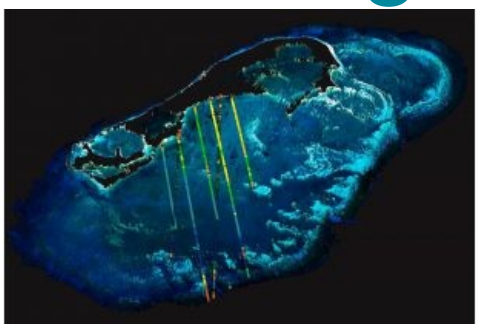
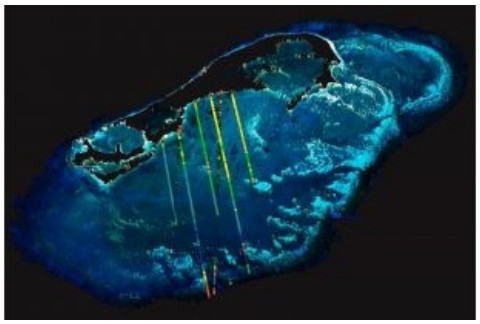
Sounding the seafloor with light





The shallow waters around islands and continental coastlines are important for human activities and for the health of many marine species. However, these areas are constantly evolving and are notoriously challenging and time-intensive to map. For several years, remote sensing scientists have worked to change this paradigm. A recent study led by NASA-funded researchers shows how this mapping might be done with freely available satellite data and cloud computing.

For centuries, marine surveyors relied on shipborne tools – first sounding lines, then sonar – to decipher the depth and shape of the seafloor, or bathymetry. Starting with U.S. Landsat satellites in the 1970s and more recently with European Sentinel satellites, researchers have been slowly developing ways to derive bathymetric information from satellite images.

Different wavelengths of light penetrate water to differing depths, with shorter wavelengths (such as blue and green) penetrating farther than longer wavelengths (near infrared, shortwave infrared). When water is clear and the seafloor is bright, scientists can estimate depth by measuring the amount of reflectance observed by a satellite and then modelling how far the light should penetrate.

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In 2021, Nathan Thomas and Lola Fatoyinbo of NASAâ€™s Goddard Space Flight Center, along with colleagues from three countries, took another step by mating ICESat-2 measurements with images from Copernicus Sentinel-2 to derive bathymetry at better resolution. The team mapped the shallows down to a depth of 26 metres (85 feet) around Biscayne Bay in Florida, the Gulf of Chania in Crete, and the island of Bermuda.