

姜雨薇,赵巧华,孙德勇,邱辉,陶蓉茵,钱昊钟,季春华.太湖水体上行漫射衰减系数的变化特征研究[J].环境科学学报,2012,32(1):164-172

太湖水体上行漫射衰减系数的变化特征研究

Characteristics of the diffuse attenuation coefficient of upwelling underwater irradiance in Taihu Lake

关键词: [上行漫射衰减系数](#) [太阳高度角](#) [空间分布](#) [太湖](#)

基金项目: [国家自然科学基金项目\(No.41071070\)](#); [国家水体污染控制与治理科技重大专项\(No.2008ZX07528-005\)](#)

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摘要: 水体上行漫射衰减系数是反映水体中上行光强衰减的重要光学参数,它直接影响着水下光场分布,对水环境生态系统变化具有重要意义.然而,对于太湖水体而言,上行漫射衰减系数的变化特征尚不明确.为此,本课题组于2010年4月29日到5月2日对太湖水体28个采样点进行了野外原位观测,获取了相应的水体光学参数和水质参数数据集.在分析水体上行衰减系数光谱特征和空间分布特征的基础上,对其与太阳高度角、悬浮物浓度和叶绿素浓度之间的关系进行了研究.结果表明,上行漫射衰减系数的光谱特征表现为短波蓝光部分衰减系数较大,长波红光部分衰减系数较小,且衰减系数在575~700 nm之间随着波长的增加变化不明显,在675 nm附近出现相对高值,其与叶绿素a浓度存在显著的相关关系($r=0.574, n=28, p<0.05$).下行与上行漫射衰减系数随波长的变化特征大致相似,其差值谱线的变化规律为:小于400 nm的范围内,呈线性减小;在400~800 nm之间除760 nm附近有一峰值外,其余部分基本无明显变化;大于800 nm时,又迅速增加.上行衰减系数在不同湖区的空间分布大致为:开阔水域区>草型湖区>典型藻型湖区>草、藻过渡型湖区,藻型和草、藻过渡湖区在675 nm附近的峰值皆较为明显.上行衰减系数基本上随太阳高度角的增大而减小,上行漫射衰减系数与悬浮物浓度的偏相关性最好($r=0.963, n=28, p<0.05$),太阳高度角次之($r=0.474, n=28, p<0.05$),叶绿素浓度的最低($r=0.175, n=28, p<0.05$).

Abstract: Diffuse attenuation coefficient of upwelling irradiance is an important optical parameter reflecting variations of upwelling light attenuation, which significantly influences underwater light field variation and water ecological system. However, the variation characteristics of the diffuse attenuation coefficient of upwelling irradiance for Taihu Lake (a typical inland lake) has been not known at present. In this study, optical and water quality parameters were acquired by field observation at 28 sampling stations distributing over Taihu Lake from April 29 to May 2, 2010. Based on analyzing characteristic of spectra and spatial distribution of the diffuse attenuation coefficient of upwelling irradiance, the relationship between the concentration of suspended matter and chl-a, solar elevation angle and the diffuse attenuation coefficient of upwelling irradiance was explored. Our results showed that the spectral properties of diffuse attenuation coefficient of upwelling irradiance was larger at shorter wavelength than that at longer wavelength, and had little variation from 575 nm to 700 nm. There existed a significant correlation relationship between a high value of diffuse attenuation coefficient of upwelling irradiance at 675nm and the concentration of chl-a ($r=0.574, n=28, p<0.05$). The variation characteristics of the diffuse attenuation coefficient of downwelling irradiance and upwelling irradiance were similar between each other. The D-value between them decreased to less than 400nm, and varied little at 400 to 800 nm, and then increased more than 800 nm. The spatial distribution of the diffuse attenuation coefficient of upwelling irradiance was in the order of Taihu Lake Center > grass-type zone>algae-type zone>grass and algae-type zone, and a high value at 675 nm was observed in the algae-type zone and grass and algae-type zone. The diffuse attenuation coefficient of upwelling irradiance gradually decreased with the increasing of solar elevation angle. And there was the most significant relationship between the concentration of suspended matter and the diffuse attenuation coefficient of upwelling irradiance ($r=0.963, n=28, p<0.05$).

Key words: [diffuse attenuation coefficient of upwelling irradiance](#) [solar elevation angle](#) [spatial distribution](#) [Taihu Lake](#)

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