

Orbital 'camera' snaps marine topography

April 14 2014, by Geoff Vivian



“Deriving bathymetry from platforms such as airborne imagery has been around since the 1970s, however those algorithms were very scene-specific and couldn’t be transferred to other regions of the world,” Mr Garcia says. Credit: Maitri

In a world first, a Curtin University physicist used data from the International Space Station to map coastal bathymetry (underwater terrain).

Curtin PhD candidate Rodrigo Garcia says they chose Shark Bay for the project because the World Heritage listed site has the largest-known seagrass meadows.

"We were just thinking of what we can use the data there for, whether we can help assess changes in depth for benthos," he says.

He likens the Hyperspectral Imager for the Coastal Ocean (HICO), mounted on the [space station](#) as it orbits 400km above the earth, to a sophisticated digital camera.

"A camera records [light](#) in three very broad channels of blue, green and red that gives us your true colour image," he says.

"The hyperspectral sensor in particular records light in 87 channels, from blue to infra red.

"That gives us more spectral information about the earth's surface, and in this case the coastal ocean, which is really what is needed for these physics-based models."

The HICO records images of areas measuring 42 x 192km based on light reflected from the ocean floor.

This then needs to be corrected in order to function as useful data.

Firstly, as the light passes through the atmosphere, including water vapour and aerosol particles that interfere with the signal, the data needs to be adjusted.

Secondly a physics-based model is used to interpret the corrected data and determine bathymetry.

Thirdly, allowances need to be made for local tides—a difficult task as no data was available at the beginning of the study, and Shark Bay's tides are influenced by wind as well as the moon.

Mr Garcia says the method has the ability to detect temporal changes in depth up to 40cm.

"Deriving bathymetry from platforms such as airborne imagery has been around since the 1970s, however those algorithms were very scene-specific and couldn't be transferred to other regions of the world," he says.

"It's only recently, since 1999, that physics-based models started appearing.

"They were more analytically exact.

"Estimating uncertainty is the next step that's only recently been developed."

He says the method can now be used by managers to measure the effects of acute events such as cyclones and dredging on the benthos, and is cheap enough to be used to map the entire coastline.

He has since submitted a new paper for review, in which he describes his efforts to further improve the data's accuracy.

More information: Rodrigo A. Garcia, Peter R.C.S. Fearn, Lachlan I.W. McKinna, "Detecting trend and seasonal changes in bathymetry derived from HICO imagery: A case study of Shark Bay, Western Australia," *Remote Sensing of Environment*, Volume 147, 5 May 2014, Pages 186-205, ISSN 0034-4257, [dx.doi.org/10.1016/j.rse.2014.03.010](https://doi.org/10.1016/j.rse.2014.03.010).

Provided by Science Network WA

Citation: Orbital 'camera' snaps marine topography (2014, April 14) retrieved 6 July 2024 from <https://phys.org/news/2014-04-orbital-camera-snaps-marine-topography.html>

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