

Detection of Land Use Change and its Relationship to Water Quality Features and Potential Fishing Grounds by Using Multi-Source and Multi-Scale Remote Sensing Imagery

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The proposed project focusing on Xin'an river watershed investigates the impact of water quality and land cover/use change on the spatio-temporal distribution of the fishing grounds in Qiandao Lake. The main objectives of the proposal are (i) to further advance our scientific understanding of the impacts of watershed processes on the fisheries resources of lake ecosystems through a multidisciplinary case study of Qiandao Lake in Zhejiang Province of China, (ii) demonstrate the key importance of remote sensing as a critical tool for monitoring ecological processes, water quality, and fishing grounds in Qiandao lake and examine the accuracy and transferability of the prediction algorithms to other lake ecosystems with similar characteristics, (iii) Establish risk base maps of potential environmental threats to the water resources and fishing resources of Qiandao Lake with regard to the watershed processes, (iv) develop a methodology for dynamically generating and updating thematic maps of watershed processes, water quality features, fishing grounds, and other thematic maps of ecological risk, that will be of valuable support for any development project in the area.

FORMOSAT-2, ALOS, ENVISAT, and HJ-1B satellite resources provide the basis for the development of accurate algorithms for monitoring water quality including Chlorophyll-a density and water surface temperature (HJ-1A, 100m). We will apply relevant processing techniques, register the images to appropriate UTM projection system, and use ground truth data collected with wireless environmental sensors develop, calibrate, and validate inversion algorithms for the retrieval of water biophysical parameters, then generate accurate thematic maps of water surface chlorophyll-a density. Variable combinations of multi-sensor and multi-resolution image fusion techniques and/or cross-calibration between image data sets will also be performed to improve accuracy of the developed algorithms and in order also to improve the predictive accuracy of Chinese environmental satellites HJ-1A and HJ-1B. The generated chlorophyll-a density and water surface temperature maps will be overlaid with additional information on actual fish catch data to generate thematic fishing ground maps using multi-criteria evaluation (MCE) rules. More accurate mapping will be carried out on the potential fishing grounds using IKONOS data. Since over 60% of the water reaching Qiandao lake transit through the main stream of Xin'an river, we will also study the land cover/use over the whole watershed of Xin'an river. For this part we will use Landsat TM, Spot 5, and HJ-1B imageries to delineate the watershed and to extract the land cover/use information by image differencing. We will study the change in cover and land use at 3 periods 1998, 2005, and 2011. We will identify potential threat to water quality and use higher resolution IKONOS and TerraSAR-X data to generate corresponding thematic risk maps. The deliverables of this project will consist of thematic maps of water quality features, and fishing grounds of Qiandao lake as well as the risk based thematic maps of environmental hazard to the lake water resources and the fishing resources.

The proposed project will be supported by existing research funds including the Key Knowledge Innovative Project of the Chinese Academy of Sciences (KZCX2-EW-318), the National Natural Science Foundation of China 41101363, 40871181, and the seed project about technological innovation of Jiashan County, Zhejiang Province, China.

基于多源多尺度遥感影像的土地利用变化监测及其与水质特征和潜在渔场的关系研究

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本项目以新安江流域为案例区域, 研究千岛湖水质和周边土地覆盖/土地利用变化对千岛湖渔场时空分布的影响。本项目的主要研究目标如下 (1) 以中国浙江省的千岛湖区域为案例, 通过多学科交叉研究, 进一步增强流域过程、与湖泊生态系统以及渔业资源的相互关系与作用影响的科学认识。(2) 证明遥感作为监测千岛湖区域生态过程、水质和渔场关键工具的重要性, 并对本项目中预测算法的准确性以及对具备相似特征的其他湖泊生态系统应用的可移植性进行验证。(3) 研究与制作与流域过程相关的千岛湖区域水资源和渔业资源潜在环境威胁风险图。(4) 发展流域过程、水质特征、渔场以及其他生态风险等专题图的动态生成和更新方法, 这些成果将对任何在该地区的其他发展项目提供宝贵支持。

FORMOSAT-2, ALOS, ENVISAT, HJ-1B等卫星数据资源为本项目中水质监测 (包括叶绿素-a密度和水的表面温度 (HJ-1A, 100米)) 的算法研发提供了基础。我们将应用相关的数据处理技术将影像纠正并投影到UTM投影坐标系统, 并采用无线网络传感器获取的地面真实数据来开发、校正和验证水体生态参数的反演算法, 然后生成水面叶绿素-a密度专题图。本项目还将尝试可变组合的多传感器和多分辨率图像融合技术和/或图像数据集之间的交叉定标技术来提高算法的精度以及中国环境卫星HJ-1A/B的预测精度; 并将所生成的叶绿素-a密度和水的表面温度图与其他捕鱼相关信息等一起进行叠加, 使用多标准评价 (MCE) 的规则生成渔场分布专题图, 同时利用IKONOS卫星数据对潜在渔场进行更精确的制图。由于超过60%的千岛湖的水来自新安江干流, 我们将研究整个新安江流域的土地覆盖/利用情况。对于这部分内容, 本项目拟使用Landsat TM, SPOT-5, 和HJ-1B来划定流域范围并提取1998, 2005和2011三个时期的土地覆盖/利用信息。项目将研究潜在威胁水质要素并使用更高分辨率的IKONOS卫星、TerraSAR-X等数据生成相应的专题风险图。该项目的成果将包括千岛湖水质特征和渔场分布的专题图, 以及湖水资源和渔业资源相关的环境风险图。

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