Assessing bottom type, anatomy, and temporal change of coral reefs using satellite imagery (Red Sea, Egypt)

Samuel J. Purkis, Jeroen A.M. Kenter and Reonold Pasterkamp
Vrije Universiteit Amsterdam

Freek van der Meer
ITC/TUD

A pilot study is presented on carbonate platform and reef substrate mapping using satellite imagery and ground verification with three objectives: 1) developing predictive models for substrate type in shoal water carbonates in selected regions, 2) assessing the effects of 10-15 years of environmental change in these regions and, 3) developing predictive models of fossil reefs and associated platform sediments as aquifers and hydrocarbon reservoirs.

The study addresses both surface, subsurface and morphology of the shoal water carbonate depositional environment. Conditions at the seafloor will be addressed through gound verification studies that include determination of bottom types and the measurement of *in situ* incident radiation, water turbidity and bathymetry, and the use of spectral unmixing techniques to determine fractional abundance for each bottom type. Bathymetry is a crucial parameter in the optical models for supervised classification of bottom types and will be derived from bathymetric charts in areas with sufficient accuracy, assumed to be constant in very shallow areas (less than 1 m), estimated from light absorption in the blue and green bands in areas of constant bottom type, or estimated from the relationship between surface roughness imaged by radar and topography in areas of sufficient current.

The resulting predictive model of bottom substrate and bathymetry is combined with existing information on the Holocene-Pleistocene transition from cores and reflection seismic data to develop, regionally, estimates for the accumulated volume of Holocene carbonate. In addition, this information will be used to develop quantitative spatial depositional facies models as analogues for hydrocarbon reservoirs and aquifers. Interpretation and quantitative image comparison of time series of satellite data representing 10 – 15 years will be used to reveal environmental changes in the selected regions.

The test area is located in the Red Sea of Egypt.