

DETECTING FIRE FROM THE AIR AND FROM SPACE

The CSIR has developed an optical imaging sensor for the detection of wildland vegetation fires through imaging of the alkali metal Potassium from burning biomass.

How it works

The sensor consists of a combination of two cameras with a common 10° field of view, placed side by side. One sensor is furnished with an ultra-narrow bandpass filter optimised for the detection of the Potassium emission lines. The second sensor is furnished with a bandpass filter that is close to but excludes the target band; this is called the “reference channel”. The K-line and reference channels are temporally synchronised at the electronic level, so that pairs of images are obtained simultaneously. Fires are detected by comparing the K-line channel image to the reference channel image. Pixels that are much brighter in the K-line channel relative to the reference channel are candidate fire detections.

The sensor performs imaging of the Potassium emissions which is then live streamed to a ground station. It also provides the fire’s geolocation information. It features advanced image processing software to ensure high performance, precise fire detection and effective clutter rejection on the resulting output images.

The payload system is used to monitor small-scale fires at an early stage and track their spread, enabling fire crews to be allocated promptly.

The sensor can also be used to detect gunshot signatures and the origin of the shooting since Potassium is added to the propellant as an oxidising agent and to suppress gun muzzle flash.

The K-line camera was designed by the CSIR to detect forest fires from space. It operates by detecting traces of potassium (the element K on the periodic table of elements) emitted and radiated from burning vegetation.



The K-line sensor payload can be integrated on drones and satellites. It weighs 1.4 kg, including batteries and antennas.



The first K-line sensor was launched in 2018 as a secondary payload onboard the ZA-Cube2 satellite. It orbited the Earth at an altitude of approximately 600 km, with a ground sample distance (GSD) at Nadir of 63 m. It was decommissioned in February 2023.

Contact: Simphiwe Mkwelo | **E:** Smkwelo@csir.co.za | **www.csir.co.za**



science, technology
& innovation

Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA



CSIR
Touching lives through innovation