Effects of ChangJiang River summer discharge on bottom-up control of coastal bacterial growth

Fuh-Kwo Shiah, Gwo-Ching Gong

Abstract

The East China Sea (ECS) has one of the largest shelf ecosystems in the world, and among the major external forces that affect the physical and biogeochemical processes in the ECS shelf is the discharge from the ChangJiang (the CJ) River. This is particularly true during the summer period when prevailing flooding results in the CJ River discharge reaching its annual maxima. To explore the effects of inter-annual variations in CJ River summer discharge on the bacterial growth rate (BGR), six cruises were conducted covering the entire width of the ECS shelf in Jul-98', Jun-01', Jun-03', Aug-03', Jun-04' and Jul-04'. It was found that the spatial patterns of inorganic nutrients (e.g. nitrate, < 0.15 - 28 μM), chlorophyll concentrations (Chl, <0.20 - 16 mg m^{-3}) and the BGR (< 0.03 - 1.05 d^{-1}) were all negatively correlated with salinity (22.4 - 34.9 psu) on each cruise, a clear sign that river discharge had an significant impact on the chemical and biological structures in the ECS shelf. Variations in the BGR in the mixing zone (salinity <33 psu) and the oceanic zone (salinity >33 psu) were positively correlated with Chl. However, the intercepts and slopes of the BGR-Chl relationship in the mixing zone were significantly higher than those in the oceanic zone. Noteworthy too is that on a monthly and/or an inter-annual scales, BGR-Chl coupling (i.e. the slope) in both zones changed positively with river discharge, and this coupling of the oceanic zone seems to have been more sensitive to the changes of discharge. This suggests that bacterial growth in the oligotrophic zone might be more substrate limited than those in the mixing zone. This is one of the few studies to suggest that in summer, the monthly and/or inter-annual variations in the CJ River discharge might significantly alter the supply rates of inorganic nutrients and dissolved organic matter, which in turn affects the relationship between the auto- and hetero-trophic processes in the ecosystem of the shelf.