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.

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FORMOSAT-2 ALOS ENVISAT HJ-1B
-a HJ-1A 100
UTM

-a
/

HJ-1A/B -a
MCE

IKONOS
60 /

Landsat TM SPOT-5 HJ-1B
1998, 2005 2011 /
IKONOS TerraSAR-X