All-Sky Infrared Cloud Imager

Product Data Sheet





Left: All-Sky Infrared Cloud Imager (ICI) Right: 180° FOV residual radiance imagery of thin high-altitude clouds. The sun and nearby trees can be seen as well.

Overview

The All-Sky Infrared Cloud Imager (ICI) autonomously detects and characterizes clouds over the full sky using a calibrated long-wave infrared (LWIR) thermal imaging camera providing real-time cloud data products. The ICI produces consistent cloud products day and night unlike visible band systems. The calibrated camera and proprietary data processing can detect thin clouds and in some cases cloud precursors, moist air masses.

The user-friendly system consists of an environmentally stabilized Camera Enclosure which is mounted outdoors and connected to a Power Enclosure mounted in a climate-controlled environment. An automated hatch system provides protection for the imager's lens during rain, snow, and high winds. An integrated weather station connects to the Camera Enclosure and collects atmospheric wind velocity, temperature, humidity, and pressure data. In addition, the system provides real-time atmospheric precipitable water vapor (PWV) observations that are derived by an integrated Global Navigation Satellite System (GNSS) receiver.

Applications

- Atmospheric radiance measurement
- Mesoscale cloud feature detection
- Free-space optical communication support
- Astronomical observatories
- Aircraft situational awareness
- Metrology (scientific and operational)
- Solar radiation predictions

Features

640 x 480 thermal camera with 180° field of view24/7/365 cloud monitoring using thermal imaging

Atmospheric precipitable water vapor (PWV)

Weather station (PTH, wind speed/direction)

Hatch system to protect against extreme weather

Field of view: 180°
Hard-carbon diamond-like coated germanium front optics
Resolution: 640 x 480
Optical bandwidth: 7.3-14 µm
80 mW/m ² ·Sr
± 1 W/m ² ·Sr
Optical depth: 0.115 (0.5 dB attenuation)
15 - 120 seconds (configurable)
HTTP web page
SSH command line interface
SFTP (SSH File Transfer Protocol)
Python 3 API
NetCDF files include raw imagery, calibrated sky radiance, residual
radiance, cloud mask, and select telemetry
Real-time telemetry accessible via Python API
Ethernet or fiber (850 nm LC multi-mode) options available
Fiber optic data, thermoelectric control, and low voltage DC power
120 VAC, 50-60 Hz, 3 A (maximum)
Automated: closes during precipitation and high wind events
Manual: closes via hardware switch or software control
-40 to 50 °C (-40 to 122 °F)
0 - 100% relative humidity
Weather tight for all outdoor environments
0 to 35 °C (32 to 122 °F)
20 - 80% relative humidity (non-condensing)
-20 to 60 °C (-4 to 140 °F)
10 - 90% relative humidity (non-condensing)
Camera Enclosure: 16 kg (35 lb)
Power Enclosure: 11 kg (25 lb)
Inter-Enclosure Cables: 5 kg (11 lb) Compare Enclosure (open batch): $41 \times 65 \times 20$ cm (16 x 25 5 x 15 5 in)
Camera Enclosure (open natch): $41 \times 25 \times 39$ cm (16 × 14 × 8 E in)
Power Enclosure. $41 \times 50 \times 22 \operatorname{Cirl}(10 \times 14 \times 6.5 \operatorname{III.})$
Inter-Enclosure Cable Length. IS III (SUIL)
Rain detector
Weather sensor
GNSS antenna and receiver for real-time precipitable water retrieval



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Software

HTTP web page (shown below and to the right) is hosted on the device and contains telemetry for monitoring and debugging. The web page has live cloud imagery from raw data to Residual radiance to cloud probabilities as well as near term predicted cloud patters, system status, environmental (weather and PWV) and diagnostic data.

The insturment is accessible from any network connected platform via SSH and SFTP interfaces. This can be used for data transfer, telemetery, configuration, software updates, etc.

A Python 3 API is available for integration into existing code and can deliver real-time telemetery, access data, configure the instrument, and more.

Configuration

The camera enclosure and power enclosure are connected by three inter-enclosure cables carrying DC power, TEC power, and data over fiber (diagrammed below). The power enclosure can be located up to 50' (15.2 m) from the camera enclosure. The power enclosure connects to a standard AC outlet and to the user's network via either Ethernet or Fiber.





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