Linkages of river fluxes of organic carbon and nutrients to the metabolic states of a river-associated coastal ecosystem

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This study aims to understand the linkages between river (Kaoping) fluxes of organic carbon and nutrients and temporal variability of metabolic states and source-sink of atmospheric CO_2 in a river-associated coastal ecosystem. The relationship between river fluxes and metabolic states of ecosystem was drawn from the basis of monthly observations in both river and coastal ecosystem. Surface concentrations of nutrients in the coastal ecosystem increased generally with the increase of freshwater and nutrient inputs from the Kaoping River that discharged the highest rate during the summer season. The depth-integrated gross primary production (IGPP) through the euphotic zone ranged from 1389 to 8918 mg C $m^{-2}d^{-1}$. The integrated dark community respiration (IDCR) ranged from 919 to 5848 mg C $m^{-2}d^{-1}$. Positive correlations are significant between GPP (DCR) and temperature, PAR and nutrients, and negative correlations are also significant between GPP (DCR) and salinity, showing the significant impacts of freshwater inputs and climatic changes on GPP (DCR). The GPP was determined largely by DCR, and DCR was attributed mainly to bacteria respiration (BR; ave., 78%). The ratio of IGPP/IDCR, an indicator of net ecosystem production, was greater than 1.0 (autotrophic) for most stations during summer but was <1.0 (heterotrophic) for offshore stations during winter. While comparing measured air-sea fluxes of CO_2 with IGPP/IDCR ratios, the IGPP/IDCR may not be the sole factor in determining the air-sea fluxes of CO_2. The physical forcing such as temperature and wind velocity may be also important in determining the source or sink of atmospheric CO_2 in the study areas.