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Caroline Herschel Framework Partnership Agreement  
for

# Copernicus User Uptake



## Towards an operational wildfire and muirburn monitoring system for Scotland

### Overview

Sentinel-2 satellite data have been used for mapping individual wildfires in Scotland for several years, especially those impacting designated sites, but the extent of muirburn practices has been largely unmonitored. NatureScot and JNCC collaborated on development of a process to semi-automate mapping of wildfires and muirburn activity at national scale.

### Work Involved

Previous studies showed that burn scars can be mapped using indices derived from Sentinel-2. This project aimed to develop an operational burn mapping and monitoring system for Scotland. Three study sites with known burn activity were chosen to identify the most suitable indices and thresholds for burn detection. Analysis-ready Sentinel-2 data was provided by JNCC's [Simple ARD Service](#).

A workflow was then built on the Science and Technology Facilities Council's [JASMIN](#) cloud computing infrastructure, scaled up to cover the whole of Scotland using all available Sentinel-2 data for April 2020. Outputs were evaluated and used to inform recommendations for development into an operational national burn mapping system.

### Key Outcomes and Expected Impact

The initial investigation successfully detected the majority of both wildfire and managed burns at all sites. The national-scale test took less than 4 hours to analyse 130 pairs of Sentinel-2 images for April 2020. It identified several burns, including some that were previously unknown. NatureScot are now established users on JASMIN, and the development of a workflow to process data now means muirburn activity can be monitored and any changes to the workflow can be successfully integrated. The scripts for the burn mapping workflow are publicly available on [GitHub](#).

### Policy relevance

This work is driven by a requirement to understand the impact of all burning on carbon emissions, biodiversity and natural capital accounting. This information would help NatureScot:

- Understand the scale, distribution, timing and frequency of muirburn
- Report on the damage caused by wildfires to habitats and wildlife
- Promote good land management practices and behaviours to reduce the likelihood or impact of wildfires in future.

### Future work

Recommendations were made to address over- and under-prediction of burnt areas, e.g. masking agricultural fields and intertidal areas to increase the accuracy of outputs. These enhancements should lead to a system which could be implemented operationally. A global threshold approach will never be perfect and will always produce false positives and false negatives. However, by enabling rapid, cost-effective, automated analysis of Sentinel-2 imagery, this system will improve knowledge of the extent, location and dates of burning across Scotland.

**Country:** United Kingdom  
**Main driver:** Monitoring extent of upland burning for insight into carbon emissions, biodiversity and natural capital accounting.

#### Contact point:

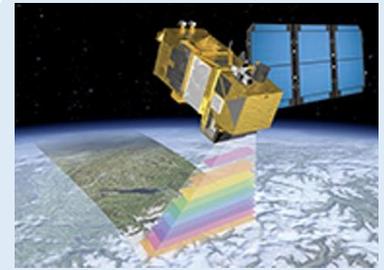
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#### Partnerships:

**NatureScot**

#### Further information:

<https://jncc.gov.uk/our-work/copernicus-project/>



Sentinel-2 © Airbus



Muirburn © Nature Scot



Burns automatically detected between 20 and 25 April 2020 at Loch Morar (outputs highlighted in red). False colour Sentinel-2 image in which burns are dark brown (© Sentinel Hub)