In Situ Measurements of Ice Water Content in Thin Cirrus

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Importance of Thin Cirrus

- Pervasive nature of subvisual cirrus in tropics
- Even very thin cirrus are radiatively important
- Contrails are becoming more significant contributors to cloud cover
Strategy to Measure IWC of Thin Cirrus

- Need to be able to measure ice water content < 1 mg m\(^{-3}\)
- Make use of inertial enhancement of anisokinetic inlet
- TDL spectroscopy for fast response
Closed-path Laser Hygrometer

- WB-57 Nosecone
- ALIAS Instrument
- WB-57 RACK
- CLH Instrument
- CLH Pitot Tube/Mount
Inertial Enhancement

For DC-8

SOLVE

EF estimated from:
Inlet temperature
Static pressure
True Air Speed
CLH flow rate

⇒ Maximum EF
Example of Raw Data
Example of Raw Data

![Graph showing water levels over time with CLH Detection Limit and +/- 3 ppm markers.](image-url)
MISR overpass - 20020709
MISR overpass - 20020709

![Graph showing water content over time with two trend lines labeled CLH + 5 and JLH. The y-axis represents water content in parts per million (ppm), and the x-axis represents time in UT seconds. The graph shows a peak around 60100 UT sec with oscillations. The S/N ratio is approximately 50:1.](#)
MISR overpass - 20020711
MISR overpass - 20020711
A final example
Vertical Profile of IWC
What’s next?

• Additional laboratory calibrations (w/NCAR)

• Need fluid dynamical calculations to improve estimation of EF

• Analysis of differences among IWC values from various techniques (HALLAR poster)