Abstract

An Automated Approach for Seabed Classification in Portuguese Canyons

Khaira Ismail, Veerle Huvenne, Doug Masson, Tim Le Bas

National Oceanography Centre, University of Southampton

Advances in technology have enabled numerous developments to explore complex deep-sea environment. As a result, a broad spectrum of data is increasingly being incorporated into seabed classification and many classification techniques have been proposed. Ideally, automated seabed classification for the deep sea is aiming for a statistically robust, objective and repeatable method, applicable at a variety of scales.

This paper presents a study from the upper Cascais and Lisbon-Setubal Canyons offshore Portugal, and will address 3 of the main objectives in automated seabed classification: 1) objective parameter selection, 2) data clustering and 3) determination of the optimal number of classes. Prior to parameter selection, it is important to ensure all spatial data are rectified on its position. To achieve this, TOBI sidescan data of high image quality but with poor locational accuracy were reprocessed using synthetic imagery produced from multibeam bathymetry. Subsequently, abiotic terrain variables were subjected to a statistical approach using the Principal Component Analysis (PCA) to select optimum parameters for habitat classification. Unsupervised fuzzy clustering was used for data clustering. Lastly, the optimal number of clusters was obtained using within-groups sum of squares.

The methods gave promising results. TOBI reprocessing successfully improved the sidescan sonar imagery registration onto the multibeam bathymetry. The automated approach yield 5 seabed-classes and were ground-truthed and evaluated using cross validation. The percentage of correctly classified pixel yields a worthy result. A critical evaluation using SLOT analysis on the overall method is carried out to identify its strength, limitations, opportunities and threats.