New simple and rapid remote sensing technique for enhancement and visual interpretation of submerged habitats in coastal environments

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Optical remote sensing data, particularly those form Landsat (TM and ETM+) and SPOT, has been proven for more than two decades to be capable of resolving of coarse-level habitat distribution in coastal environments. However, capability of these sensors for interpreting and resolving all major submerged coastal habitats in one color display is confounded by their relative low spectral resolution, as well as, by limitation of the color mode input to only three wavelength bands. In a reef environment for example, a true color image (blue, green and red visible bands in a blue-green-red display) from Landsat TM or SPOT is only capable for interpreting coral reef types and bottom changes. However, information on the other coastal habitats such as seagrasses, macro-algae and other submerged aquatic vegetation (SAV) types are suppressed or lacked because of absence of their spectral signature in this band combination.

In order to display or to be able to visually interpret SAV habitats, the analyst should replace the red visible band with the near-infrared band in the last band combination, so that it can reflect the characteristic spectral signature of the aquatic vegetation. This adds similar difficulty when one tries to digitally classify a coastal environment with reef substrate types and SAV habitats. Unfortunately, review of the remote sensing literature reveals that there is no one remote sensing technique to date can visually enhance all substrate habitat types simultaneously.

The present paper tries to solve this problem through providing a new simple and rapid algorithm (cf. ER Mapper 5.5) derive d by linear interpolation of the blue visible band with the green, red and near-infrared bands. Adding of the blue band to this combination entails addition of the brightness component and hence, bottom changes, to the spectral characteristics of the SAV habitats. Bottom changes and information on background, are critical for mapping reefs habitats, whereas coupling the green and red visible bands with the near-infrared in one combination, is essential for mapping SAV habitats. The provided algorithm takes the advantages of the two band combinations.

Results of application of this algorithm and examples provided in this study, show that it can be very useful for visual interpretation and mapping of the major submerged habitats in coastal environments.