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OZFUEL-1: TOWARDS AND IMAGING SPECTROMETER TO MONITOR FOREST FUEL FLAMMABILITY FROM SPACE

Abstract

The catastrophic 2019-2020 fires in Australia resulted in the death of 33 people, burned more than five million hectares of eucalypt forests, and had a major impact on biodiversity, including threatened species. Recent national and international reports have recommended better monitoring of forest fuels and their flammability as a way of reducing fire risk. Forests are dynamic ecosystems; therefore, it is critical to understand how forest flammability changes over space and time. Changes in water, oils, cellulose and the physical attributes of leaves can make vegetation more flammable leading to longer and more intense fires. As a response to this challenge, we present OzFuel, an initiative by the Australian National University (ANU) aimed at developing, deploying, and operating a constellation of spaceborne hyperspectral sensors to monitor forest flammability from space.

OzFuel-1, is a technology demonstrator sensor currently being designed and built at the ANU. With a sun-synchronous low Earth orbit, OzFuel will acquire images, primarily over the Australian Capital Territory, with targeted acquisitions over Europe and the Americas. Whenever possible image acquisition will coincide with Landsat, Sentinel-2 and other reference missions for data comparison and analysis.

The OzFuel-1 sensor has a multispectral imager based on the Leonardo SAPHIRA electron avalanche photodiode detectors. The sensor is a pushbroom shortwave infrared multispectral imager featuring a Mercury Cadmium Telluride (MCT) detector with four narrow (20 nm) spectral bands between 1,200 – 2,500 nm; these bands are specifically located to detect changes in the water and dry matter content of vegetation; these traits were selected as they are the main drivers of forest flammability. The SAPHIRA detector , coupled with the Rosella electronics control system, enable the acquisition of imagery at high frame rates with almost noise-free performance. A dedicated cryogenic cooler for the detector is being developed and tested by the University of Melbourne to ensure the optimal operating temperatures for the MCT.

The OzFuel program will enhance Australia's capabilities for disaster prevention, preparedness, response, recovery, and resilience; it will also advance Australia's capabilities in the space and geospatial sectors through innovative research, manufacture, and testing activities.