use of Hyperspectral imagery for mapping and monitoring coral reefs of Galapagos Island, Ecuador

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In a time where the effects of climate change are increasingly raising alarm, a global coral reef database is necessary for a better understanding of climate change and the study on distributions and the abundance of coral reefs are indeed. Assessing the health of the reef requires the capability to distinguish living corals from dead corals and other substrates and to monitor their possible recovery after a bleaching event. There is great potential for remote sensing in coral reef mapping especially when the previous applicability of remote sensing requirements were constrained to coral detection limits due to the heterogeneity nature of coral reefs. The present study demonstrates the capability of hyperspectral data acquired by the Compact High Resolution Imaging Spectrometer (CHRIS) aboard the PROBA satellite to extract bathymetric detail of Galapagos coral reefs and monitor them. The Principal Component (PC) analysis and the subsequent image enhancement techniques have been employed to discriminate coral species patterns. The 18 spectral band CHRIS/Proba data showed that wavelength penetration of fully illuminated submerged coral reef peaked at band 3 (0.53 μm), with the adjacent bands 2 and 4 (0.49 μm and 0.55 μm respectively) also returning acceptable underwater benthic reflectance discrimination. The image was classified using the CHRIS at-sensor radiance data and the Spectral Angle Mapper metric using the simulated at-sensor spectral library. A first test with hyperspectral data from the CHRIS/PROBA sensor shows promising results for the discrimination of different bottom-types on the Galapagos reef west of Ecuador. The results suggest that using CHRIS data and spectral libraries created with forward modelling from the sea bottom to top of the atmosphere are useful tools for interpretation of reefs and can give better results for the localisation of those parts of the reefs that are most affected by degradation.