Deriving island characteristics using EO

MSc Thesis Proposal

Background

Small island developing states (SIDS) are highly vulnerable to natural disasters and climate change. Whilst data is the basis for the assessments of coastal hazards and risks and for the design of suitable adaptation options, data sources are often very scarce and/or fragmented due to the island remoteness. Among the data sources, one could think of information on coral reefs protecting the islands from incoming waves, presence and extension of seagrass, island topography, presence of anthropogenic interventions, etc…

The lack of data can be partly overcome by looking at different sources, such as Earth Observations from satellite images. New developments in satellite image processing, such as for instance the launch of the Google Earth Engine cloud computation platform and the launch of multiple satellite missions by ESA and NASA provides the opportunity to derive this information on a regional scale. Methods are for instance available to derive nearshore bathymetry in clear coastal waters, but these methods are hardly explored to their full extent yet.

MSc thesis objectives

The objective of this master thesis is to quantitatively derive, by using state-of-the-art image processing techniques, some of the most important island and reef characteristics, which may have an impact on the coastal hazards and island ecosystems. For example: reef widths, slopes, reef health, shoreline dynamics, presence of mining pits, etc. This information will be linked to coastal engineering parameters such as potential wave run-up, wave propagation and bottom friction, and will be used as a basis to derive a regional assessment of coastal hazards and suitable adaptation options.

The work is part of a larger research project; therefore, collaboration with other master thesis students focusing on the upscaling of hazard assessment and adaptation for small islands is expected.

Fig 1 Coral reefs under pressure Kwajalein Atoll

Fig 2 EO derived nearshore bathymetry

General information

Thesis project: duration: 8 months (starting as soon as possible).
We are looking for an enthusiastic student with clear skills and interest in Earth Observations, programming and a good basis in coastal engineering to be able to relate EO to coastal engineering practice.
Good knowledge of Python is required.
The project will be carried out at Deltares in close collaboration with The World Bank and other institutes operating in The Pacific (e.g. SPC) and in Europe (e.g. JRC).

For more information please contact: Gerben Hagenaars (Gerben.Hagenaars@deltares.nl), Dr. Alessio Giardino (Alessio.Giardino@deltares.nl), Dr. Roderik Lindenbergh (r.c.lindenbergh@tudelft.nl), Dr. Ap van Dongeren (Ap.vanDongeren@deltares.nl), Kees Nederhoff (kees.nederhoff@deltares.nl),Dr. Bregje van Wesenbeek (Bregje.vanWesenbeeck@deltares.nl).