

# Scalable Space-Based Hydrospatial Solutions Deployed for Surveying Remote Locations in the Maldives and Arctic Canada

Goodrich Kyle<sup>1</sup>, Abileah, Ron<sup>2</sup>

<sup>1</sup>TCarta, U.S.A.

<sup>2</sup>Omegak, U.S.A.

## Background

Suriname is not the typical location for applying Satellite Derived Bathymetry surveying techniques which rely on calm and optically clear water to calculate depth.

## Objectives

The Northeast coast of South America, with its consistent seasonal wave patterns, gently sloping seafloor makes for ideal conditions for an alternative SDB method which leverages repeated imaging of wave patterns as viewed via satellite imagery or video to derive water depths. Wave Kinematic Bathymetry, produced from Sentinel 2 satellite imagery, offers a tool for surveying broad coastal areas repeatedly.

## Methods

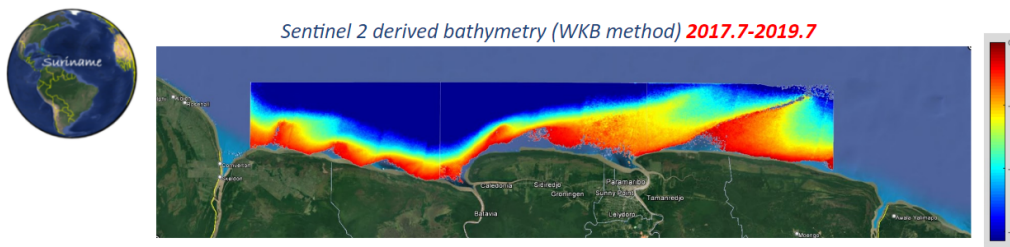
Wave Kinematic Bathymetry derives the depths from the ocean surface waves. Several observable phenomena occur when waves 'feel' the bottom: refraction, shift to higher wave numbers (shorter wavelengths), lower celerity, and in very shallow depths, wave steepening and breaking. This method relies on the visibility of surface waves so it is not limited by turbidity. There is a time delay built into the band collection that allows for stop-motion movement detection.

## Results

Over 300 Sentinel 2 images were downloaded, spanning five years, from late 2016 to the present. WKB surface was compared against SBES. A total of 11,236 SBES points intersected the WKB surface with a minimum depth of 0.84m, maximum depth of 13.34m with an average difference of 0.52m.

## Discussion

WKB processed over a broader area and creating year-to-year time series indicates shifting mud flats, migrating to the East in the region. Historical survey maps corroborate seafloor topography and geomorphs depicted in Wave Kinematic bathymetry calculated using Sentinel 2 imagery.



## Conclusion

WKB could be used in combination with SBES survey data to provide a supplemental technology to survey broad areas with wavy turbid conditions and monitor changes in the seafloor.

