

摘要

本計劃為東海長期觀測與研究(LORECS)整合型計劃中子計劃3。主要係研究細菌生產力(Bacterial production; BP)，水體群聚呼吸率(Community respiration rates; CR)及浮游植物溶解態有機碳分泌率(Phytoplankton exudation rates; PER)在東海之時空分布、來源，消耗及其控制機制。PER係測量溶解態之初級生產力。生物源有機碳在上層水體(光透層)的消耗速率以R及BP的測量而加以評估。除航次調查外，並將進行岸上及船上生態實驗槽(mesocosm)之研究，期對上層水體內BP, CR, PER間之互動以及它們與其它各生物及化學因子間的細部運作及關聯性能有更細密之瞭解。二者之研究成果對於東海碳通量的深入瞭解及模式分析之依據皆能提供重要之參考。

Abstract

This proposal is a component of the cooperative research program entitled "Long-term Observation and Research of the East China Sea (LORECS). The distribution patterns, sources, consumption and possible controlling mechanisms on bacterial production (BP), community respiration rates (CR) and phytoplankton exudation rates (PER) in the East China Sea will be investigated. In addition to cruise survey, laboratory and shipboard mesocosm studies will be conducted. The interactions among BP, CR and PER as well as their relationships with other biological and chemical factors will be explored. The data derived from either cruise observations or the mesocosm experiments will be helpful in developing the biogeochemical model for the East China Sea.

結果與討論

東海陸棚最大的特色在於有著強烈對比的物理(如溫，鹽度)，化學(如無機營養鹽與有機養分)及生物(如初級生產力)梯度(gradients)；異營細菌的生產力(production;圖1)因而呈現出極為明顯的季節(冷水期 vs. 暖水期)與空間(陸棚內區 vs. 中區 vs. 外區)變化。細菌生產力在冷水期($24 - 60 \text{ mgC m}^{-2} \text{ d}^{-1}$)變化不大，但在暖水期($25 - 166 \text{ mgC m}^{-2} \text{ d}^{-1}$)則呈現內區高外區低。在冷水期有機養分添加實驗中，發現細菌生長率在陸棚中區及外區係受限於有機養分之供應速率；但在陸棚內區則受水溫變化之操控(圖2)。

由以上之結果，吾人可以推斷細菌生產力在微生物環及浮游生物的食階動態平衡中的重要性勢必會因地因時而異。如欲解決此一問題，除了持續進行航次觀測外，在船上進行生態模擬槽(mesocosm)實驗亦是不可或缺之工作。後者已在東海做過先期實驗，結果尚在整理之中。

計畫成果自評

本年度共發表 8 篇 SCI 論文(見下), 第一作者及共同作者各 4 篇。另有一篇論文已被 Deep Sea Research 接受。感謝國科會的資助及海洋研究同仁的合作。

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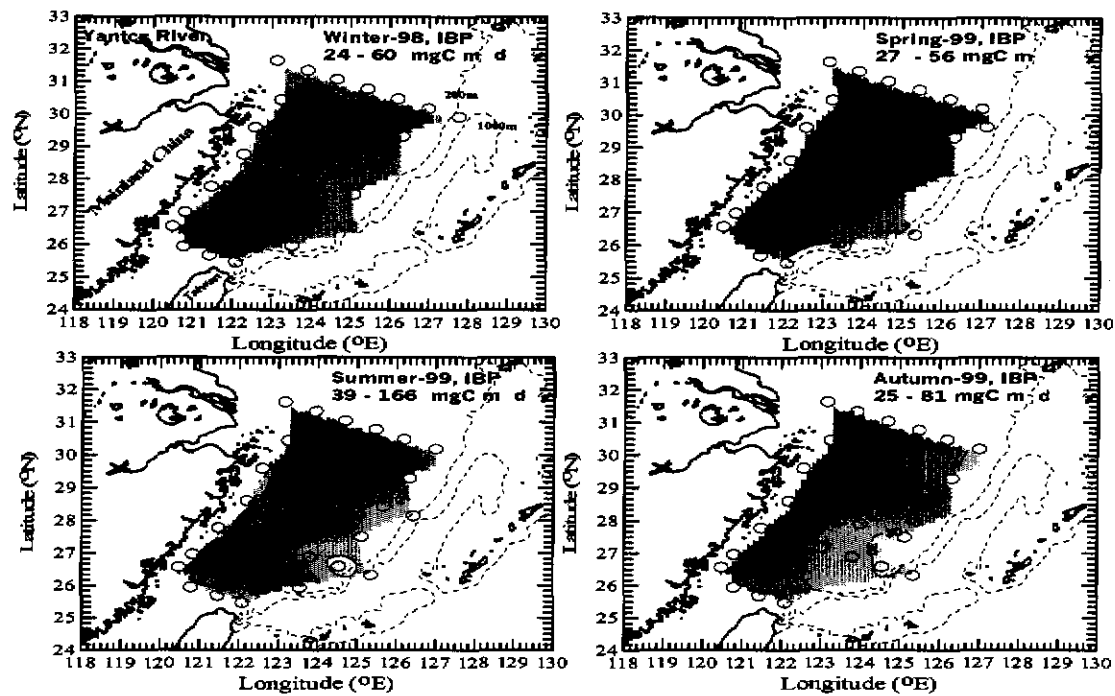


Figure 1. Spatial contours for the euphotic zone average values of bacterial turnover rates during the four different seasons in the continental shelf of the East China Sea.

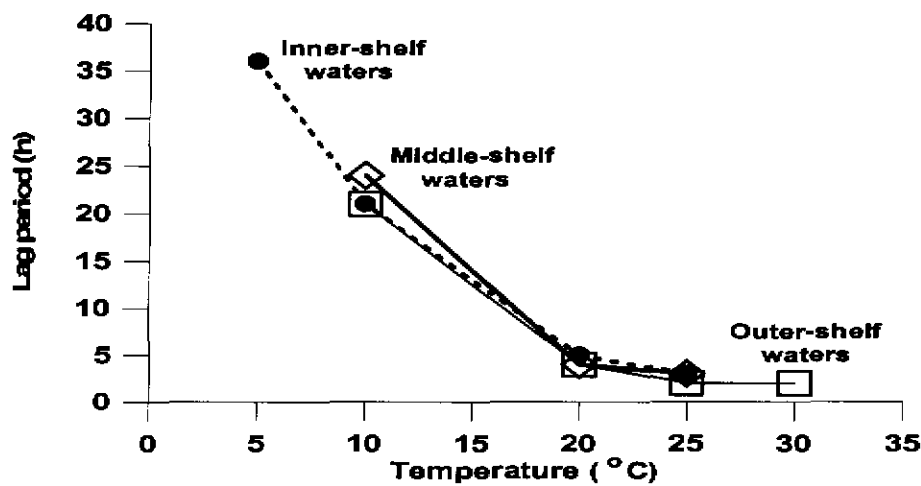


Figure 2. Temperature effects on the lag period required for bacteria to respond to the enrichment of dissolved free amino acids. The inner-shelf waters, solid circles; the middle-shelf mixed waters, open diamonds and the outer-shelf waters, open squares.