地理学报(英文版) 2004年第14卷第1期

Estimation of ocean primary productivity and its spatio-temporal variation mechanism for East China Sea based on VGPM model

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According to calculation results of ocean chlorophyll concentration based on SeaWiFS data by SeaBAM model and synchronous ship-measured data, this research set up an improved model for Case Ⅰ and Case Ⅱ water bodies respectively. The monthly chlorophyll distribution in the East China Sea in 1998 was obtained from this improved model on calculation results of SeaBAM. The euphotic depth distribution in 1998 in the East China Sea is calculated by using remote sensing data of K490 from SeaWiFS according to the relation between the euphotic depth and the oceanic diffuse attenuation coefficient. With data of ocean chlorophyll concentration, euphotic depth, ocean surface photosynthetic available radiation (PAR), daily photoperiod and optimal rate of daily carbon fixation within a water column, the monthly and annual primary productivity spatio-temporal distributions in the East China Sea in 1998 were obtained based on VGPM model. Based on analysis of those distributions, the conclusion can be drawn that there is a clear bimodality character of primary productivity in the monthly distribution in the East China Sea. In detail, the monthly distribution of primary productivity stays the lowest level in winter and rises rapidly to the peak in spring. It gets down a little in summer, and gets up a little in autumn. The daily average of primary productivity in the whole East China Sea is 560.03 mg/m2/d, which is far higher than the average of subtropical ocean areas. The annual average of primary productivity is 236.95 g/m2/a. The research on the seasonal variety mechanism of primary productivity shows that several factors that affect the spatio-temporal distribution may include the chlorophyll concentration distribution, temperature condition, the Yangtze River diluted water variety, the euphotic depth, ocean current variety, etc. But the main influencing factors may be different in each local sea area.

Paper (PDF)

关键词: East China Sea; primary productivity; chlorophyll concentration; remote sensing algorithm; spatio-temporal variation; mechanism doi: 10.1360/gs040104