands, oceans, the atmosphere and sediments meet and interact. Despite their moderately-sized surface areas, marginal zones play a significant role in the biogeochemical cycles of both carbon and nitrogen in that they receive huge upwelled and riverine inputs of both. Although the riverine flux of nutrients has been on the rise in the past few decades, this study confirms the results of a recent synthesis (Chen et al., 2002) according to which eutrophication-derived carbon deposits in the continental margins do not yet account for all the reportedly missing anthropogenic CO$_2$. Nevertheless, marginal zones absorb 30·10$^{12}$ molC y$^{-1}$ (0.36 GtC y$^{-1}$) from the atmosphere, therefore representing important, albeit often neglected, links in the global carbon cycle. On the other hand, most shelves and estuaries do show that the production of other such greenhouse or reactive gases as CH$_4$, dimethyl sulfide (DMS) and N$_2$O are an ongoing feature, making up a net total flux of 0.1·10$^{12}$ mol y$^{-1}$ CH$_4$, 0.07·10$^{12}$ mol y$^{-1}$ DMS and 2.5·10$^{12}$ molN y$^{-1}$ N$_2$O to the atmosphere. The shelves also transport 50·10$^{12}$ mol y$^{-1}$ DOC, 45·10$^{12}$ mol y$^{-1}$ POC, 21·10$^{12}$ mol y$^{-1}$ PIC, 5·10$^{12}$ mol y$^{-1}$ DON and 5·10$^{12}$ mol y$^{-1}$ PON to the open oceans.