

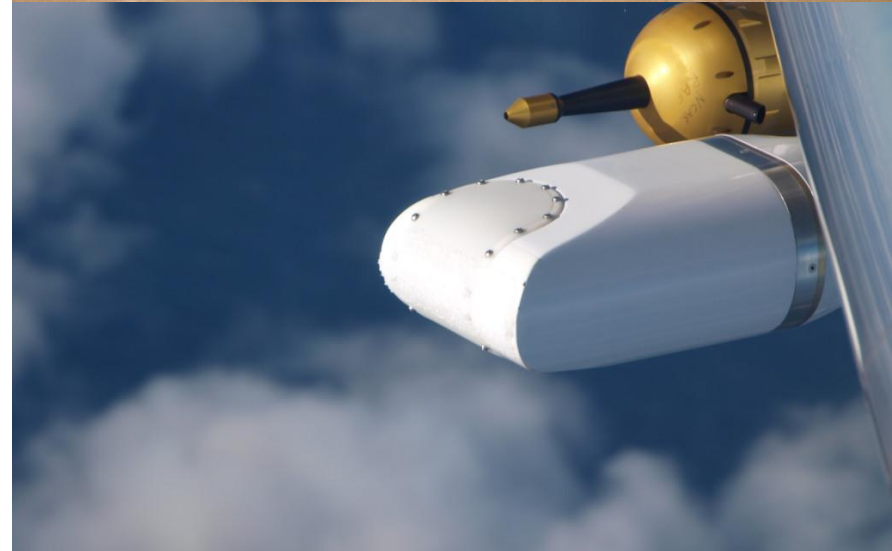
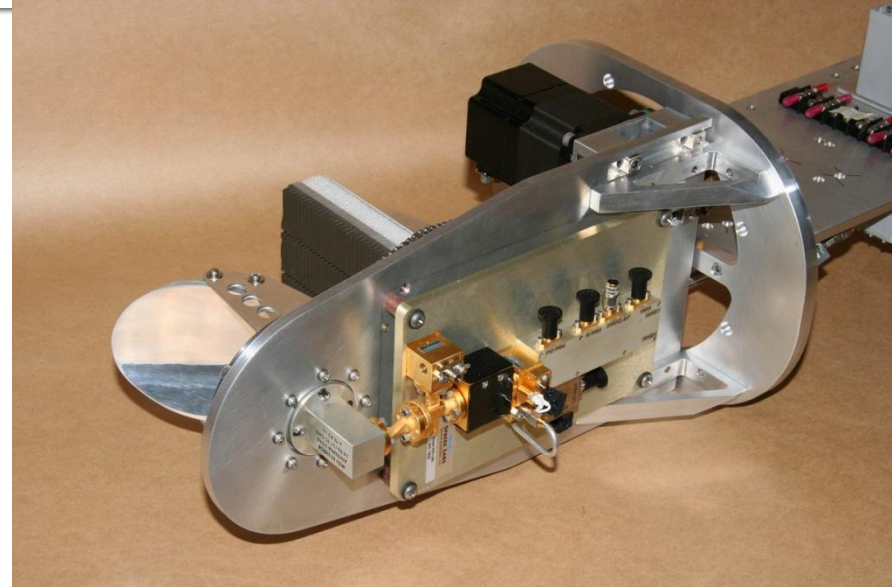
**Measurements of  
Vertical Temperature Profile  
and  
Sea Surface Temperature  
during TORERO**

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NCAR**

TORERO Workshop, 31 Oct – 1 Nov, 2011, Boulder, Colorado

# Microwave Temperature Profiler

- Microwave radiometer measures emission from oxygen at 3 frequencies
- Scans above/below aircraft
- Statistical retrieval method converts measured brightness temperatures to physical temperature profile
- Provides context for other atmospheric measurements



# Microwave Temperature Profiler

## History

- Designed and built at JPL
- Delivered to NCAR in 2008
- Deployed on multiple GV projects since delivery
- Excellent performance during recent projects (HIPPO)

## Operations

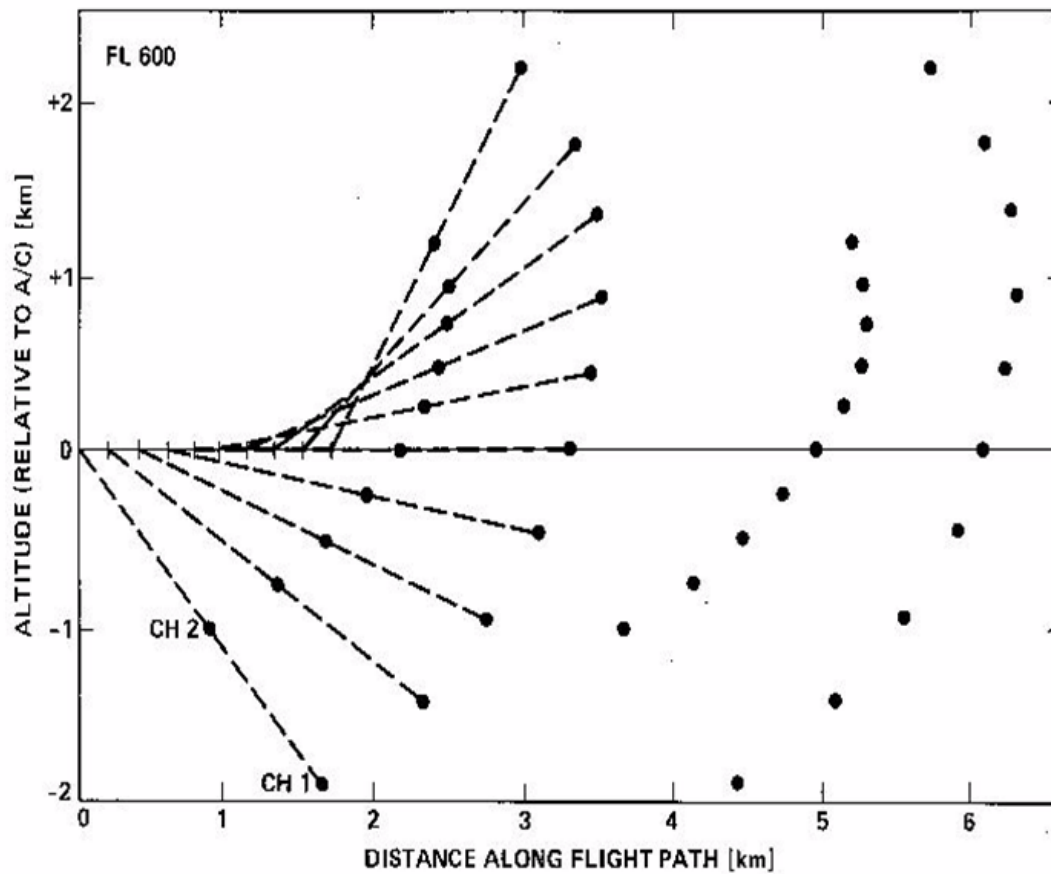
- Requires low-level attention from operator in flight
- Data monitored from ground
- Best data obtained during level flight
- Real-time display of preliminary profiles

# MTP: Specifications

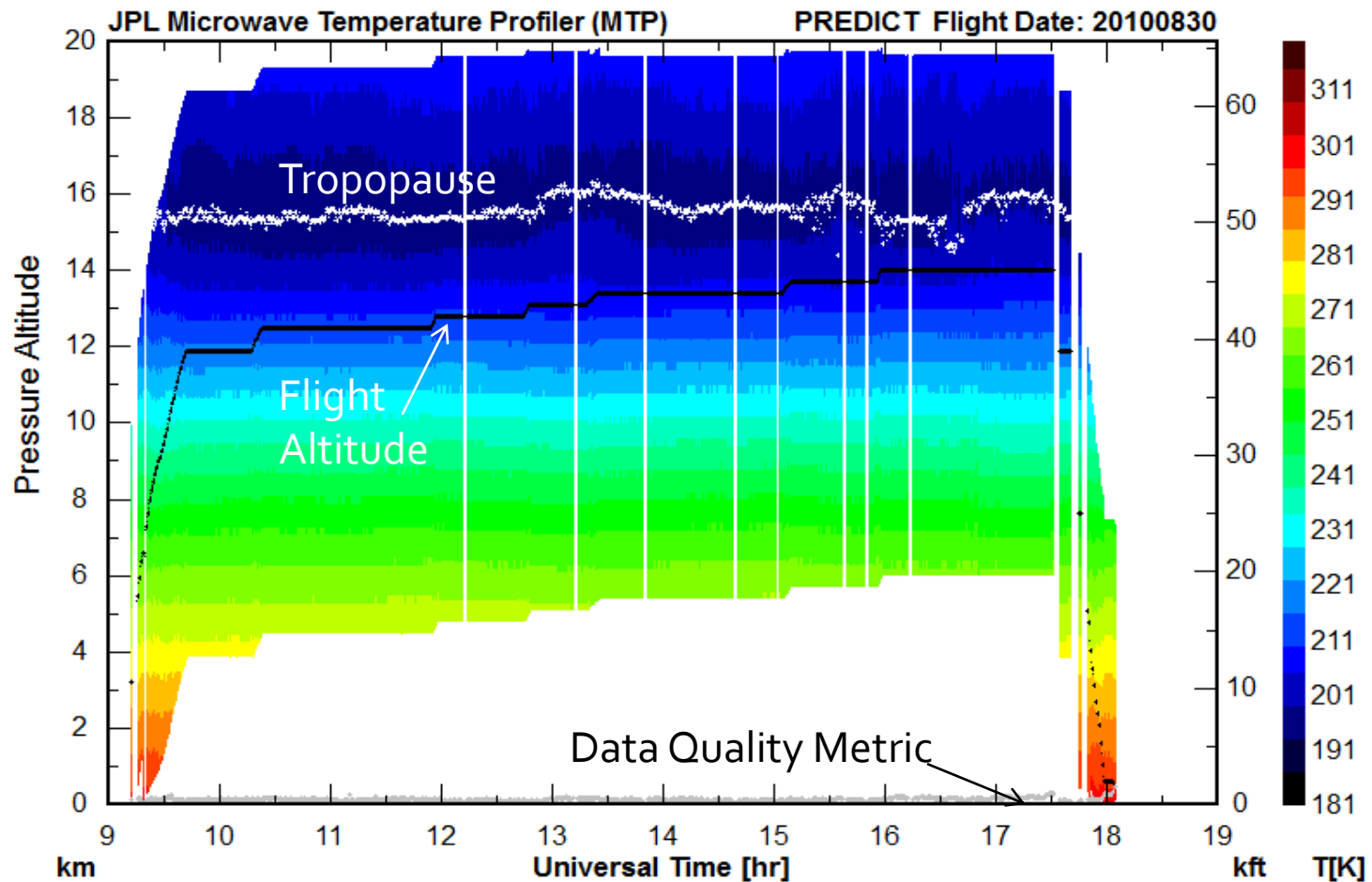
- Measures oxygen emission at 56.363, 57.612, 58.363 GHz; measurement centered on absorption line
- Scans between  $\pm 80^\circ$  from horizontal
- Internal calibration system uses heated blackbody target and in situ ambient temperature measurement
- Vertical resolution near aircraft  $\sim 150$  m
- Profile available every 17 seconds
- Best accuracy within  $\pm 6$  km of flight level
- Uncertainty range 0.5 – 1.2 K

# Spatial Scale

OBSERVATION GEOMETRY



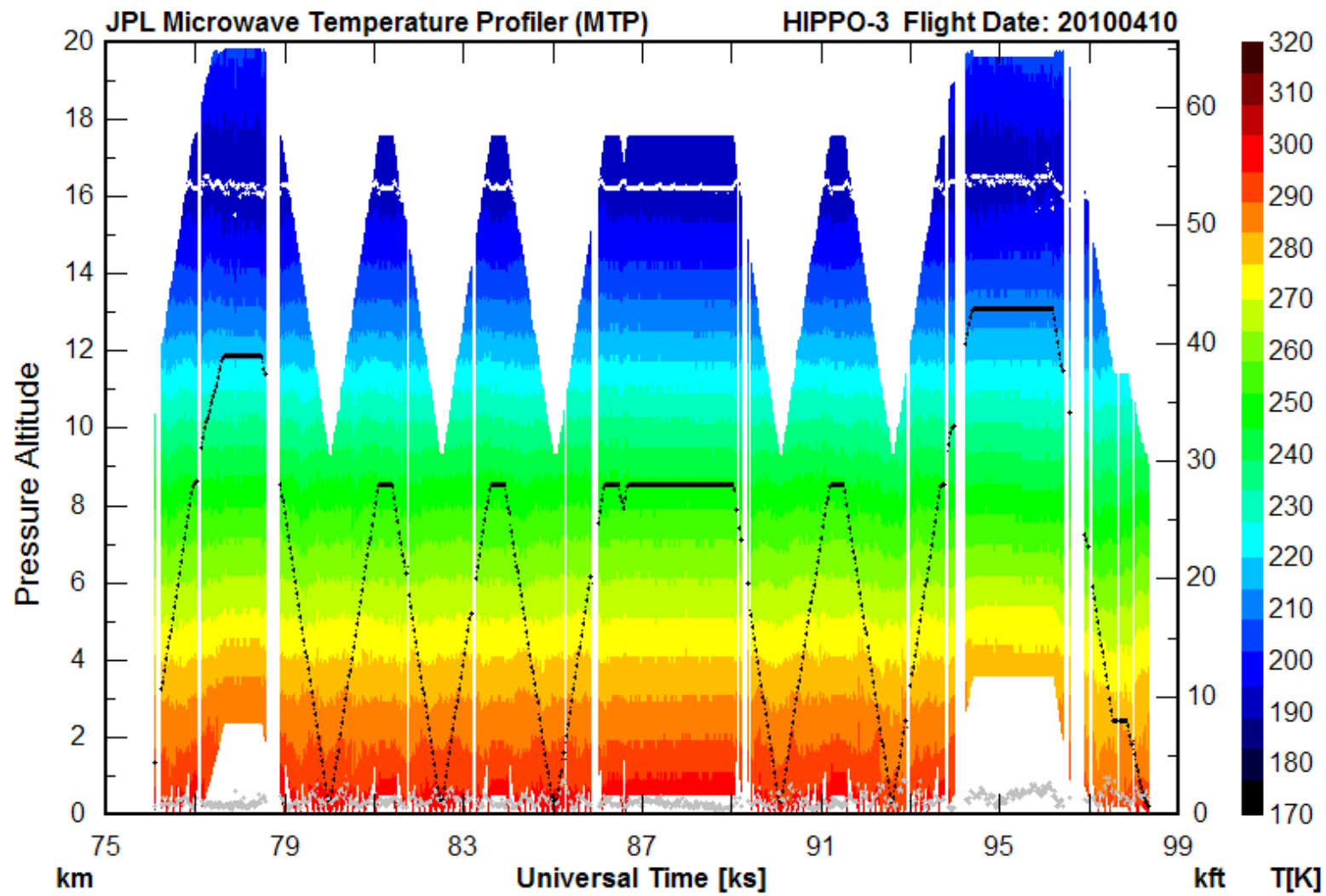
# MTP: Data Products



MTP Temperature Curtain Plot from PREDICT RFo6 (8/30/10) into TS Fiona

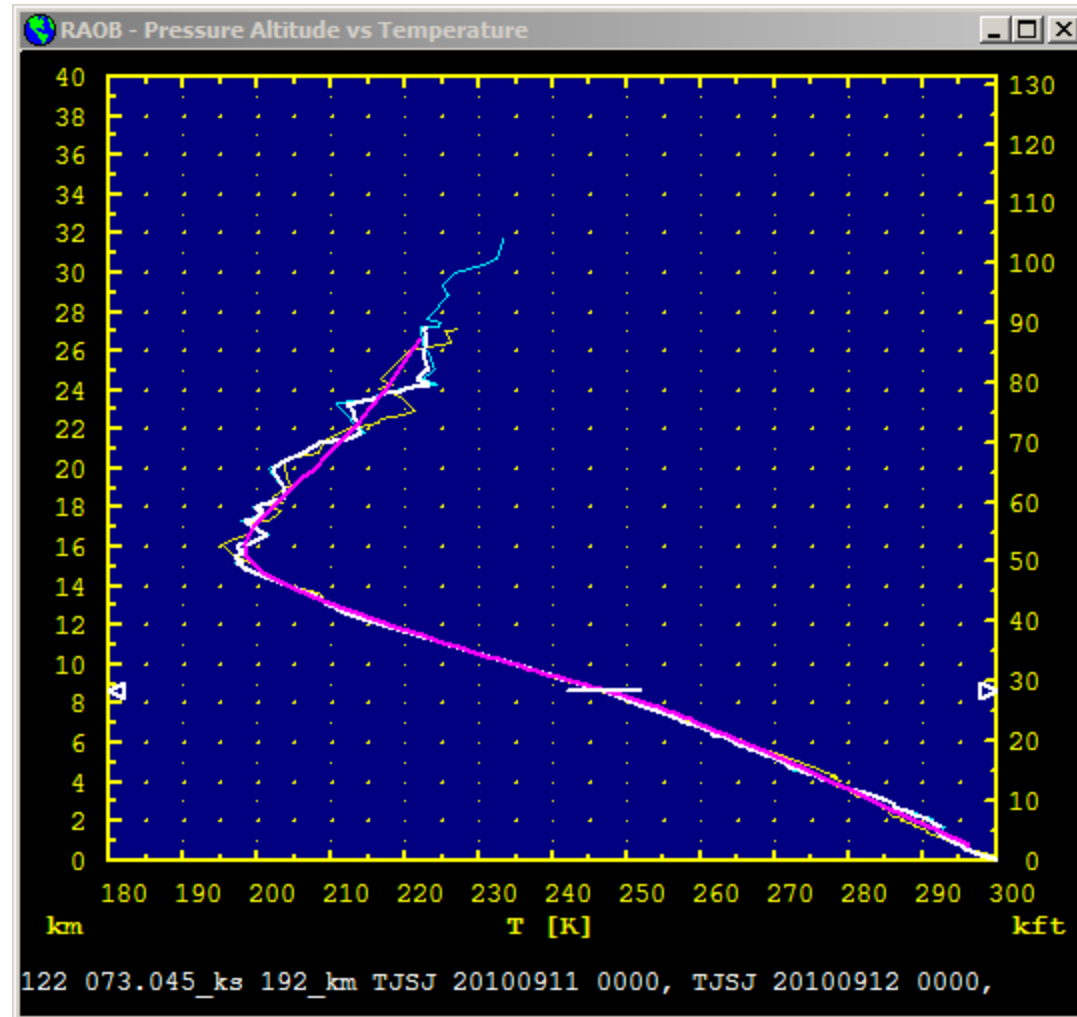
# HIPPO-3

## RFo8: American Samoa to Kona, HI



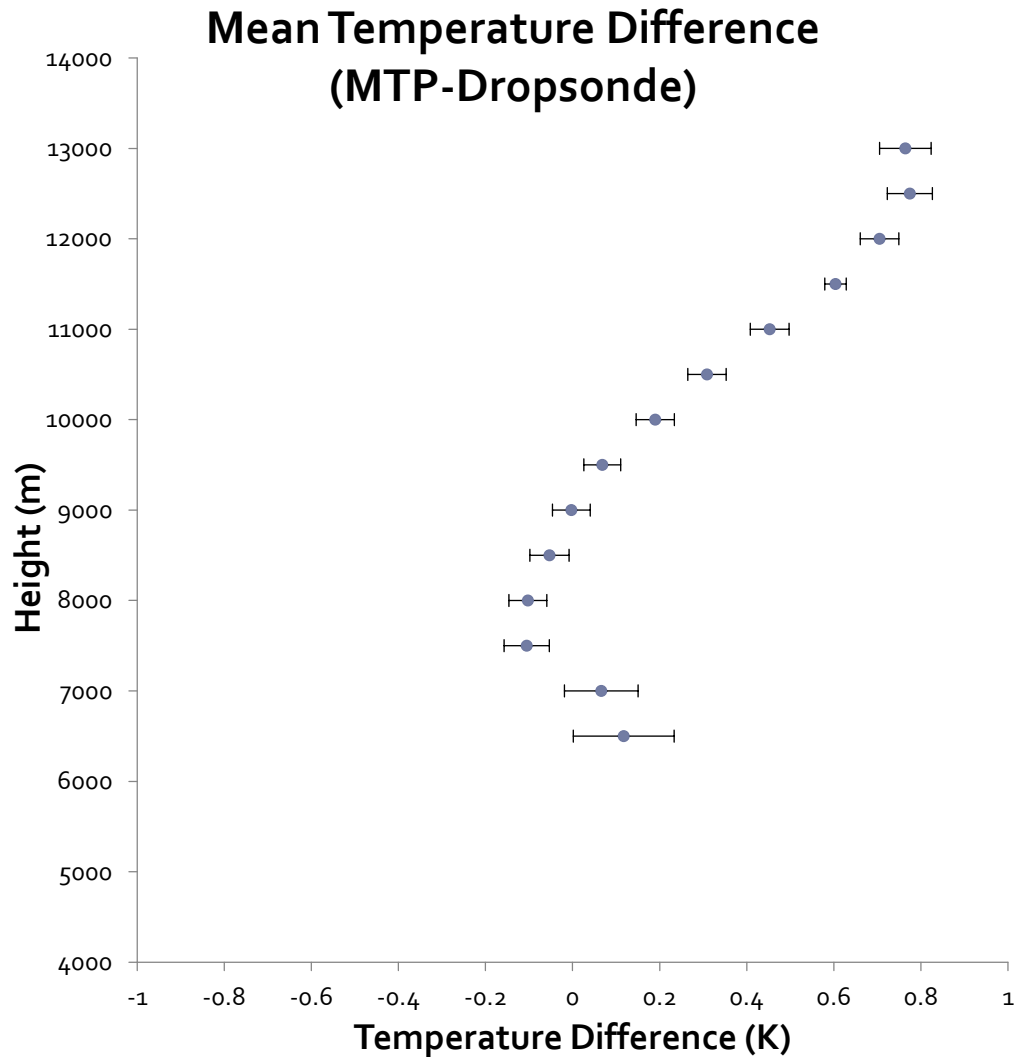
# MTP: Data Products

- Archived files are in NASA Ames format (ascii) with self-describing header
- Data generally released within 2-3 months of deployment





# MTP vs. Dropsonde Profiles (475 comparisons)



# Sea Surface Temperature

- Heitronics KT19.85 infrared pyrometer
- Spectral range 9.6 – 11.5  $\mu\text{m}$
- Field of view  $2^\circ$
- Sampling rate 5 Hz
- Specified accuracy 0.5 K plus 0.7% of difference between sensor housing temperature and scene temperature
- Emission by water vapor in the column also contributes to uncertainty; contribution can modeled and removed (Haggerty et al., JGR, 2003)



## GV Installation

- Mounted on downward facing aperture plate
- Vertical orientation