CHS Remote Sensing Center of Expertise, Remote Sensing Applied to Hydrography to Support Safety to Navigation

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The Canadian Hydrographic Service (CHS) has developed innovative approaches using recent advances in satellite-based earth observation (EO) techniques to support various hydrographic applications. To implement the use of EO data across CHS and to recruit the necessary expertise within the organization, a Remote Sensing Center of Expertise (RSCoE) was established in 2017. The CHS-RSCoE provides various EO services to support the creation of nautical products. The most requested services are coastline extraction, intertidal mapping, satellite-derived bathymetry (SDB), change detection/rate of change analysis, and mission planning support. The CHS-RSCoE analyzes EO data to determine potential risks to navigation for all of its offered services, and to date, several uncharted shoals have been detected and mapped. A hybrid multi-sensor approach that uses both optical and radar was developed and is used for each service to ensure the accuracy of features extracted from EO data. To further increase efficiency, the RSCoE uses different techniques to automate extraction of various EO-derived information. Some of these techniques, such as artificial intelligence (AI) and remote sensing indices, are particularly useful for automatically extracting both shorelines and shoals from the EO data. Polarimetric and Interferometric Synthetic Aperture Radar (InSAR) techniques are valuable for charting intertidal zones. The EO data are geometrically corrected with a physical approach to achieve the highest horizontal accuracy needed to ensure safety to navigation. Developed techniques are adaptable to different water conditions and site characteristics. CHS projects on the Mackenzie and Fraser Rivers have shown that remote sensing is the most cost-effective approach for maintaining and updating nautical charts in dynamic waterways.