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TITLE: Physical?biological coupling in the Pearl River Estuary

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ABSTRACT:

The Pearl River Estuary is a subtropical estuary and the second largest in China based on discharge volume from the Pearl River. Processes in the estuary vary spatially and temporally (wet vs dry season). In the dry season at the head of the estuary, hypoxic and nearly anoxic conditions occur and NH4 reaches >600 ?M, NO3 is ?300 ?M and nitrite is ?60 ?M indicating that nitrification and denitrification may be important dry season processes in the region extending 40 km upstream of the Humen outlet. There are very few biological studies conducted in this upper section of the estuary in either the dry or wet seasons and hence there is a need for further research in this region of the river. In the wet season, the salinity wedge extends to the Hongqimen outlet and oxygen is low (35?80% saturation). Nitrate is ?100 ?M, silicate ?140 ?M; and phosphate is relatively low at ?0.5 ?M, yielding an N:P ratio up to ?200:1 in summer. Nutrients decrease in the lower estuary and primary productivity may become potentially P-limited. Eutrophication is not as severe as one would expect from the nutrient inputs from the Pearl River and from Hong Kong's sewage discharge. This estuary shows a remarkable capacity to cope with excessive nutrients. Physical processes such as river discharge, tidal flushing, turbulent dispersion, wind-induced mixing, and estuarine circulation play an important role in controlling the production and accumulation of algal blooms and the potential occurrence of hypoxia. Superimposed on the physical processes of the estuary are the chemical and biological processes involved in the production of the bloom. For example, the 100N:1P ratio indicates that P potentially limits the amount of algal biomass (and potential biological oxygen demand) in summer. While extended periods of hypoxia are rare in Hong Kong waters, episodic events have been reported to occur during late summer due to factors such as low wind, high rainfall and river discharge which result in strong density stratification that significantly dampens vertical mixing processes. Nutrient loads are likely to change over the next several decades and monitoring programs are essential to detect the response of the ecosystem due to the future changes in nutrient loading and the ratio of nutrients.

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