



## **The role of carbonic anhydrase in the regulation of phytoplankton photosynthesis in the northern South China Sea during the northeast monsoon season**

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The carbonic anhydrase (CA) is considered as an important enzyme in the process of primary production of phytoplankton. We present the results of a field study in the northern South China Sea (NSCS) during the northeast monsoon season (Nov., 2010). The enzyme activity of CA was investigated through the effect of the specific CA inhibitors acetazolamide (AZ) and ethoxzolamide (EZ) on the P-I curve parameters. The results showed the following two patterns: (1) in the coastal regions, the inhibitor EZ mainly affects the initial slope ( $\alpha$ ) of P-I curve to reduce the photosynthetic rate ( $\sim 50\%$  inhibition when  $\alpha > 0.03$ ); (2) in the regions of deep water, the inhibitor EZ caused more severe photo-inhibition in the high irradiance levels the phytoplankton was exposed to in the sea surface. And the effect of inhibitor AZ showed more variability within different regions and size-fractions. The results also revealed that the different roles of CA depending on the diversity of phytoplankton assemblage. Through the comparison with the data we got in other seasons, we considered that the reduction of photo-inhibition by the together effect of higher intracellular CA activity and deeper mixing layer depths was the important factors for the higher primary production in the northeast monsoon season than in the southwest monsoon season in the NSCS basin. In the future, the increasing atmosphere  $\text{CO}_2$  concentration would make ocean more acidification, and pH shift and more available free- $\text{CO}_2$  in the seawater would affect the carbon concentrating mechanism of phytoplankton. The influence might be various in different parts of ocean, which need further studies.