Mapping Health of Bonaire Coral Reefs Using a Lightweight Hyperspectral Mapping System – First Results

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Introduction

The Dutch Caribbean island of Bonaire is one of the world's top diving holiday destinations much due to its clear waters and healthy coral reefs. The coral reefs surround the western side of the island as an approximately 50–150m wide band. However, the general consensus is that the extent and biodiversity of the Bonarian coral reef is constantly decreasing due to anthropogenic pressures. The last extensive study of the health of the reef ecosystem was performed in 1985 by Van Duyl creating an underwater atlas. In order to update this atlas of Bonaire's coral reefs, in October 2013, a hyperspectral mapping campaign was performed using the *WUR Hyperspectral Mapping System* (HYMSY).

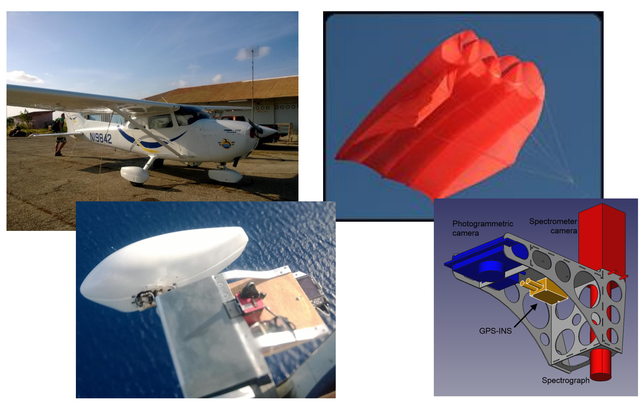
Mapping

The HYMSY consists of a custom pushbroom spectrometer (range 450–950nm, FWHM 9nm, ~20 lines/s, 328 pixels/line), a consumer camera (collecting 16MPix raw image every 2 seconds), a GPS-Inertia Navigation System (GPS-INS), and synchronization and data storage units. The weight of the system at take-off is 2.0kg allowing it to be mounted on varying platforms.

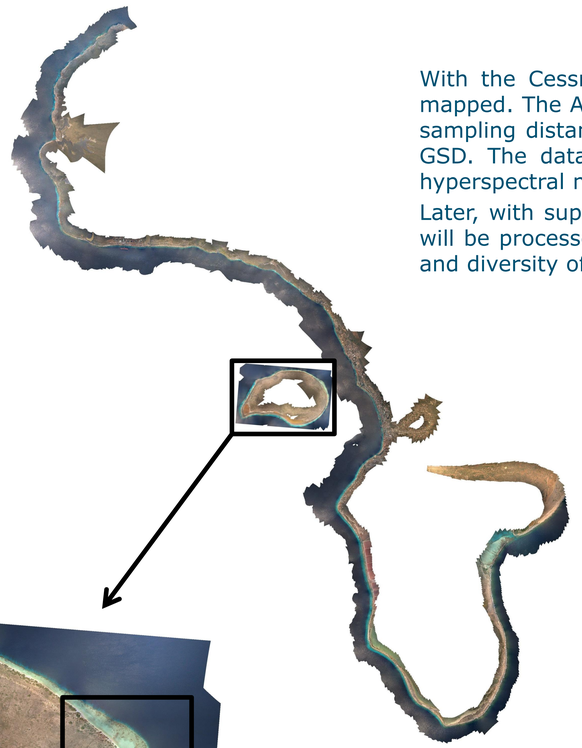
In Bonaire the system was flown on two platforms.

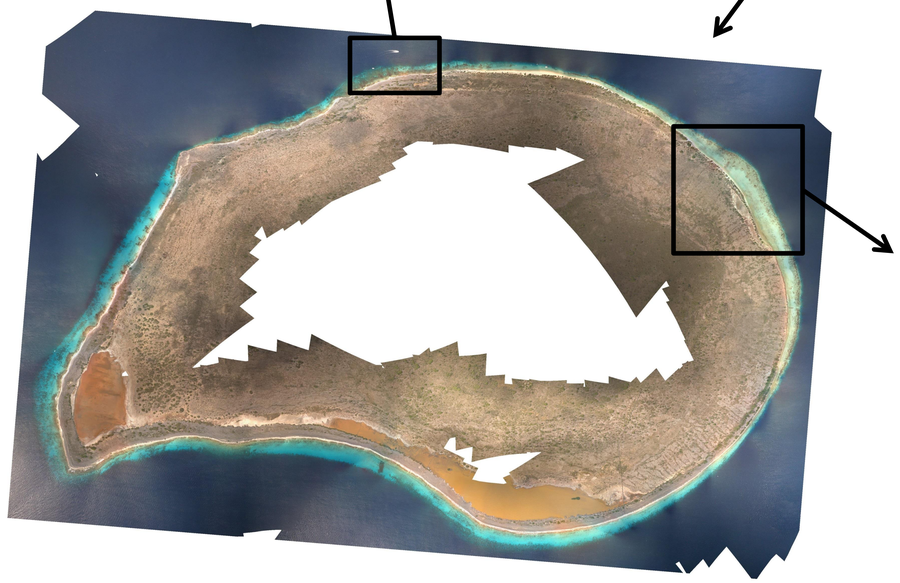
(1) on a Cessna airplane to provide a coverage for whole coastline

(2) on a kite pulled by boat or car to provide a subset coverage in higher resolution.



RGB imagery in 150mm resolution of the coast





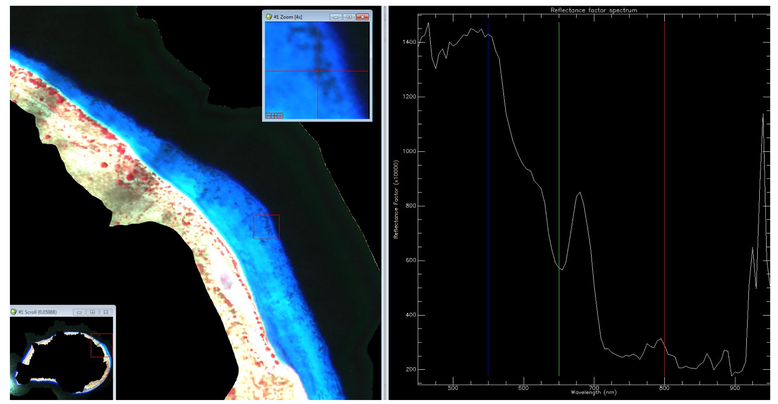
Orthomosaic of Klein Bonaire generated from HYMSY aerial images

Results

With the Cessna the whole west coast of the island was mapped. The Aerial images were collected at 150mm groud sampling distance (GSD) and the hyperspectral data in 2m GSD. The data were mosaicked and georectified to form hyperspectral maps of the coast line.

Later, with support of a dive validation campaign, the data will be processed to produce an underwater atlas of extent and diversity of the coral and algae species.

Aerial image from low altitude dataset taken with kite.



Subset of hyperspectral data from East coast of Klein Bonaire. The reflectance factor spectrum shows a typical coral/algae spectrum. On shallow water the red edge peak at 650-700nm region can be detected.

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