



OzFuel Multispectral Instrument to Monitor Fuel Flammability from Space

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Introduction

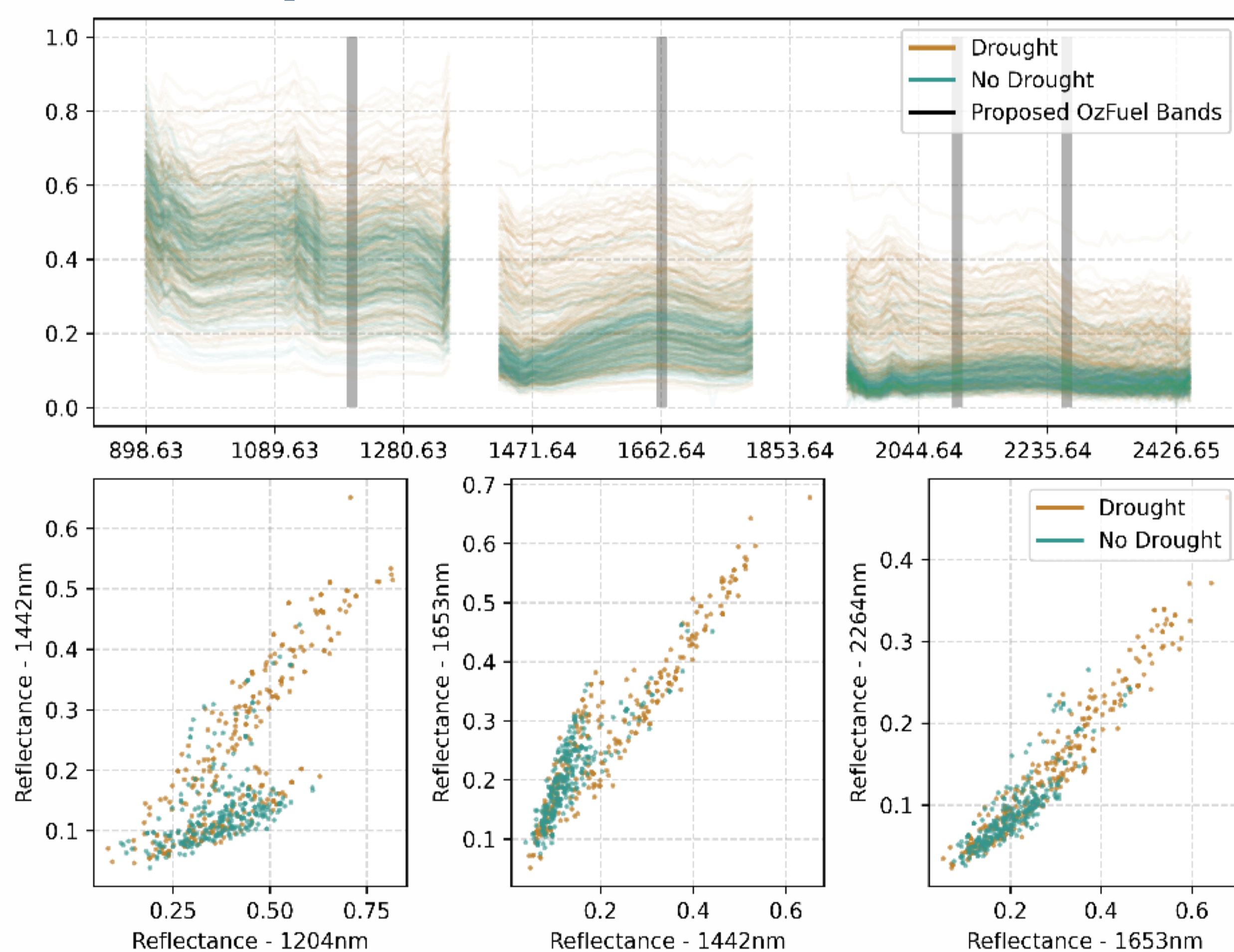
The OzFuel instrument is the first step in the creation of an early warning Earth Observation system to assist fire management authorities, emergency services and communities in enhancing bushfire situational awareness and preparedness.

The OzFuel payload consists of a multi-spectral instrument designed to operate at four targeted Short Wave Infrared (SWIR) bands, each sensitive to variations in critical fuel properties that influence the flammability of the Australian landscape.

Aims

- Address the need for more efficient national monitoring of fuel conditions and bushfire prevention.
- Provide essential data directly to ground-based resources as a proactive measure aimed at mitigating the risk of uncontrolled bushfires.
- Promote the expansion of the local space industry while showcasing Australia's capacity to develop and manage a satellite mission.
- Enable Australian contribution to the Global observing system.

Mission Specifications



Spectral reflectance along with OzFuel bands (top panel) and spectral separability (bottom panel) of drought-affected and control eucalypt trees [2]

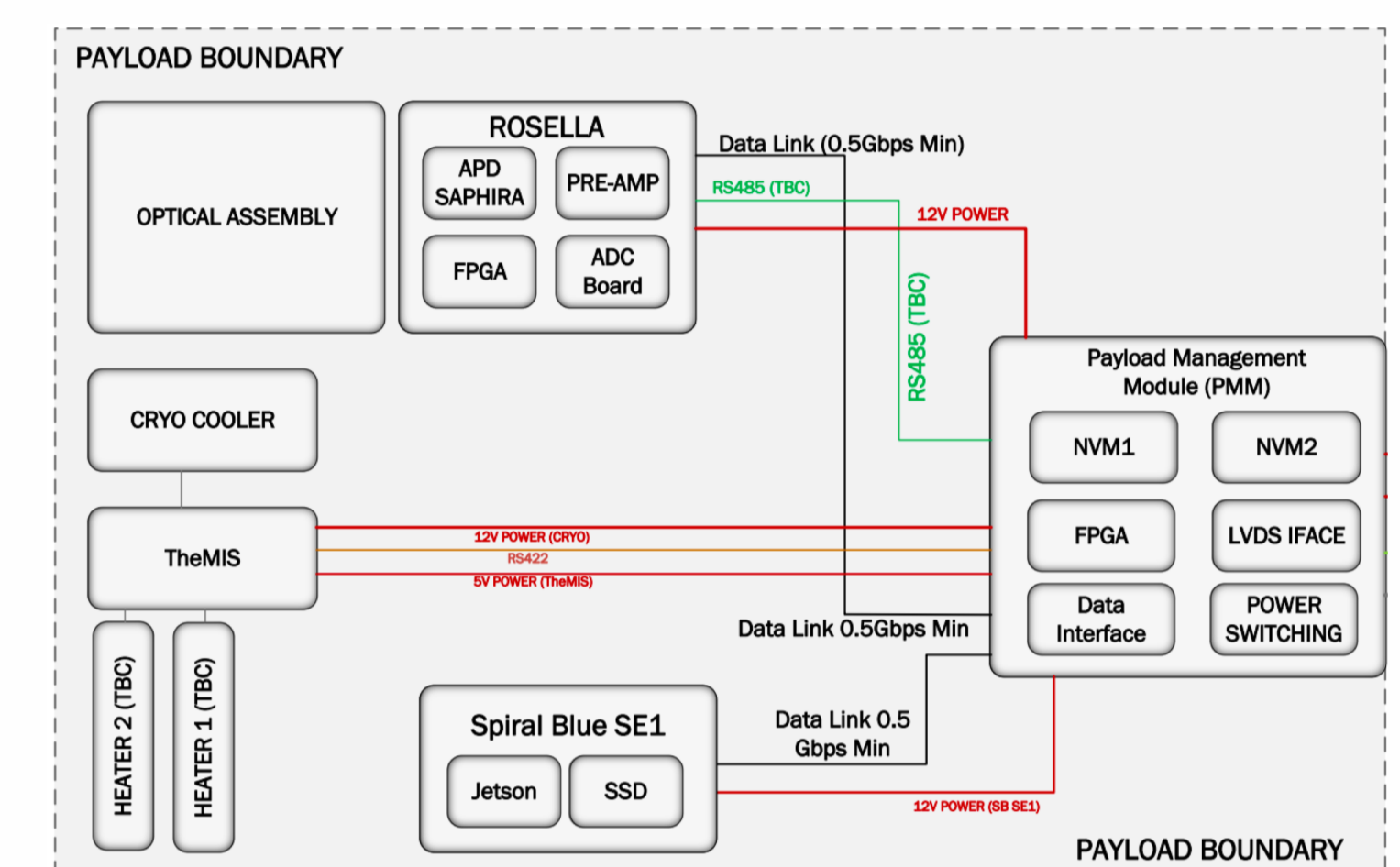
Characteristics	Specifications
Revisit time:	6 days
Ground sampling distance:	50 m
Swath width	At least 16 km
Albedo	10-20% for eucalypt forests
Spectral bands (μm)	1.200, 1.442, 1.653, 2.260
Number of Spectral bands:	4 bands
Radiometric resolution:	16 bit
Signal-to-Noise ratio:	100:1 or better

Summary of user requirements for the OzFuel instrument

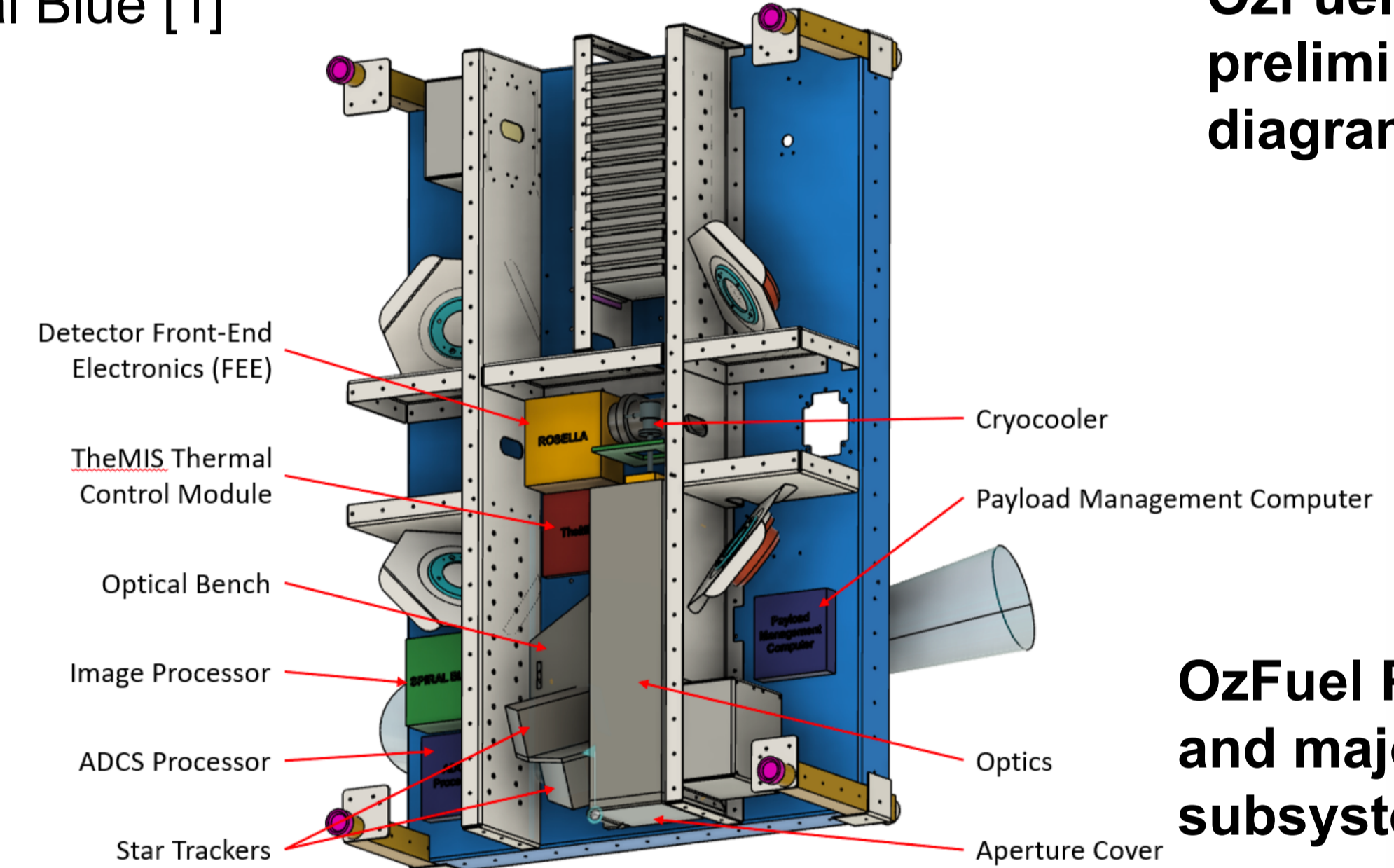
OzFuel Payload Overview

The OzFuel instrument is based on:

- Custom optical system
- SAPHIRA detector and Rosella Control Electronics [3]
- The TheMIS active thermal management system by the University of Melbourne [1]
- A payload management module for data & power interface
- An image data processor developed by Spiral Blue [1]



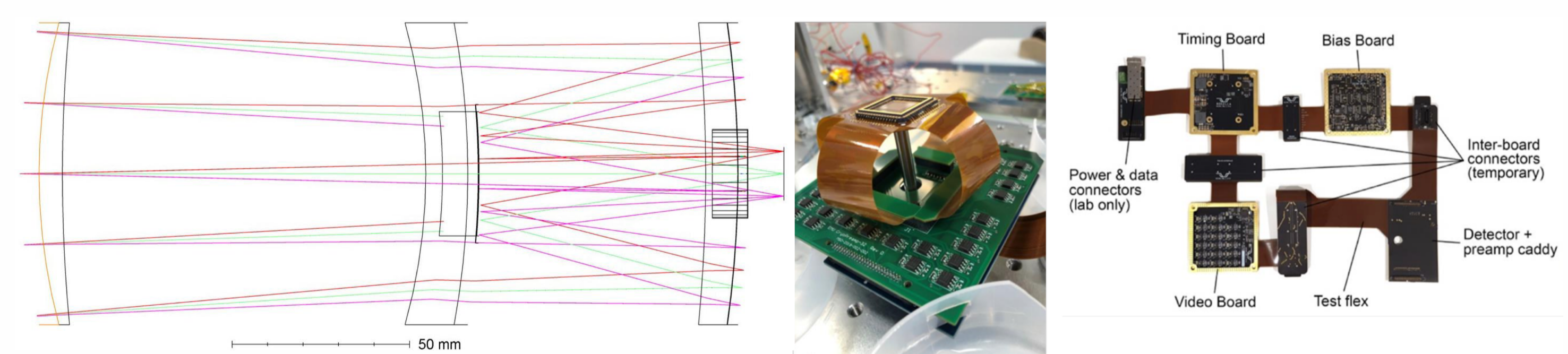
OzFuel Payload preliminary block diagram [1]



OzFuel Payload and major subsystems [1]

Optics & Focal Plane

The preliminary optical design is based on the assumed 3U payload volume, with an 85 mm aperture. OzFuel focal plane comprised of the Leonardo SAPHIRA detector and the Rosella front-end electronics, currently at TRL 4-5 [4]. Rosella is a modular and compact detector controller for space applications under development by ANU.



Left: Baseline design of the OzFuel optical unit. Right: SAPHIRA with flex cable and Rosella 'FlatSat' engineering model [4]

References

- [1] OzFuel Phase A Study Space-based Australian Forest Fuel Flammability Monitoring, UNSW Canberra Space, November 2022. Available at https://www.unsw.adfa.edu.au/sites/default/files/documents/990391422 - OzFuel Report Publication_FA_0.pdf
- [2] Younes, N, Yebra, M. 2023. Pre-launch OzFuel CAL/VAL report, ANU DOI:10.25911/3JN5-MG88
- [3] Mathew, Gilbert, Sharp, et al., 2022, arXiv: <https://arxiv.org/abs/2210.04770>
- [4] Mathew, J., Gilbert J., Sharp R., et al., 8(2), 024002, JATIS, 2022 <https://doi.org/10.1117/1.JATIS.8.2.024002>