

# Vaisala Laser Ceilometer CT12K **Cloud Fraction Retrieval Analyses**



**Cloud Amount Table** 

(Percent of Sky)

> 0 to  $\leq 2/8$ 

8/8

> 2/8 to  $\le 4/8$ 

> 4/8 to < 8/8

CLR

FEW

SCT

BKN

OVC

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#### Introduction



A set of two CT12K Vaisala Laser Ceilometers were configured and tested during an undergraduate research experience in Summer 2012. After adapting wireless communications, a ceilometer was mounted on the Oceanography and Meteorology (O&M) Building at Texas A&M University. The CT12K measures cloud base heights up to 12,650 feet for up to two cloud layers and provides a raw backscatter profile. However, the ceilometer does not directly supply cloud fraction, presenting the challenge of developing our own cloud fraction approaches. Atmospheric Infrared Sounder (AIRS) cloud fraction retrievals and a nearby CL31 Vaisala Ceilometer operated by the National Weather Service (NWS) are used for comparison and method development.

#### **Results and Conclusions**

During the summer research experience, two intensive operational periods were conducted: June 20<sup>th</sup> and June 27<sup>th</sup>, 2012. Comparisons of cloud base heights of the CT12K and the CL31 at Easterwood Field Airport (KCLL) in College Station, TX were made to determine the accuracy and precision of our cloud fraction algorithm. Differing instrument location, cloud fraction algorithm, and the ceilometer model appear to be responsible for discrepancies in the comparison. Further analyses and development of the cloud fraction retrieval algorithms are needed to increase the accuracy of sky cover.

20–June–2012 Cloud Base Heights at O&M

27–June–2012 Cloud Base Heights at O&M

#### Methodology

Three different methods were used to calculate cloud fraction. Manual observations were also made.

- . Ratio of cloud base observations to total number of observations in 1 hour.
- 2. Ratio of the number of 15-minute samples when clouds were detected to the total number of 15-minute sample in 1 hour.
- 3. Weighted average of the most recent 30 minutes, where the last 10 minutes of data are processed twice.





### Future Work and Applications

- Stream the CT12K data on the web for public and departmental use
- Compare CT12K and CL31 cloud base heights
- Test different cloud fraction algorithms to increase precision
- Test how the thickness of the first cloud layer affects the measurements of the second cloud layer
- Obtain separate cloud fraction

The CT12K Vaisala Laser Ceilometer has several applications. The CT12K will serve as an educational tool and provide local instantaneous data to the public. A CT12K will be used by students and professors during a Research Experience for Undergraduates (REU) program in the Costa Rican cloud forest.

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