# OPERATIONAL WILDFIRE MAPPING WITH SENTINEL2 AND LANDSAT IN BRITISH COLUMBIA

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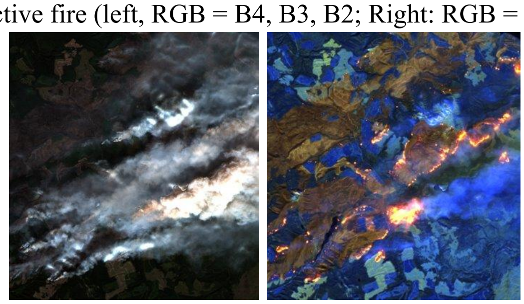
**ABSTRACT**

We outline an operational trial of satellite fire perimeter mapping in the 2022 fire season in British Columbia using ESA Sentinel-2 data, supplemented by NASA Landsat data. Over three hundred “low latency” fire polygon updates were generated by BCWS’s Predictive Services Unit and vetted by BCWS’s Geospatial Services Team, demonstrating: Sentinel-2 for timely (delivery in under twelve hours from capture) fire mapping even of small or unknown fires, and mapping fires under smoke cover. The products’ value was recognized by front-line staff on high-profile incidents in 2022. The increased potential for extreme weather events (White et al, 2023) highlights the need for improved situational awareness offered by increased exploitation of Remote Sensing.

In 2022 the BC Wildfire Service took the opportunity of using Sentinel-2 spaceborne multispectral data from ESA to monitor the progression of remote fires where active suppression was not occurring and to improve situational awareness. Moreover, frequency and fidelity of fire mapping updates were improved, including for fires being actively suppressed. A non-thermal infrared method (Wooster et al, 2021) was used, illustrated here with 20220910 imagery of the Battleship Mountain wildfire (G72150).

1. Prepare Sentinel-2 (bands B12, B11 and B9) or Landsat data (spectrally interpolated to Sentinel-2 bands B12, B11 and B9). Sentinel-2’s three longest wavelengths are selected for cloud-penetration and sensitivity to active fire (left, RGB = B4, B3, B2; Right: RGB = B12, B11, B9):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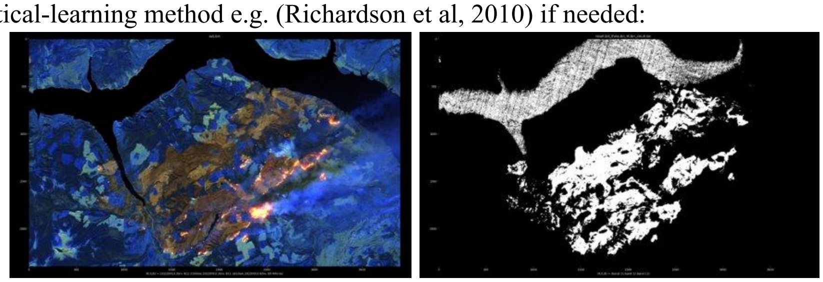
2. Classify fire with a simple rule-based method (B12 > B11 && B12 > B9) or a rudimentary statistical-learning method e.g. (Richardson et al, 2010) if needed: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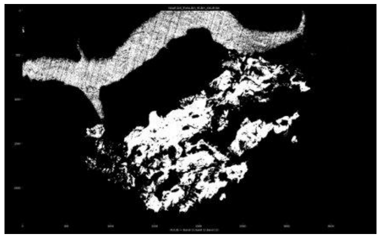
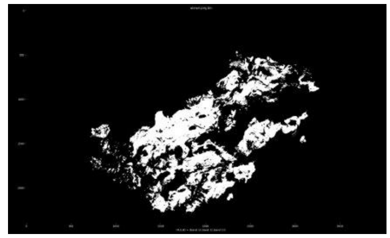
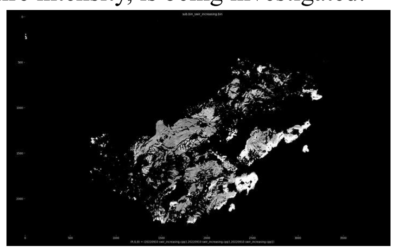
3. Scrub false positives:

 .

4. Convert to Polygon and compare with existing publicly available BCWS perimeter data, in QGIS.
5. Submit polygon in KMZ format for SME review by BCWS's Geospatial Services Team.

Currently a new rule: "(B12 / B9 > 1.1) * B12" reducing false positives due to cloud cover and ice, and scaled by B12 to correspond with fire intensity, is being investigated:

.

Acquisition frequency and data latency were the most significant issues. The authors are grateful for infrastructure support provisioned by NRCan's Emergency Geomatics Service team, which is anticipated to improve this application's latency to less than five hours for use in the 2023 fire season. Continued development of this initiative will contribute towards Knowledge Exchange (KE) and agency readiness for Canada's upcoming WildfireSat mission (McFayden et al 2023).

***Keywords*—** Fire Mapping, Sentinel-2, Landsat, SWIR, Fire intelligence, Situational awareness

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