

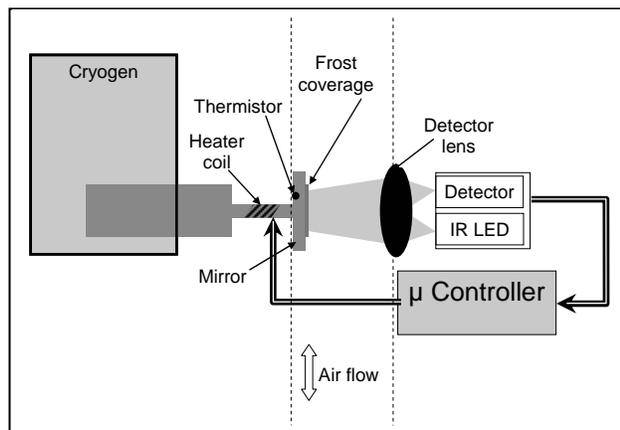
Instrument: Cryogenic Frostpoint Hygrometer (CFH)
ECC ozone sonde

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Instrument Description:

The Cryogenic Frostpoint Hygrometer (CFH) is a small balloon borne instrument, which measures water vapor continuously between the surface and the middle stratosphere. It is based on the chilled mirror principle and measures the temperature of a mirror carrying a thin dew or frost layer, which is maintained in equilibrium with the ambient water vapor. The optical phase sensitive detector measures the bulk reflectivity of the mirror and the microprocessor feedback controller regulates the mirror temperature such that the bulk reflectivity and hence the condensate layer remain constant. Under this condition the condensate layer on the mirror is in thermal equilibrium with the vapor phase of the air passing over the mirror. The mirror temperature is then equal to the ambient dew point or frost point temperature and the water vapor mixing ratio and relative humidity can be calculated from this observation using a variation of the Clausius Clapeyron equation.



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The CFH is currently flown with an ECC ozone sonde, GPS, and a Vaisala RS80 radiosonde, which is used as data transmitter. Therefore, in addition to water vapor mixing ratio, every CFH payload provides ozone mixing ratio and RS80 pressure, temperature and humidity data, which are used to determine altitude, potential temperature and mixing ratio.

Instrument characteristics:

Vertical measurement range:	0 km to ~28 km
Dew point or frost point detection range:	>+25°C to <-95°C
Mixing ratio detection range:	>25000 ppmv to <0.8 ppmv
Dew point or frost point uncertainty:	0.5°C
Mixing ratio uncertainty:	~ 3.5 % (surface), ~9% (tropopause), ~11% (28 km)
Vertical resolution:	<~ 50 m (troposphere) to < ~ 100 m (stratosphere)
CFH instrument weight:	400 g
CFH + ECC + RS80 payload launch weight:	1500 g
