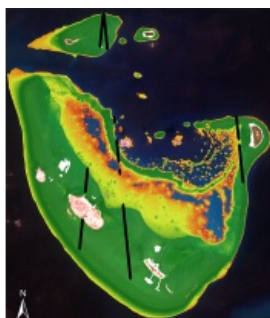


How to Derive Shallow-water Bathymetry Measurements from Satellites



TCarta Marine, a provider of marine geospatial products, is commercializing a new technique to derive highly accurate shallow-water bathymetry measurements from NASA's ICESat-2 satellite data. The new methodology is being developed with funding from the National Science Foundation (NSF). In 2018, NSF awarded the company a Phase 1 Small Business Innovation Research (SBIR) grant to commercialize new satellite-derived bathymetric (SDB) measurement technologies. Referred to as Project Trident, the research focused on leveraging Artificial Intelligence (AI) – machine learning and computer vision – to determine shallow-water seafloor depth in variable water conditions.

Bathymetric Data Extraction Tool

“As participants in NASA's Applied Users Program, we incorporated laser data from ICESat-2 as a validation tool for the enhanced SDB technologies under development,” said TCarta President Kyle Goodrich. “The results were so impressive we plan to introduce a stand-alone ICESat-2 bathymetric data extraction tool as one of several commercial products from our NSF work.”

NSF awarded TCarta a \$750,000 Phase 2 grant in late 2019 to continue Project Trident for an additional two years. Phase 2 will incorporate the new ICESat-2 research into the project's original objective of enhancing existing SDB technologies with AI capabilities to measure seafloor depths in diverse water conditions.

“The breakthroughs we made with NSF funding will enable us to apply SDB technology in geographic areas and water conditions not previously possible,” said Goodrich. “The results will have commercial impacts on marine operations related to oil and gas exploration and production, coastal infrastructure engineering, environmental monitoring, and geospatial intelligence (GEOINT) activities.”

High-resolution Optical Satellite Imagery

TCarta pioneered the application of high-resolution optical satellite imagery for seafloor depth measurement in 2014 with the commercialization of a proprietary technique. This SDB technology, however, was limited to the relatively calm and clear waters of shallow coastal areas. In 2018, TCarta teamed with jOmegak of San Carlos, California (US) and DigitalGlobe of Maxar Technologies (DigitalGlobe) of Westminster, Colorado (US) on Project Trident.

The Project Trident team added ICESat-2 space-based laser data to the project shortly after the small satellite's launch in 2018. Developed by NASA and the University of Texas, ICESat-2 (Ice, Cloud & land Elevation Satellite) was designed primarily for polar ice elevation and tree canopy measurements, but the green laser altimeter on board has proved remarkably accurate at gauging seafloor depths down to 100 feet below the surface.

About the NSF's Small Business Programs

America's Seed Fund powered by NSF awards \$200 million annually to startups and small businesses, transforming scientific discovery into products and services with commercial and societal impact. Startups working across almost all areas of science and technology can receive up to \$1.5 million in non-dilutive funds to support research and development (R&D), helping de-risk technology for commercial success. America's Seed Fund is congressionally mandated through the Small Business Innovation Research (SBIR) program. The NSF is an independent federal agency with a budget of about \$8.1 billion that supports fundamental research and education across all fields of science and engineering. To learn more about America's Seed Fund powered by NSF, visit <https://seedfund.nsf.gov>.

About TCarta

The TCarta product lines include high-resolution satellite-derived water depth and seafloor map products as well as 90- and 30-metre GIS-ready bathymetric data aggregated from numerous information sources (www.tcarta.com).