

All-Sky Camera Upward-Looking Thermal Infrared Cloud Characteristics

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Investigating Low-Cloud Lifecycle

Advantages of Ground-Based IR

- Sees clouds bases
- Not obscured by higher clouds
- More sensitive to optically thin cloud
- Can differentiate cloud base heights
- Consistent performance across night and day
- Spatial resolution of cloud base temperature as low as 10s of meters

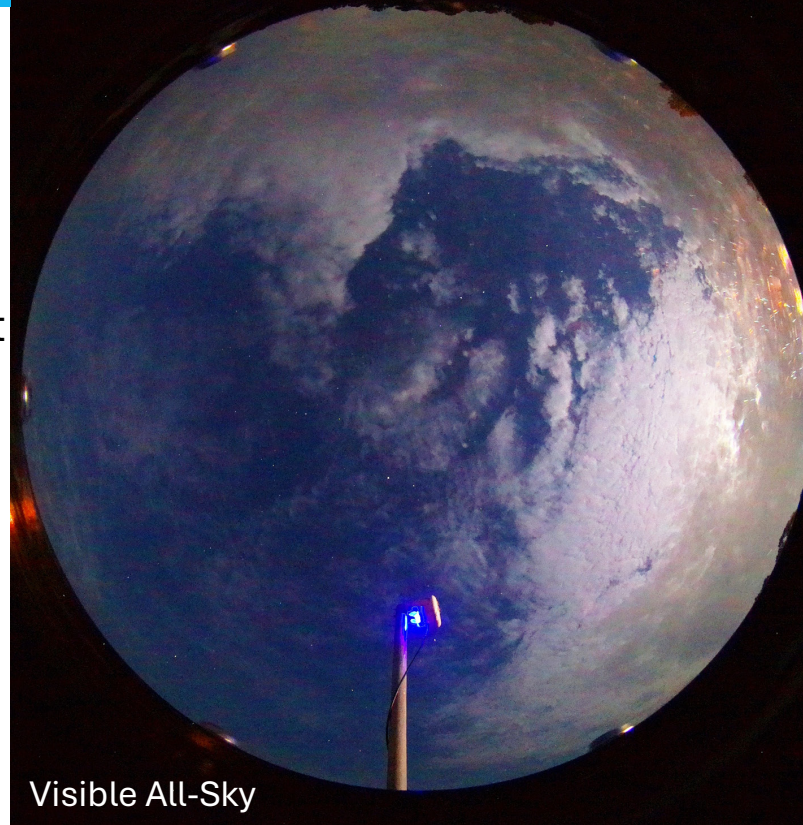
From IR We Can Infer

- Cloud fraction
- Cloud coverage characteristics relating to the size and shapes
- Altitude of cloud bases across the diurnal cycle

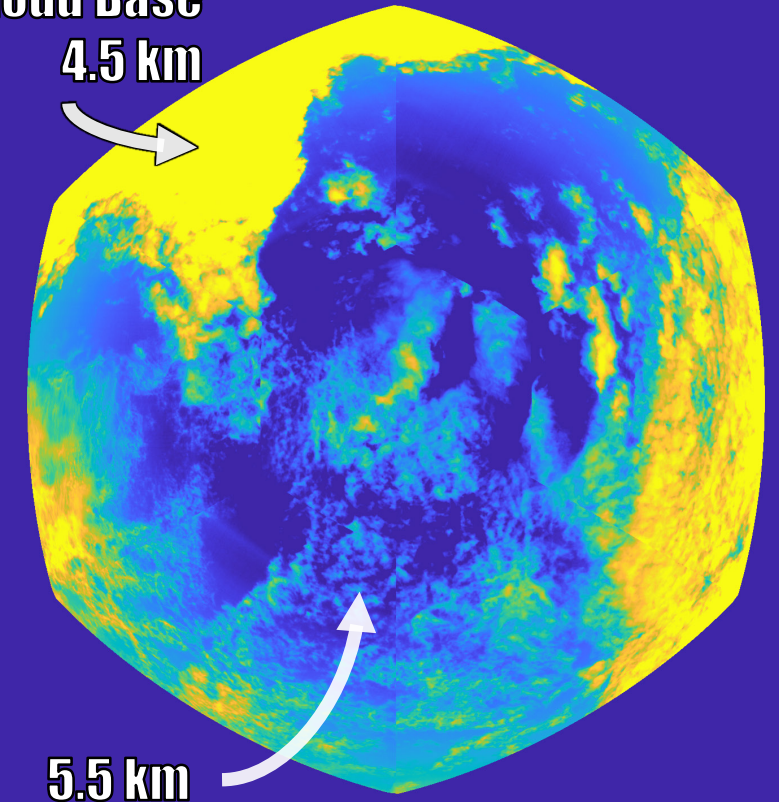
Sequences of Images Reveal

- Evolution of individual cloud elements
- Information on the phase space of cloud properties across the diurnal cycle and related to air mass changes, such as the passage of fronts

2026-04-25 00:54:33 Local Time



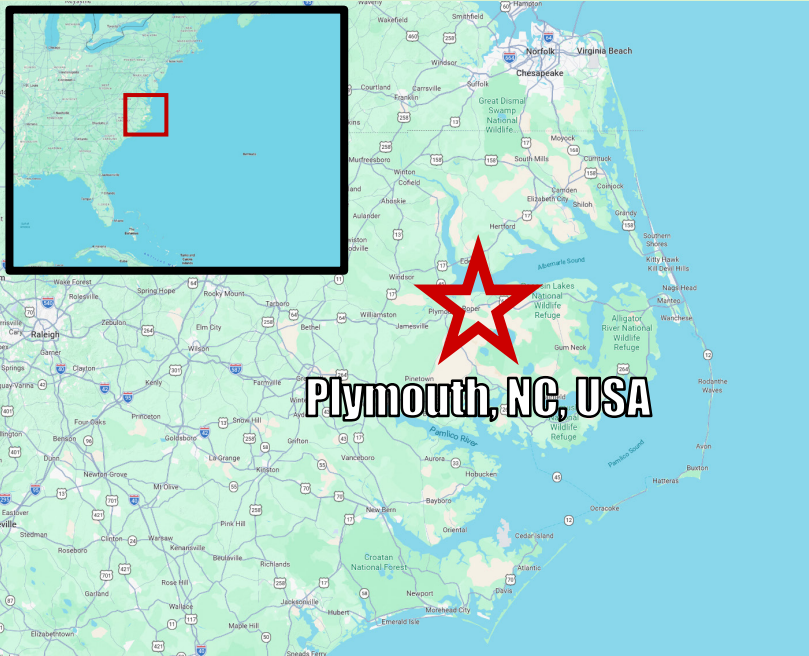
Cloud Base
4.5 km



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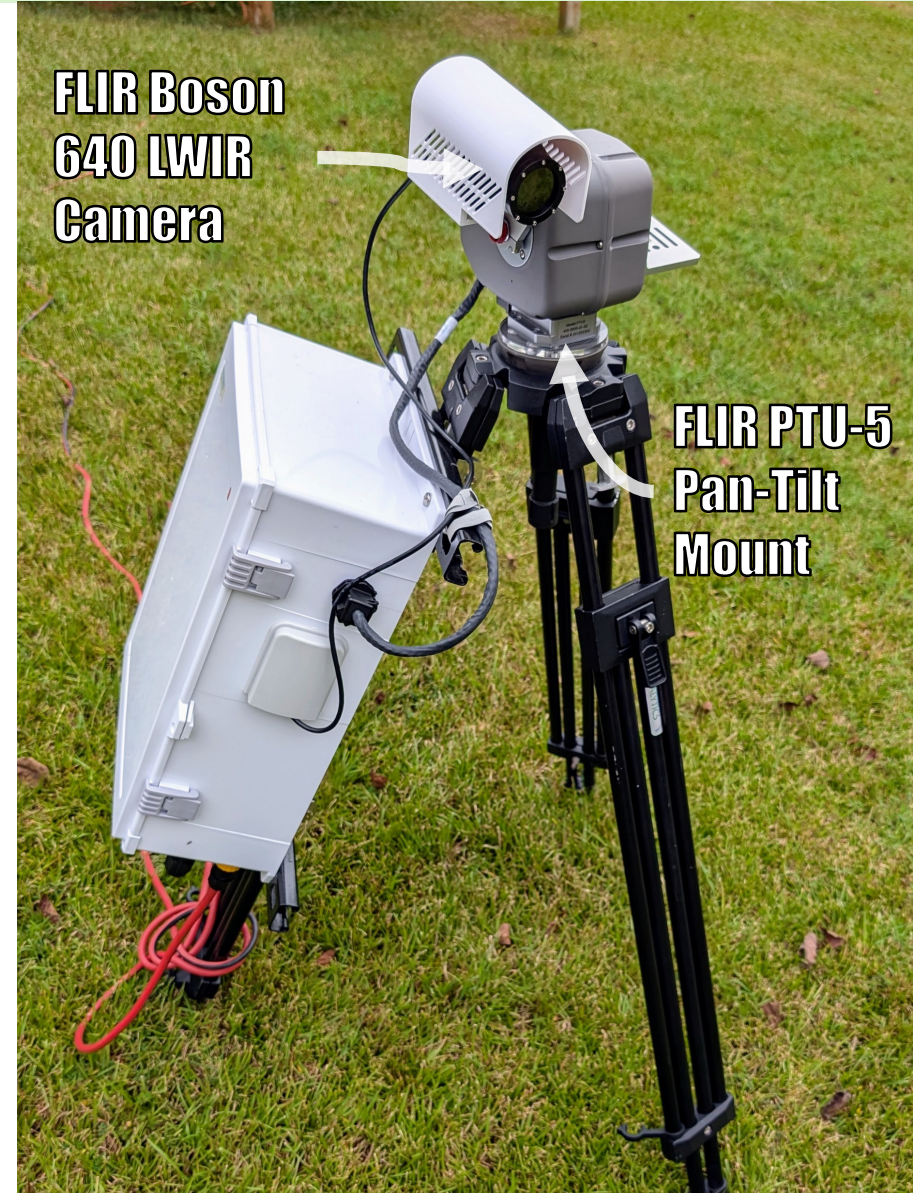
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Cameras are located at the Eastern Carolina Atmospheric Observing Site (ECAOS) with other instruments:

- Vaisala CL61 ceilometer
- 3 Lufft CHM 15k ceilometers
- Metek Micro Rain Radar
- OTT Parsivel laser disdrometer
- Campbell Scientific SunScout surface weather and solar radiation measurement station
- PurpleAir Zen laser particle counter

**FLIR Boson
640 LWIR
Camera**



**FLIR PTU-5
Pan-Tilt
Mount**

Thermal IR Camera

- Constructed using commercial off-the-shelf parts
- Images the entire sky by pointing the camera in multiple directions and stitching the images together
- Scan strategy uses 7 images to capture the sky from zenith down to 35° elevation, executed every 30 seconds
- All sub-images are captured within 16 seconds with roughly 2-3 seconds between successive images

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