



分层水体对表层辐照度比影响的蒙特卡罗分析

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摘要 众多海洋观测数据表明, 在真光层深度范围内, 海水固有光学特性和光学有效组分的剖面分层分布是广泛存在的, 而很多遥感反演模型的建立基于均一分布假设, 尤其是在经验模型的建立中, 往往只利用某一深度或各深度平均的光学有效组分浓度与水体光谱的统计关系。文章通过模拟平静水面水下光的辐射传输, 分别研究了叶绿素、无机悬浮物浓度垂直分布结构对水下辐照度比的影响, 并对比了两类分层水体权重函数等效浓度计算式及相应水下辐照度比, 结果表明, 对于分层水体, 透射深度和层化强度是影响等效浓度值计算误差的主要因素, 透射越深, 表层层化越强, 水体层化对水下辐照度比的影响就越大, 但其计算误差也越大。Gordon等效浓度计算结果比较接近实际值, 而Zaneveld计算式则高估了分层水体的等效浓度值。

关键词: 分层水体 蒙特卡罗 权重函数 等效浓度

Abstract: Many in-situ data indicate that the vertical stratification of the inherent optical properties and optical active constituents in euphoric depth is a common phenomenon in most ocean water. Most of satellite retrieval algorithms of the optical constituents concentration are, however, based on the assumption of homogeneous ocean water, especially for empirical retrieval models, which are usually based on the statistical relation between the reflectance spectral of surface and the depth-averaged constituent concentration or that of a certain depth. Using the underwater optical radiative transfer model, the influences of vertically stratified concentration of chlorophyll and suspended sediment matter on the irradiance ratio at the depth of 0 m are respectively analyzed. The two computation formulas of depth-weighted equivalent concentration of stratified water and their responding irradiance ratio at 0 m depth are then compared. The results indicate that the primary error sources is the light penetration depth and the intensity of stratification: the deeper the penetration and the more distinct stratification, the greater the effect of stratified water on the value of irradiance ratio at 0 m depth, as well as the error of depth-weighted equivalent concentration. Gordon's computation results of equivalent concentration are more accurate, and the Zaneveld's results overestimate the equivalent concentration of stratified water.

Keywords: stratified water bodies, Monte Carlo, weight function, depth-weighted equivalent concentration

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