

HICO Data User's Proposal

Utility of HICO imagery in Monitoring Coastal Waters with High Content of Sediments

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ABSTRACT

The transport of sediments is very important for the evolution of coastal land; suspended sediments also have great impacts on aquatic system by controlling subsurface light conditions. In this work, the hyperspectral imaging data of HICO will be employed in the tentative estimation of sediments concentration and particle size in the turbid waters with high content of suspended sediments. The testing sites will be the Yellow River Estuary and the Northern Jiangsu Shoal, China. In-situ work will be conducted to collected data of the remote sensing reflectance and the water samples for further sediments analysis. Macro-algae blooms (green tide) often happen at the Northern Jiangsu Shoal, but it is difficult to detect it with low-resolution (spatial and spectral) imagery data due to the high-scattering background. The HICO hyperspectral data will also be used for the early-detection of green tide at the turbid waters.

Background

The transport of sediments is very important for the evolution of coastal land; suspended sediments also have great impacts on aquatic system by controlling subsurface light conditions. Due to the high back-scattering characteristics, estimation of sediment concentration by remote sensing seems to be an easier task than CDOM and chlorophyll. However, there are many kinds of sources of sediments (or particles), their particles size varies in spatial and temporal scales, which make it difficult to get robust retrieval algorithm in sediments concentration. Estimation of the particle concentration as well as the particle size is of great interest for coast studies.

The waters near the Yellow River Estuary at the Bohai Sea and the Northern Jiangsu Shoal at the Yellow Sea are full of sediments. The sediments have two kinds of sources: river discharge and bottom sediments re-suspension. Hyperspectral imagery has the potential of providing information about concentration and particle size of sediments when sediments transport, deposit or re-suspend.

In the recent years, massive macro-algae blooms happened at the Yellow Sea. There is some evidence that the macro-algae comes from the northern Jiangsu Shoal where is dominated by turbid waters with high content of sediments. The high scattering background makes it different to identify the green patches at this area. The early-detection of macro-algae bloom is currently limited by band width (Landsat TM) and low spatial resolution (MODIS).

HICO, the first spaceborne imaging spectrometer designed for monitoring coastal ocean, has very fine spectral resolution (5.7 nm) and spatial resolution (90 m), and a very high signal-to-noise ration to resolve the complexity of the coastal ocean.

Project description

Duration: September, 2011-September, 2012.

4 HICO images in total are proposed to be acquired during 2011-2012: 3 at the Yellow River Estuary, covering the wet season and the dry season; 1 at the northern Jiangsu Shoal during the summer when green tide blooms happen. The details are shown in the table below. With HICO's fly over the target waters, quasi-simultaneous validation field work will be conducted to collect the reflectance, water and sediments samples. Particle-size will be examined by laser-particle-sizer. The MODIS imagery will also be collected for cross-validation.

In-situ data and remote sensing imagery will be employed in estimation of the sediments characteristics and detection of "green tide" at the turbid waters with high content of sediments.

Site imagery	Description
	Yellow River Estuary
	Long, Lat: 119.28406 E, 37.72728 N
	Acquisition Date: Nov. 1–30, 2011 Apr. 1–30, 2012 Jul. 1–30, 2012
	Northern Jiangsu Shoal
	Long, Lat: 120.54199 E, 33.77915 N
	Acquisition Date: May–June, 2012

Personnel

Qianguo Xing (YIC, CAS), Phd, physical oceanology, remote sensing

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Facilities and support

We have several ongoing projects focusing on the sediments dynamics and monitoring at the Yellow River Estuary, which are funded by the Chinese Academy of Sciences. Our host institute have a field station which is located near the Yellow River Estuary and can act as the main support base for this work. We also have adequate necessary equipments and the instruments.

Output and deliverables

Publications on mapping of sediments concentration and particle size with new hyperspectral imagery;

New algorithm for green tide extraction with hyperspectral image data if the macro-algae can be caught by the HICO camera;

Attending HICO Data Team Meetings.

References

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