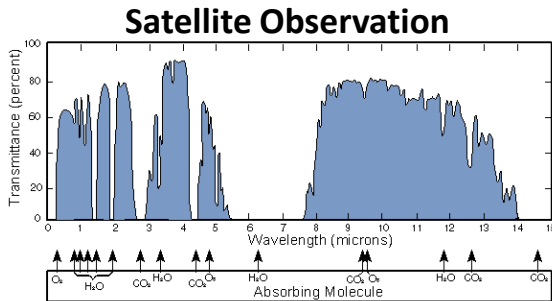
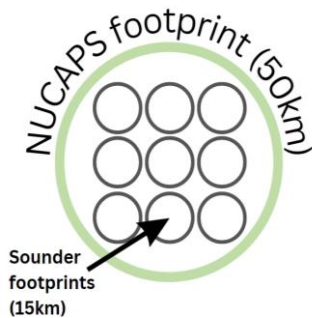


# Quick Guide



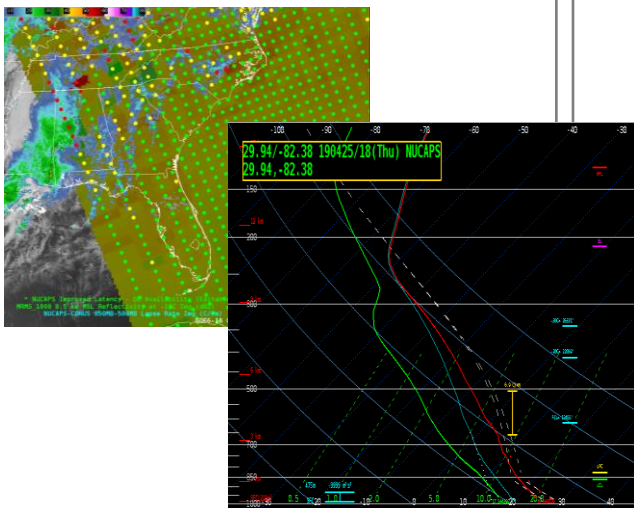
NUCAPS uses hyperspectral sounders to estimate temperature, moisture, and trace gases from space. GOES-R series satellites have 16 bands, while sounders can have 1000s across IR and MW bands.

### Collocated IR and MW retrievals

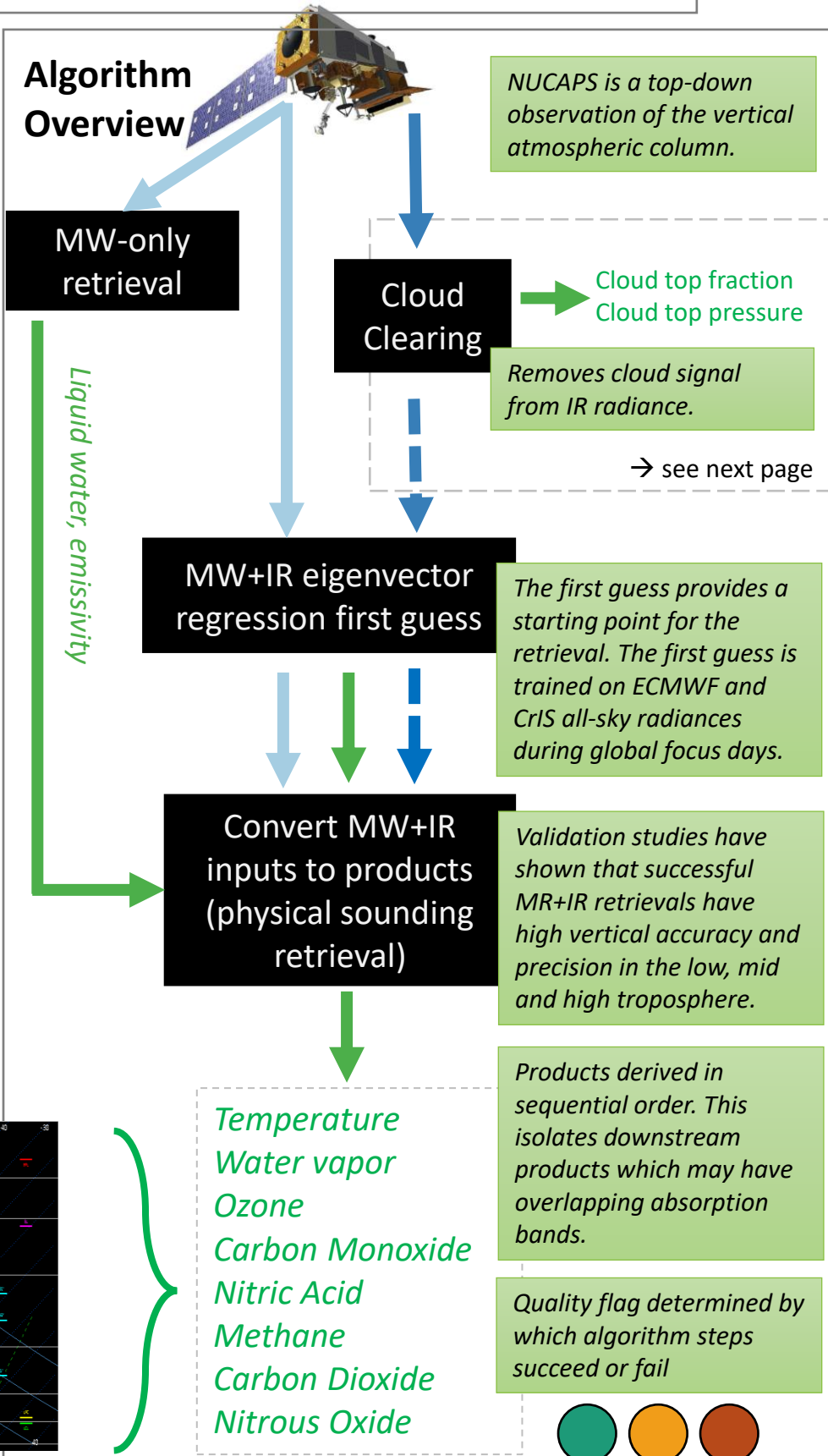


Each NUCAPS sounding is derived from collocated IR and MW sounder footprints (nadir shown).

### Satellite-based sounding



## Algorithm Overview



NUCAPS is a top-down observation of the vertical atmospheric column.

Cloud top fraction  
Cloud top pressure

The first guess provides a starting point for the retrieval. The first guess is trained on ECMWF and CrIS all-sky radiances during global focus days.

Validation studies have shown that successful MR+IR retrievals have high vertical accuracy and precision in the low, mid and high troposphere.

Products derived in sequential order. This isolates downstream products which may have overlapping absorption bands.

Quality flag determined by which algorithm steps succeed or fail



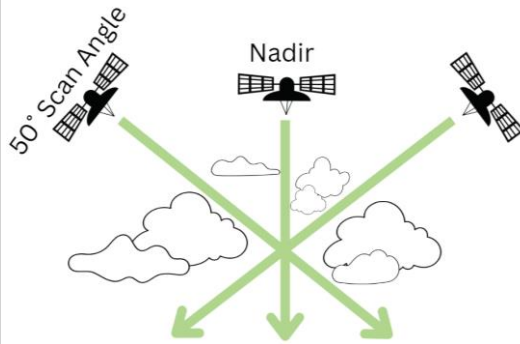
# Quick Guide



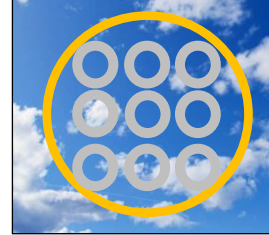
## Cloud Clearing

- Only 5% of NUCAPS footprints are 100% cloud free.
- **Cloud clearing** enables retrievals in partly-cloudy scenes.
- NUCAPS can make retrievals in up to 80% cloud coverage.

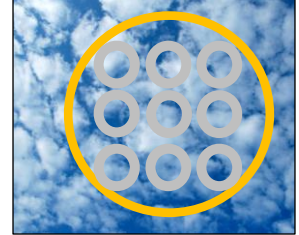
NUCAPS retrieves cloud-free thermodynamic environment around/past clouds (not through the clouds).



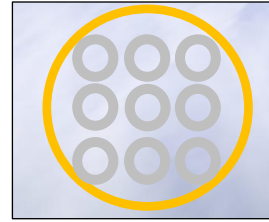
Yes



Yes



No

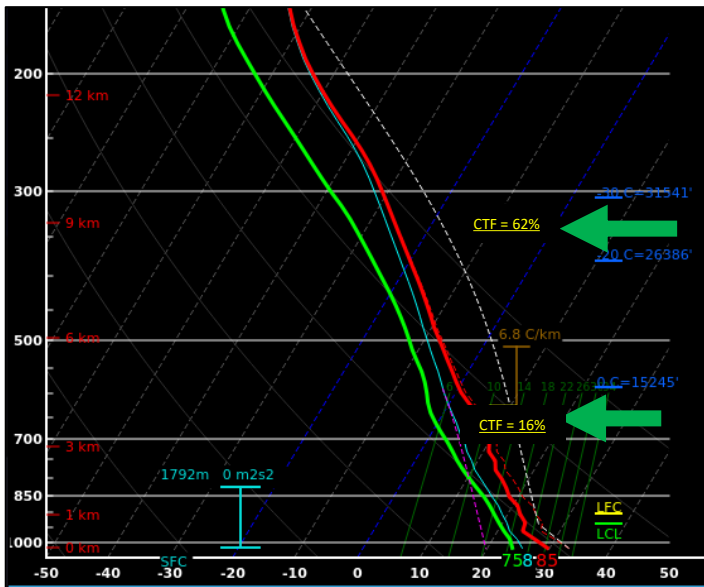


No

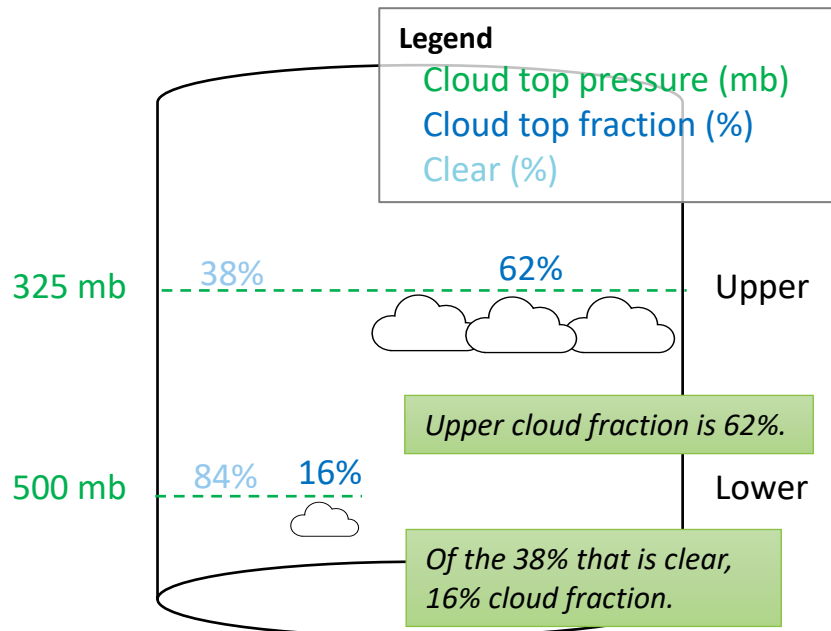
Cloud clearing is successful when there is high cloud contrast. Cloud clearing fails when clouds are uniform.

## Cloud Top Fraction Cloud Top Pressure

- NUCAPS produces a **cloud top pressure** and **fraction** retrieval for two cloud layers (green arrows on a, upper and lower on b).
- High cloud top fractions may produce unreliable temperature and water vapor calculations below cloud tops.



a. NUCAPS in NSHARP display



b. Interpretation of cloud products