Remotely sensed study of air-sea CO_2 fluxes variability in the northern South China Sea

Fenfen LIU[a], Shilin TANG[b], Chuqun CHEN[a,*]

[a] *LED, South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, 510301,China*

[b] *Laboratory of Digital Earth Sciences, Center for Earth Observation and Digital Earth, Chinese Academy of Sciences, Beijing, 100190, China*

* *Corresponding author, E-mail address: cqchen@scsio.ac.cn*

The CO_2 source or sink status and variability in the coastal ocean are the subjects of highly debate. Satellite remote sensing offers an avenue for expanding observations and analyzing temporal and spatial variability of the environment of the ocean. In the present study, the algorithm for surface layer seawater partial pressure of CO_2 (pCO_{2sw}) of the northern South China Sea (NSCS) was applied to remote sensing products and the air-sea CO_2 fluxes were calculated from salinity, wind speed corrected to 10 meters, sea surface temperature data obtained from remote sensing in the NSCS, for the period 2004-2007. The CO2 source and sink status in the NSCS were analysed and showed significant variability in time and space. In winter, the pCO_{2sw} in most of the NSCS ranged from ~320-360μatm, indicative of undersaturation with respect to atmospheric partial pressure of CO_2 (pCO_{2air}). However, in summer, the pCO_{2sw} increased to ~400-420μatm mainly due to sea surface temperature. The air-sea CO_2 fluxes in summer have been increasing year after year which have the same trend with the pCO_{2sw}. These upswings correlated with a rise in sea surface temperatures, showing that sea surface temperatures played key role in the CO_2 source and sink status in NSCS. In regions of the Luzong Strait, the air-sea CO_2 flux remained generally high likely associated with the remineralization of organic matter. The low air-sea CO_2 fluxes conditions occurred on the western part of the Taiwan Strait in winter, which may be caused by the low temperature and low salinity China coastal current entering the Taiwan Strait driven by the northeast monsoon. The research showed that most of the NSCS represents weak sinks for atmospheric CO_2 in winter and sources for atmospheric CO_2 in summer.