Hurricane and Severe Storm Sentinel (HS3) Integration and Test Fights

HS3 Pacific Flight

September 8-9, 2011

Dryden Flight Research Center

Instruments and Key Measurements

- Cloud Physics Lidar (CPL)
  - Cloud and aerosol backscatter
- Scanning High-resolution Interferometer Sounder (S-HIS)
  - Temperature and humidity profiles in clear air, 1-2 km vertical resolution
- High-Altitude MMIC Sounding Radiometer (HAMSR)
  - Temperature and humidity profiles in clear and cloudy air, 1-2 km vertical resolution
- Advanced Vertical Atmospheric Profiling System (AVAPS)
  - Very high vertical resolution temperature, humidity, and wind profiles from in-situ sensors on dropsonde

Integration Activities

- CPL, HAMSR, and AVAPS were all “returning” instruments
- S-HIS was the only new instrument to be integrated

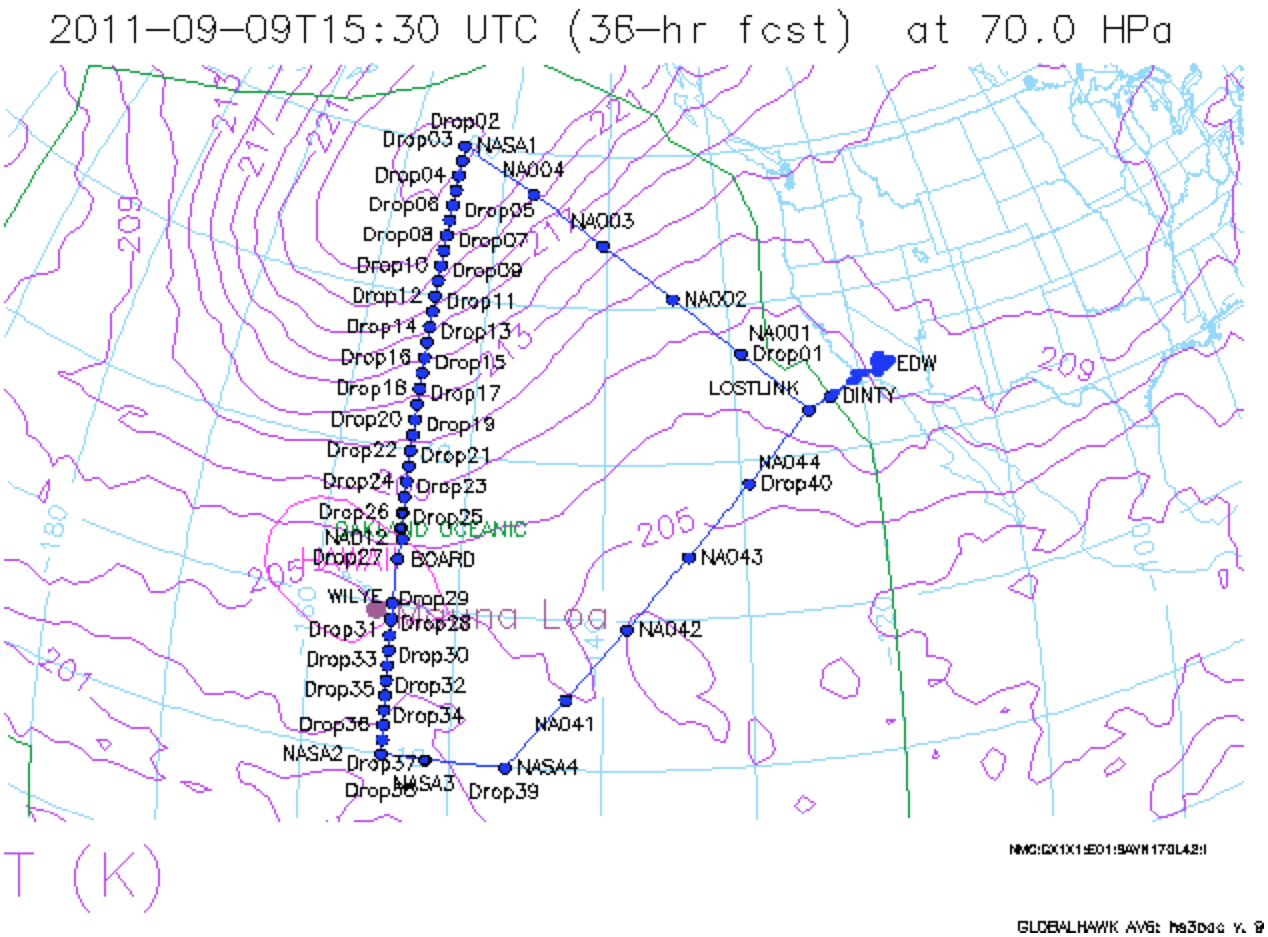
Test Flights

- HS3 conducted three test flights in 2011
  - Range flight to test dropsonde release (required because original tests included use of the deep radome, no longer to be used for HS3 on AV-6) and test CPL and S-HIS
  - Pulled CPL off after range flight, put on HAMSR
  - Pacific Flight for instrument inter-comparison
  - Gulf of Mexico Flight for coordinated flight with NOAA G-IV to inter-compare dropsondes

Pacific Flight Objectives

- Primary goal: Test S-HIS, HAMSR, and AVAPS instruments for data acquisition and instrument intercomparison
- Secondary goals:
  - Flight and Payload Operations Rooms communications
  - Ku and Iridium links
  - COMPASS system for real-time mission monitoring
  - ATC and FOR communications for science operations

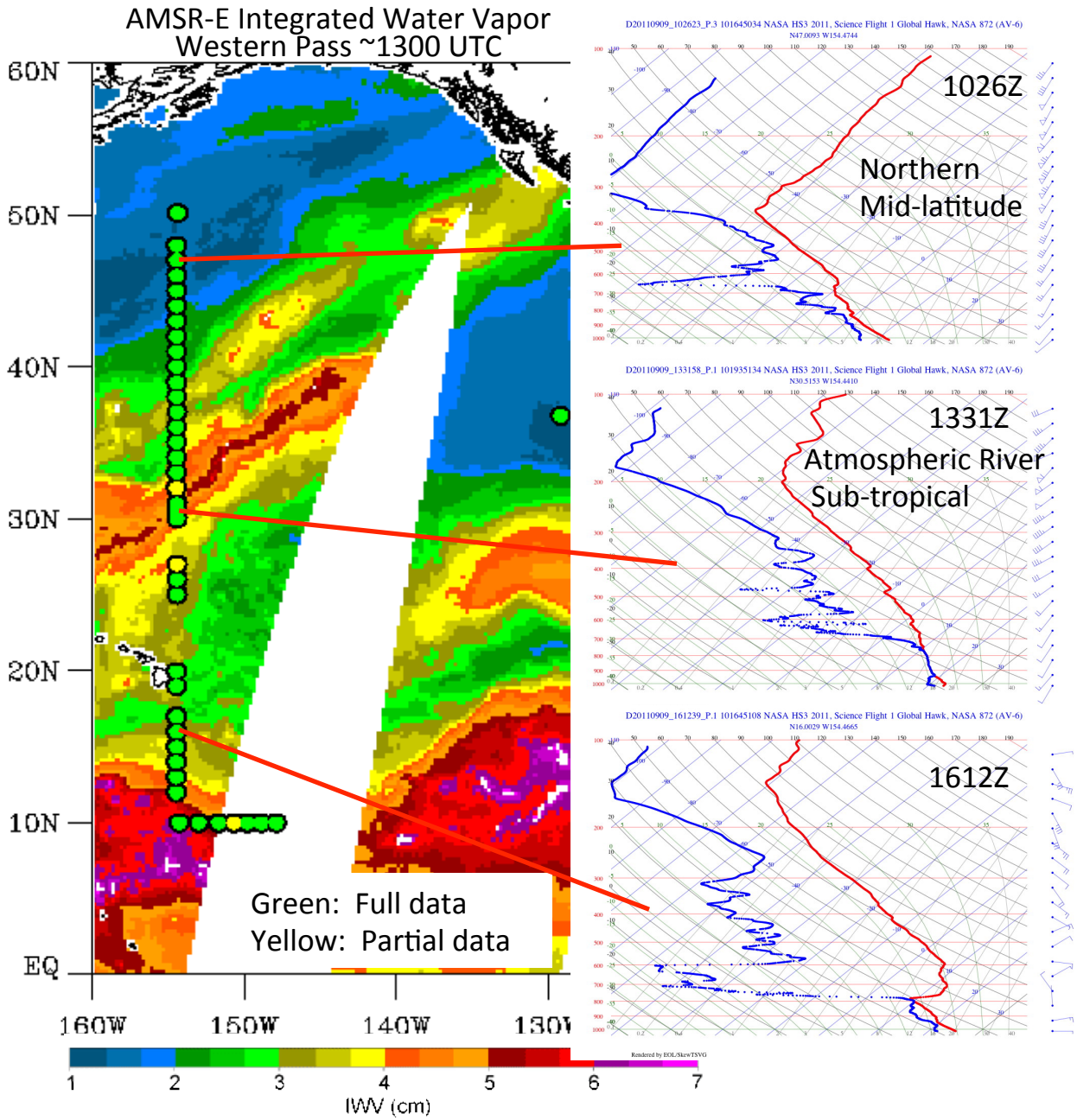
Flight Pattern



Pattern designed to provide wide range of temperature and humidity conditions

35 dropsonde release locations between 50°N and 10°N with 5 double drops to test new AVAPS temperature sensor.

Preliminary Dropsonde Results

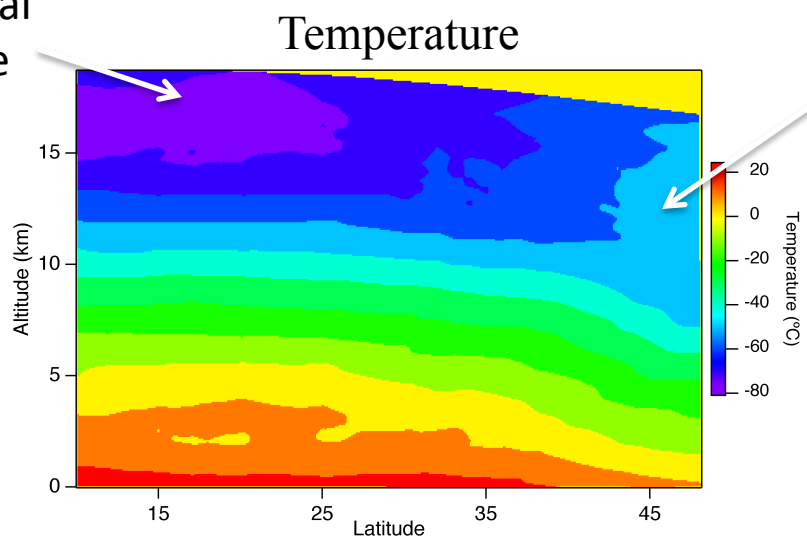


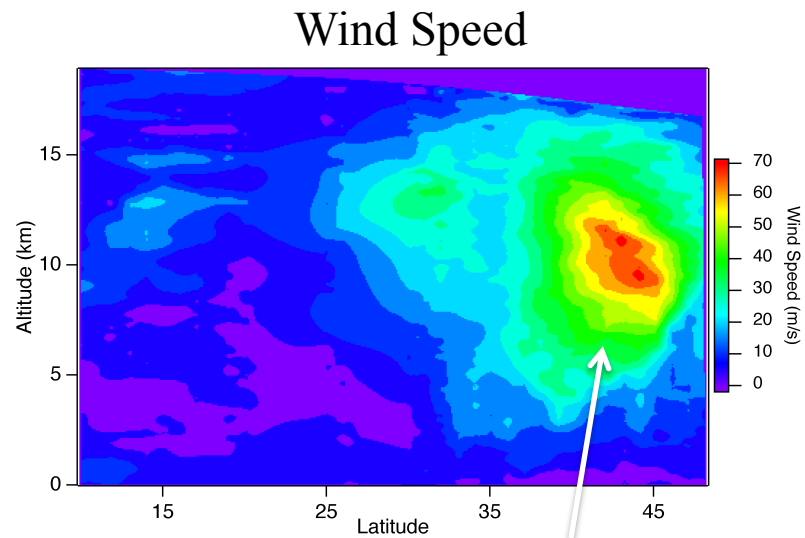
- Dropsondes sampled an extremely wide range of atmospheric conditions during N-S transect
- 45 sondes deployed
- Northern, mid-latitude soundings show strong polar jet stream
- Sounding within atmospheric river shows high moisture content but relatively weak transport at low levels
- Southern, tropical sounding shows moist boundary layer capped by inversion and drier air aloft

North Pacific Cross Sections
32 Dropsondes, 10°N – 48°N

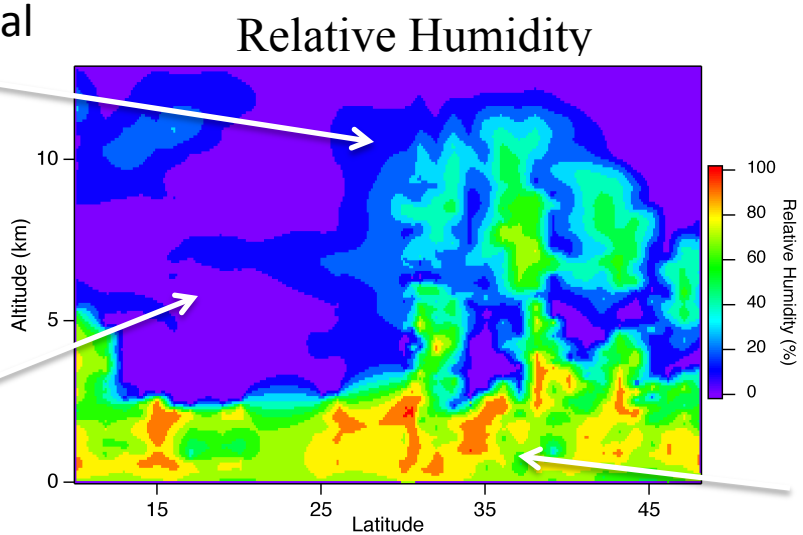
Cold tropical tropopause

Stratospheric air





Extratropical storm



Strong polar jet stream in the upper troposphere at midlatitudes

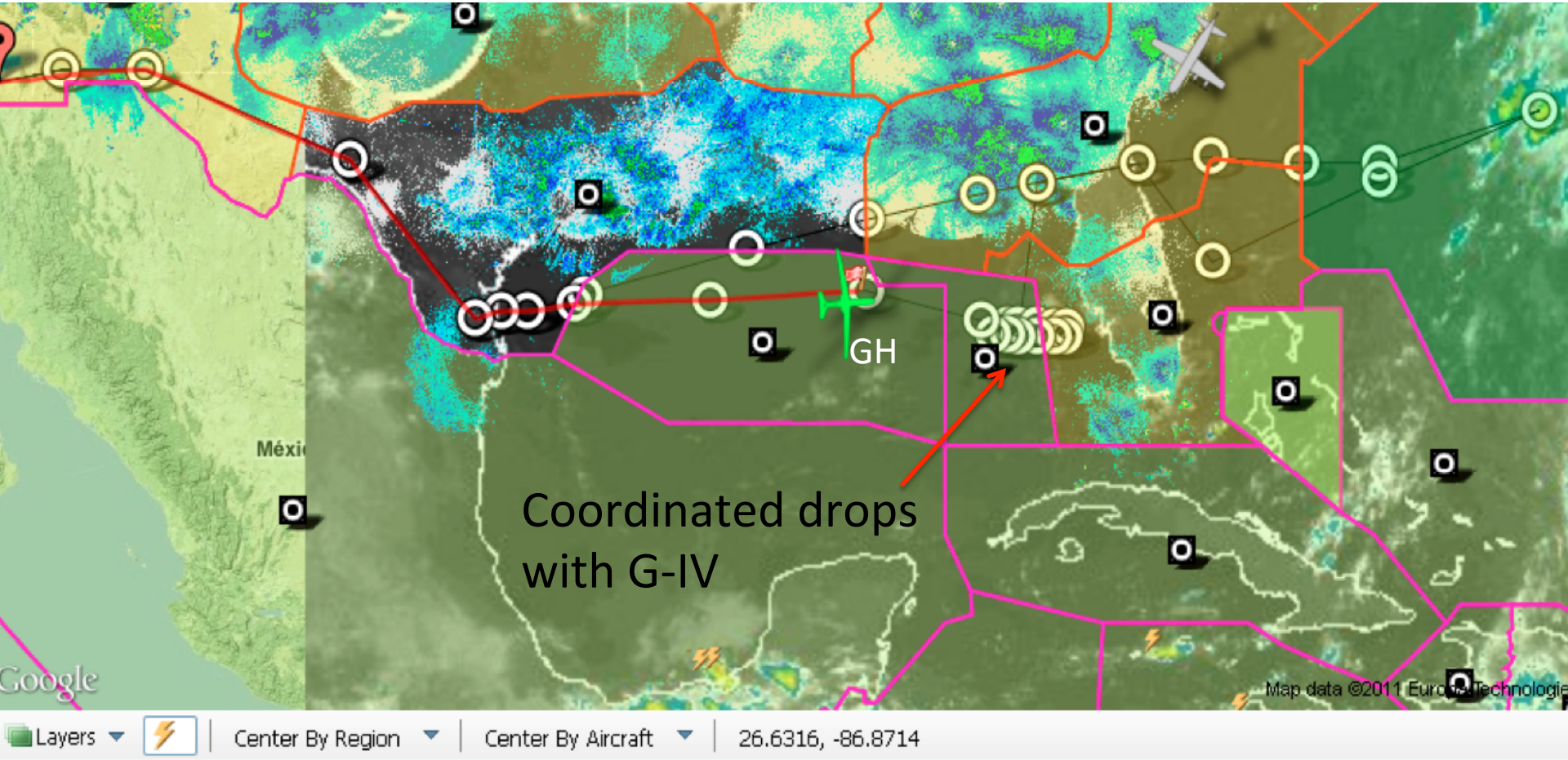
Dry subtropics

Atmospheric River

Gulf Flight—September 13-14

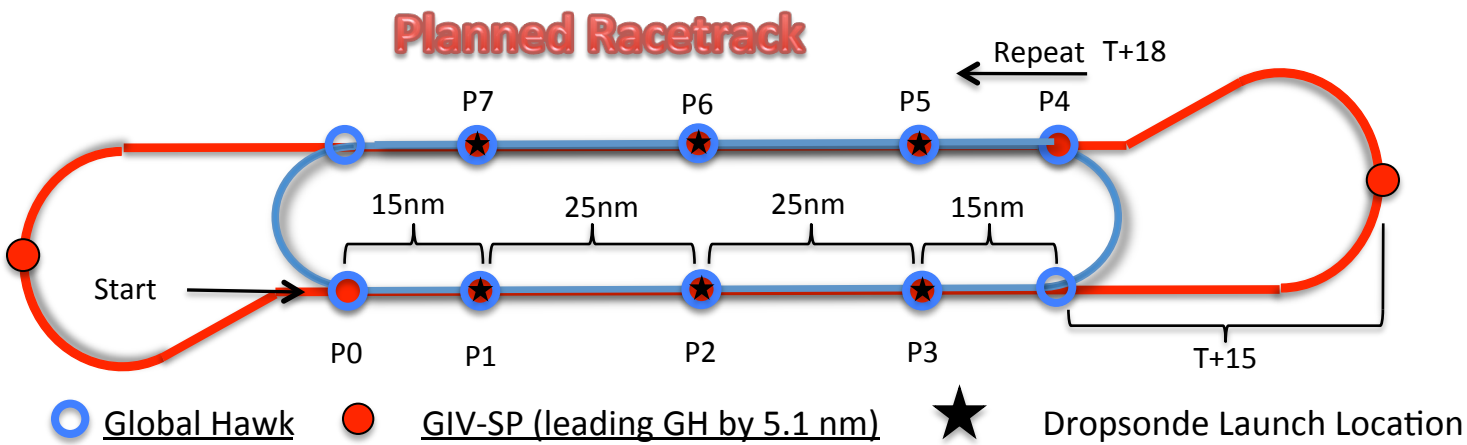
- Goals
  - Intercomparison between GH dropsondes and NOAA G-IV dropsondes
    - Allows improved error characterization of GH sondes
    - Will facilitate use by data assimilation groups
  - GHOC and ATC communication in Houston, Miami, and New York Oceanic Flight Information Regions
  - Test zone 25 temperatures for S-HIS after removal of a seal to allow colder air into zone
    - May remove need for air inlets for flights in 2012

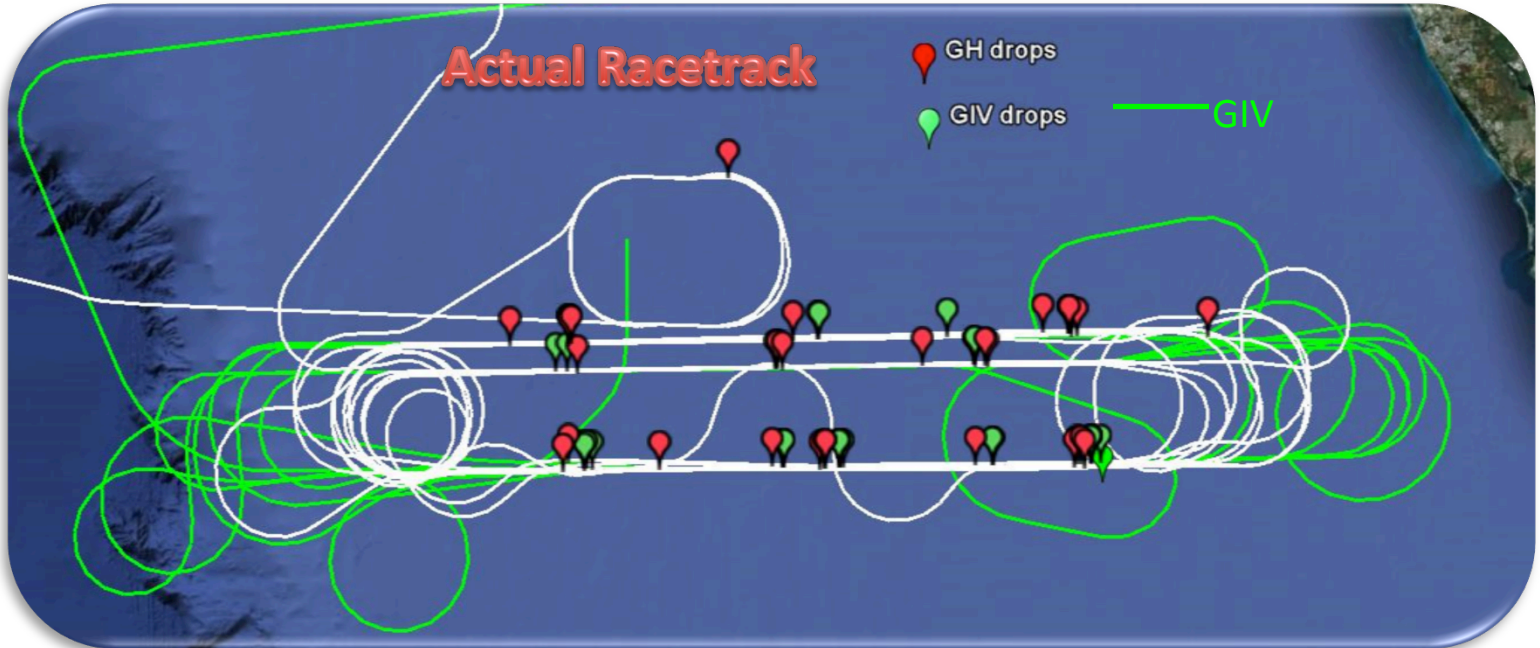
Gulf Flight Plan



2011 Test Flights—Comparison with G-IV

Total 27 pairs on 9/14/2012 11-15 UTC (7-11am EST)

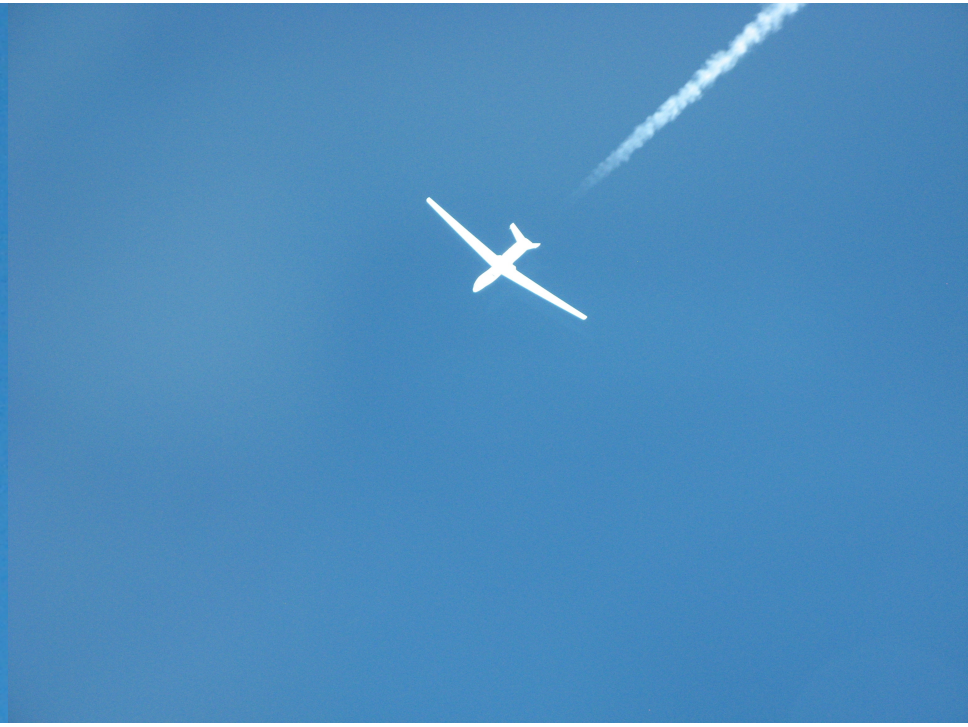




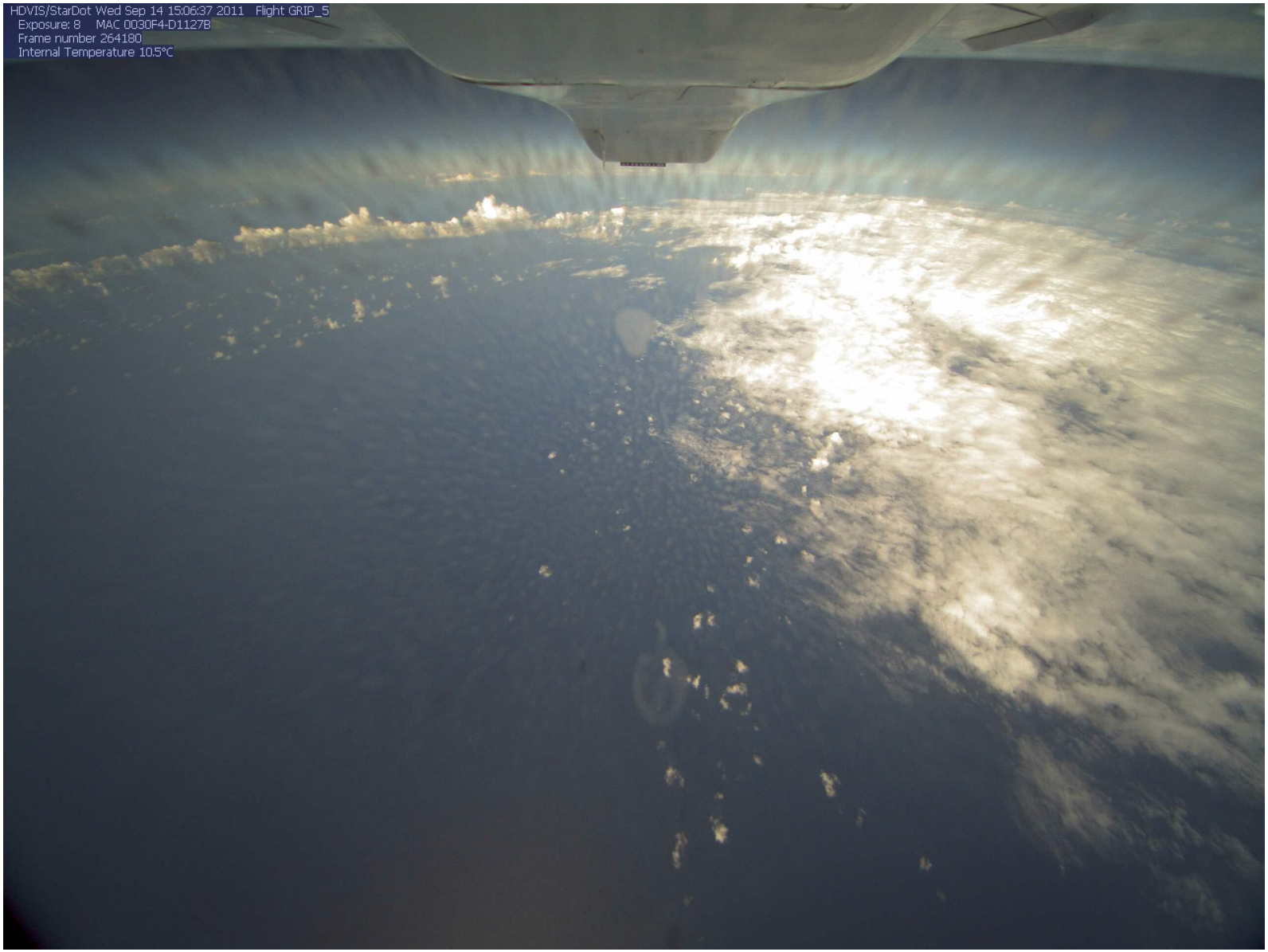
Key Accomplishments—Gulf Flight

- All instruments performed well, collected data through the G-IV intercomparison
- Dropsonde system had jam at end of comparison
  - Was able to reproduce the problem on the ground
  - Fix identified and will be implemented for next year
- Flight to Atlantic cut short since no operational dropsonde system
- Coordination between pilots and Houston ATC worked very well

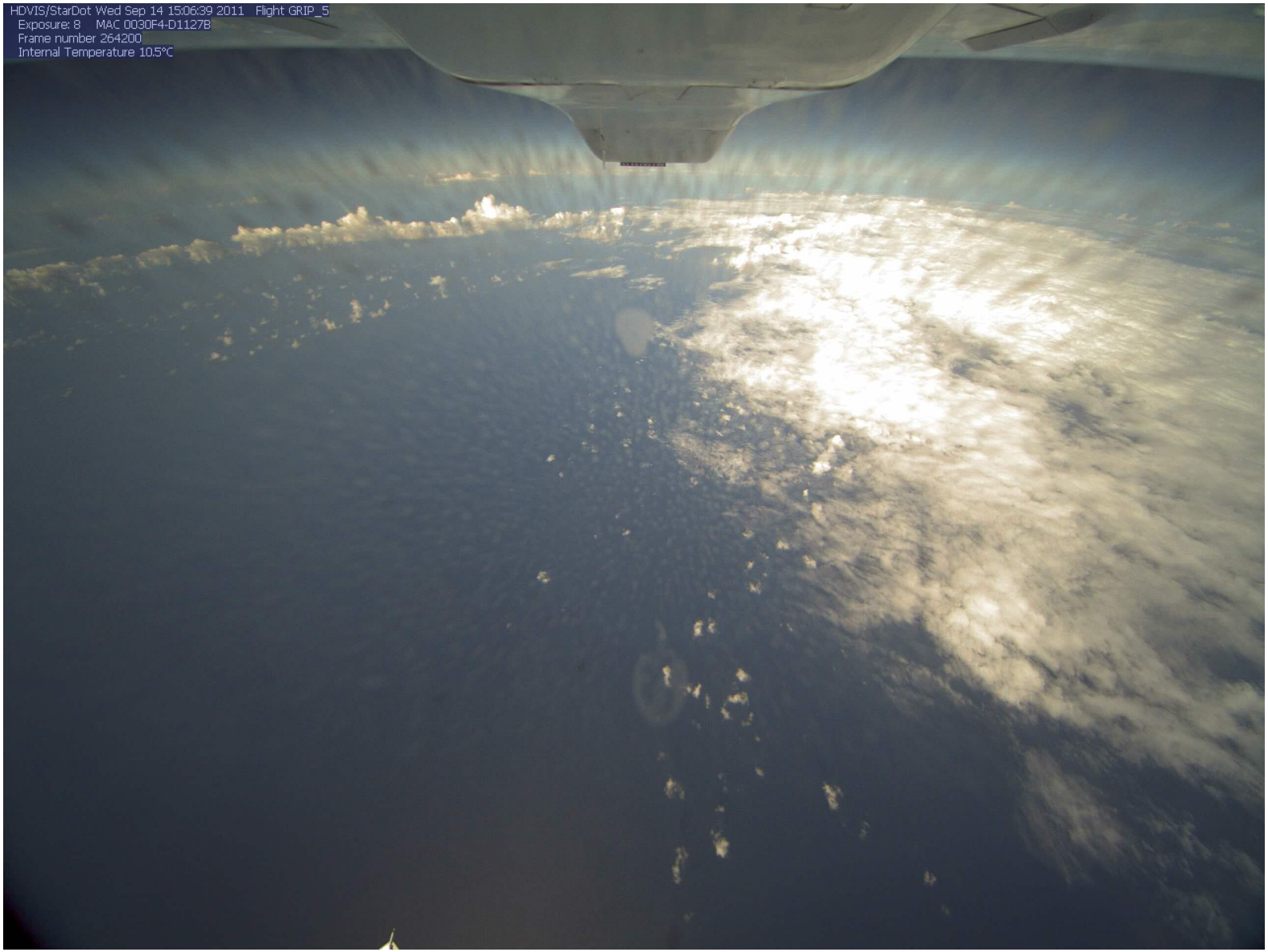
Views of the GH from the G-IV



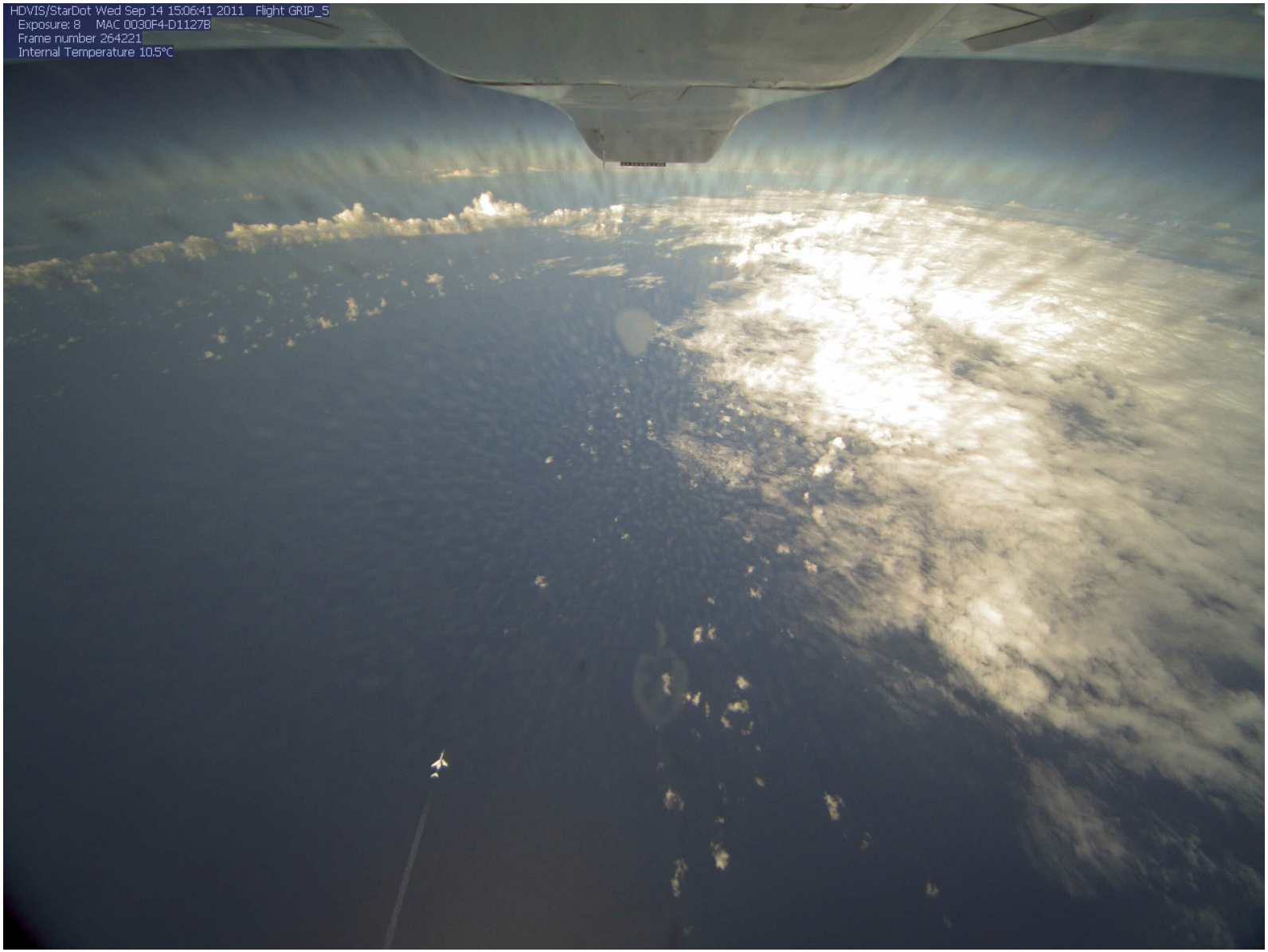
HDVis Image of NOAA G-IV Underpass



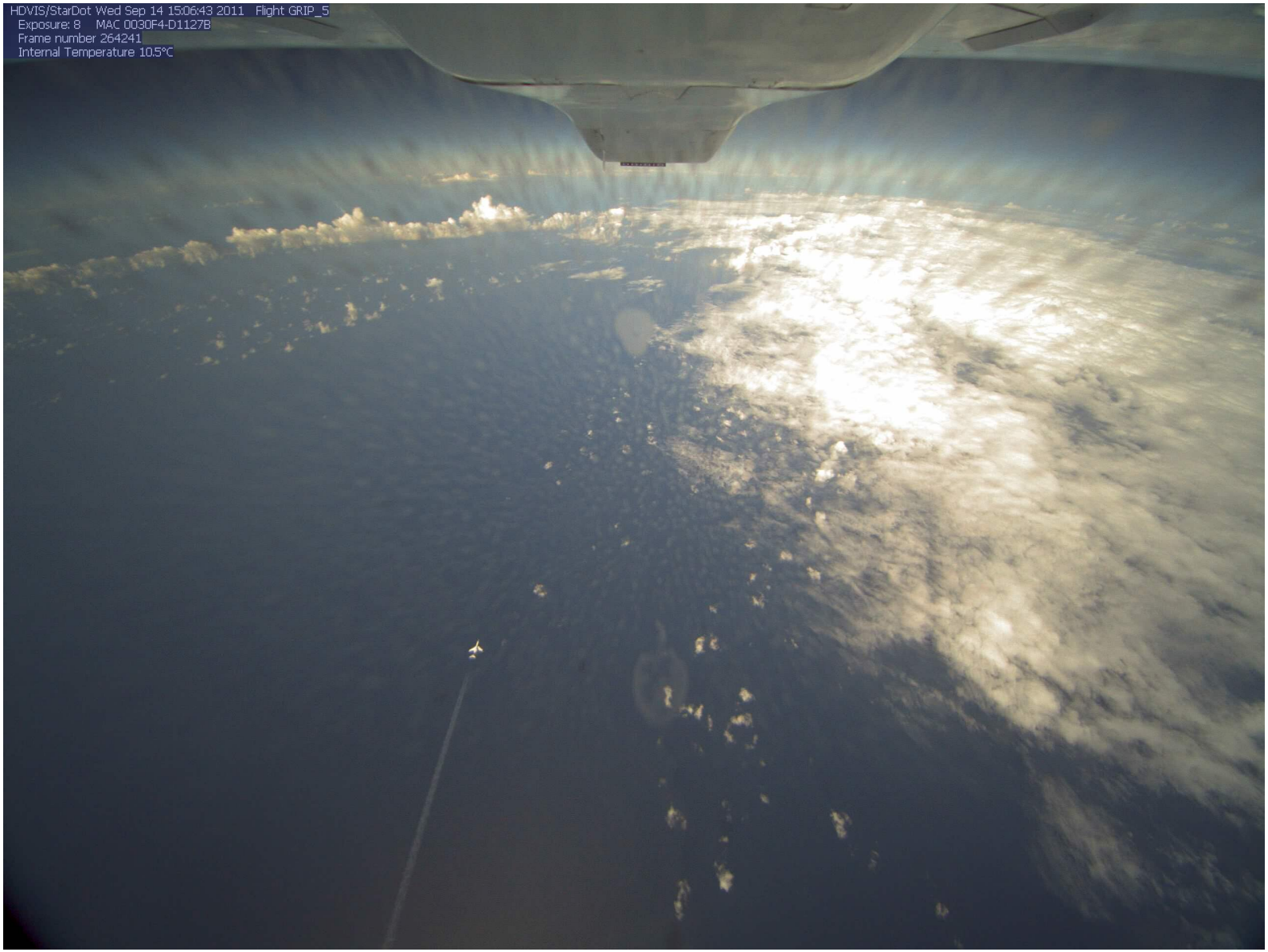
HDVis Image of NOAA G-IV Underpass



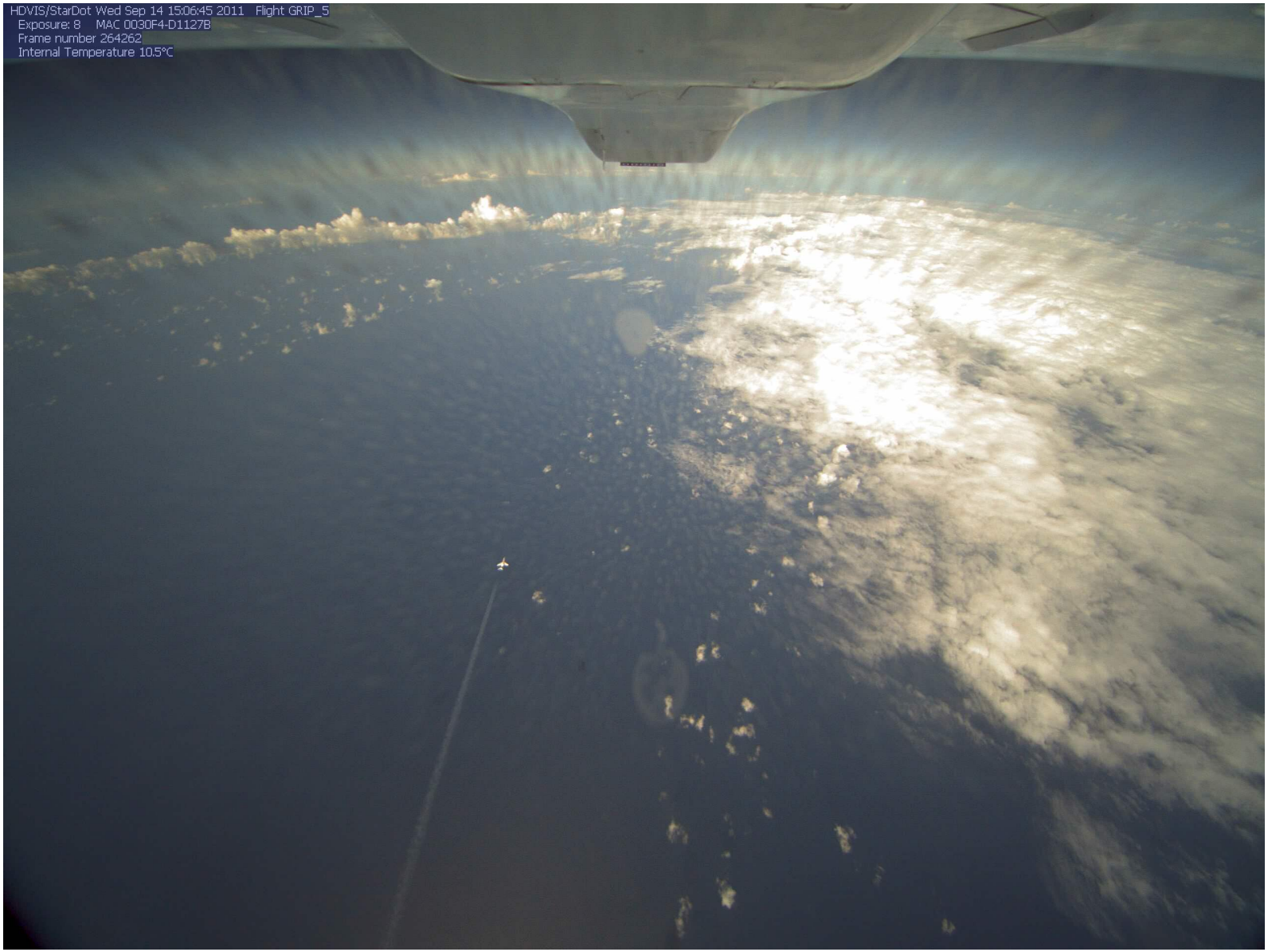
HDVis Image of NOAA G-IV Underpass



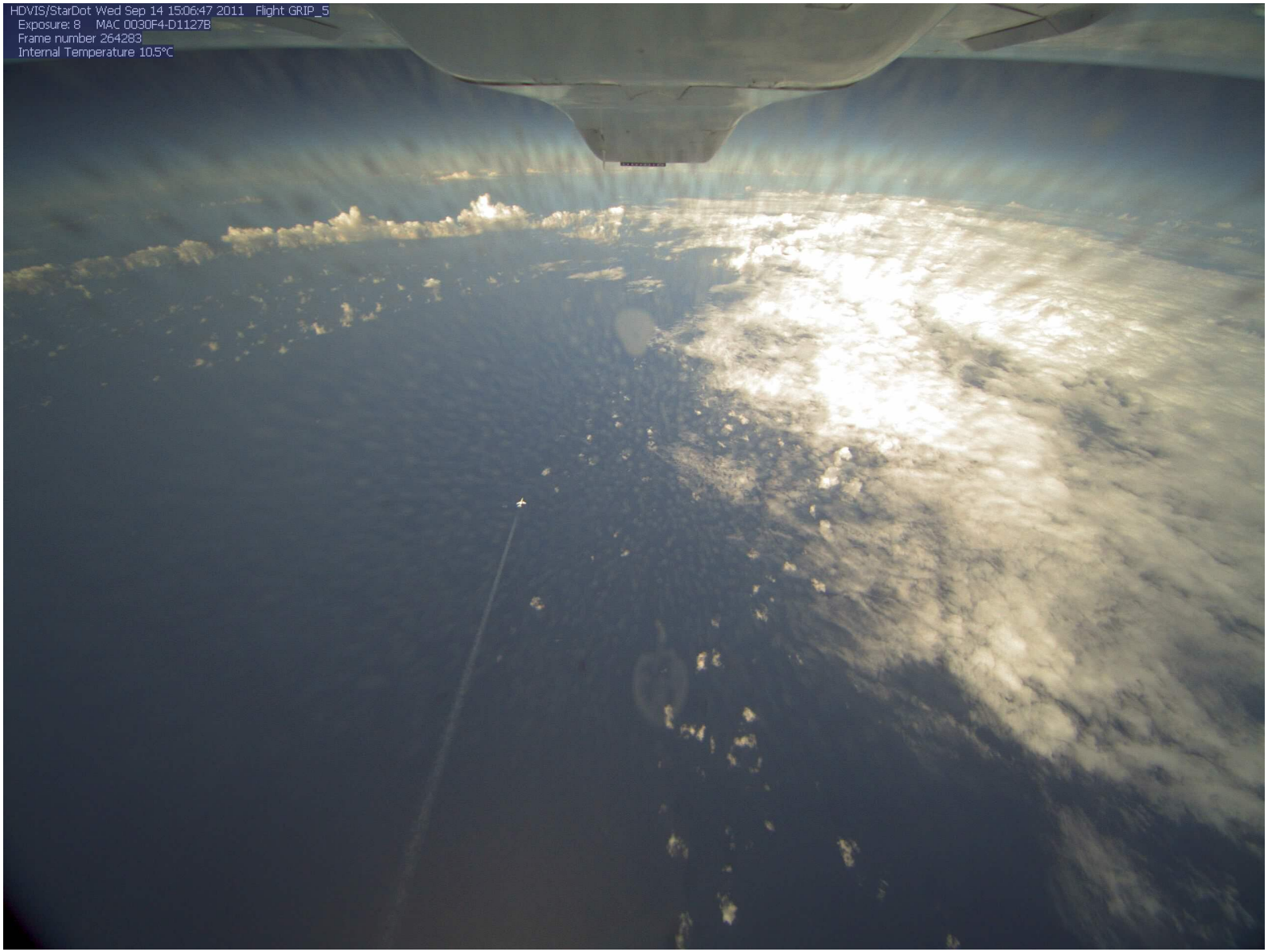
HDVis Image of NOAA G-IV Underpass



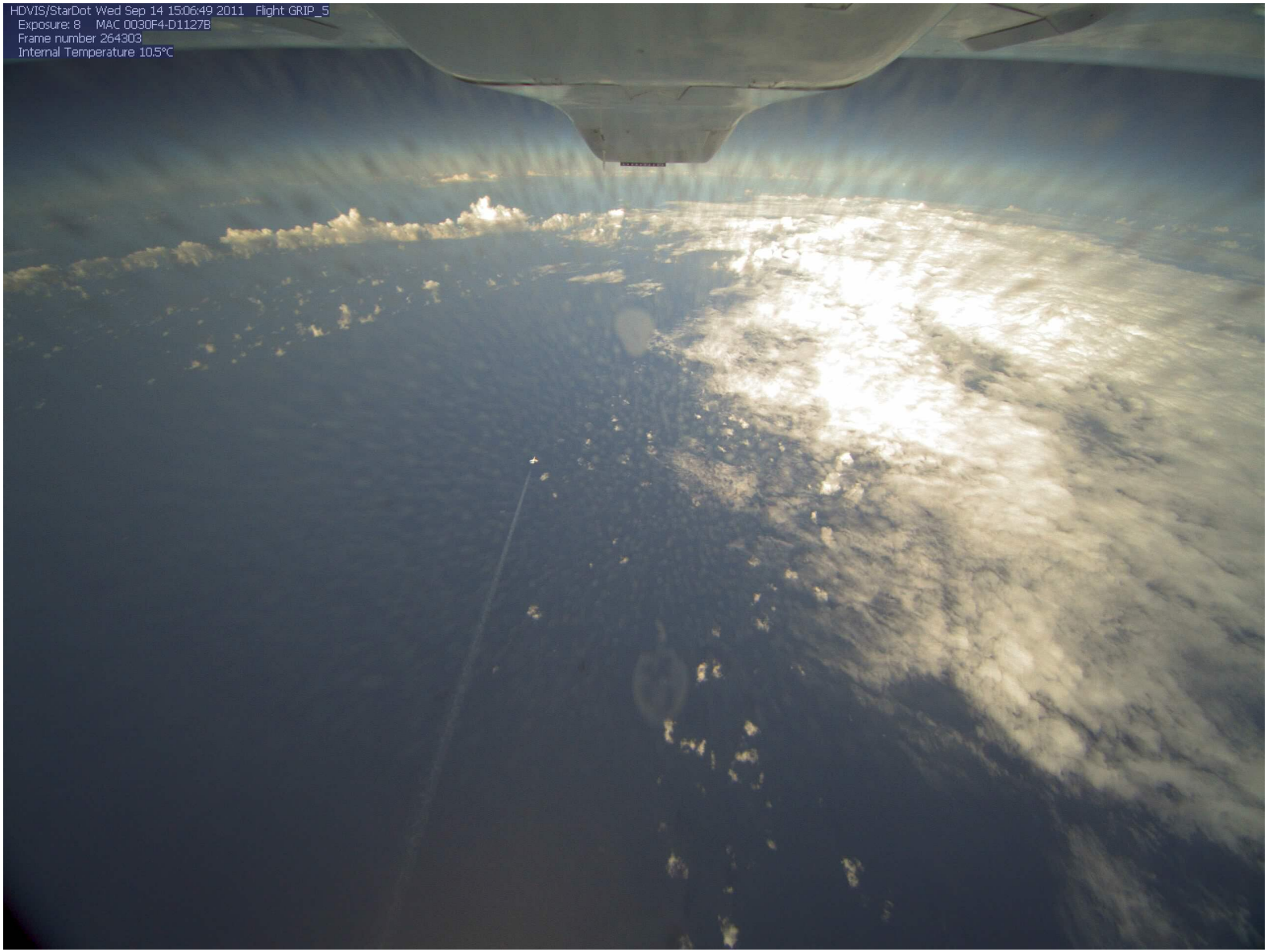
HDVis Image of NOAA G-IV Underpass



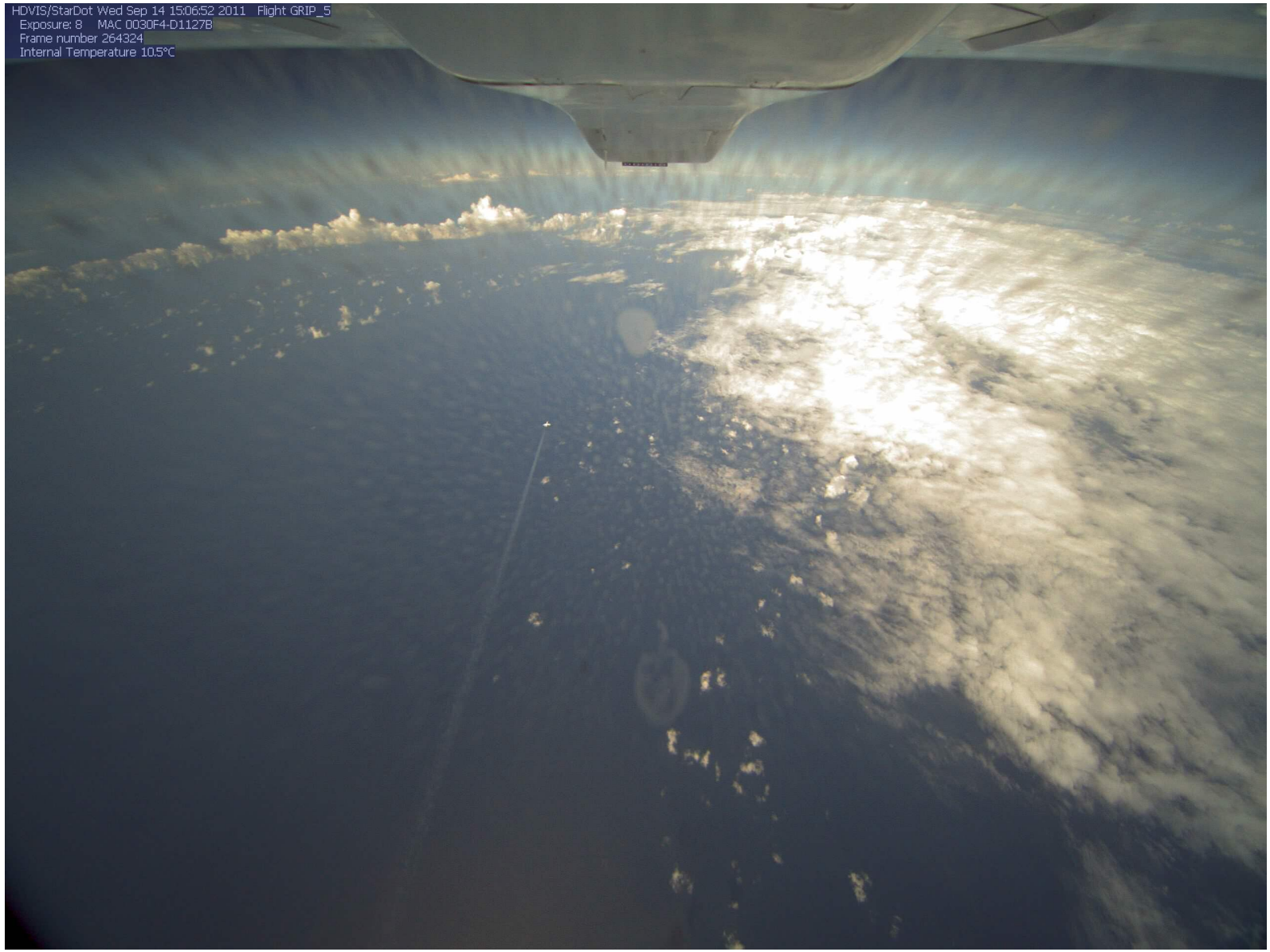
HDVis Image of NOAA G-IV Underpass



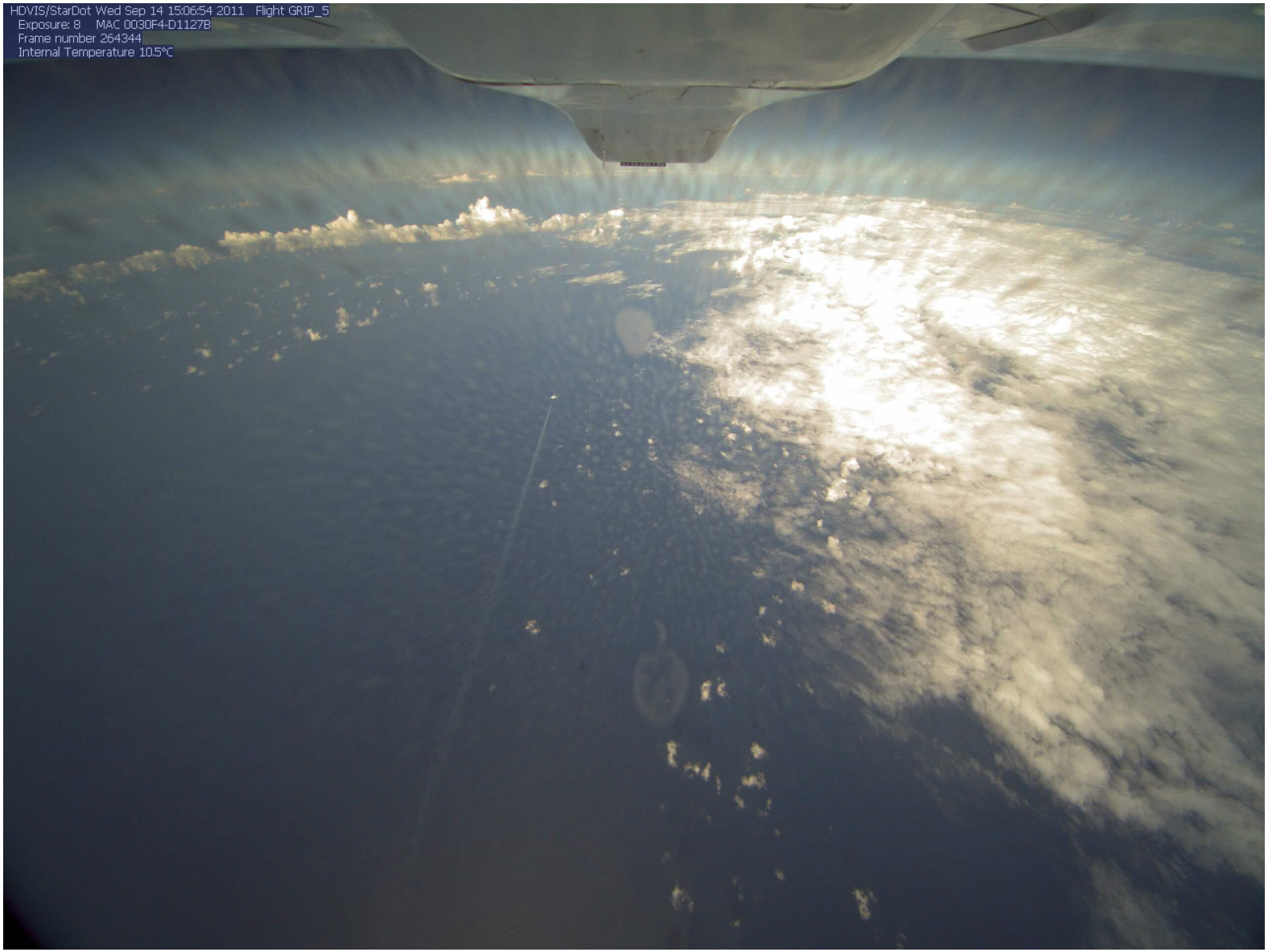
HDVis Image of NOAA G-IV Underpass



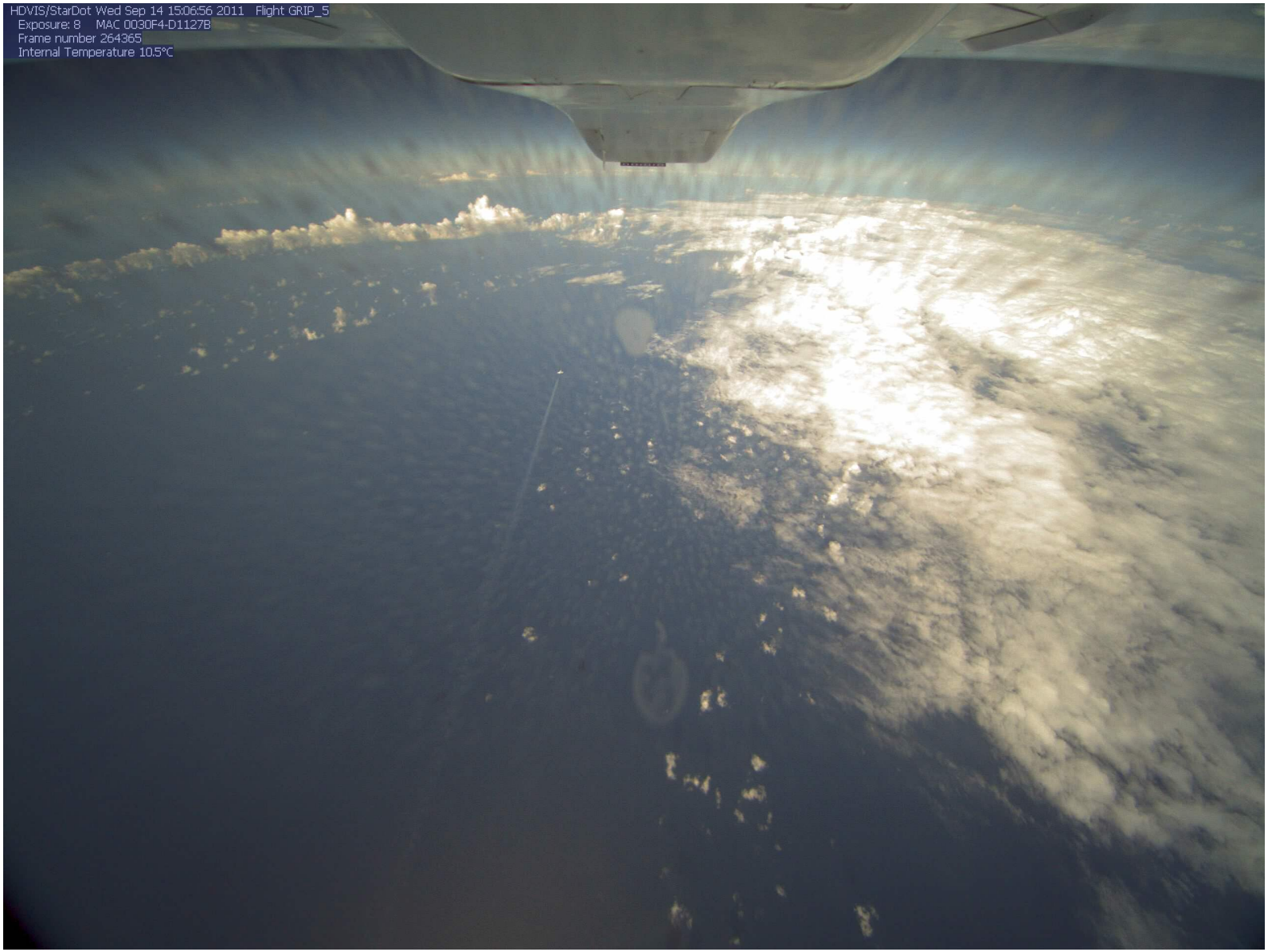
HDVis Image of NOAA G-IV Underpass



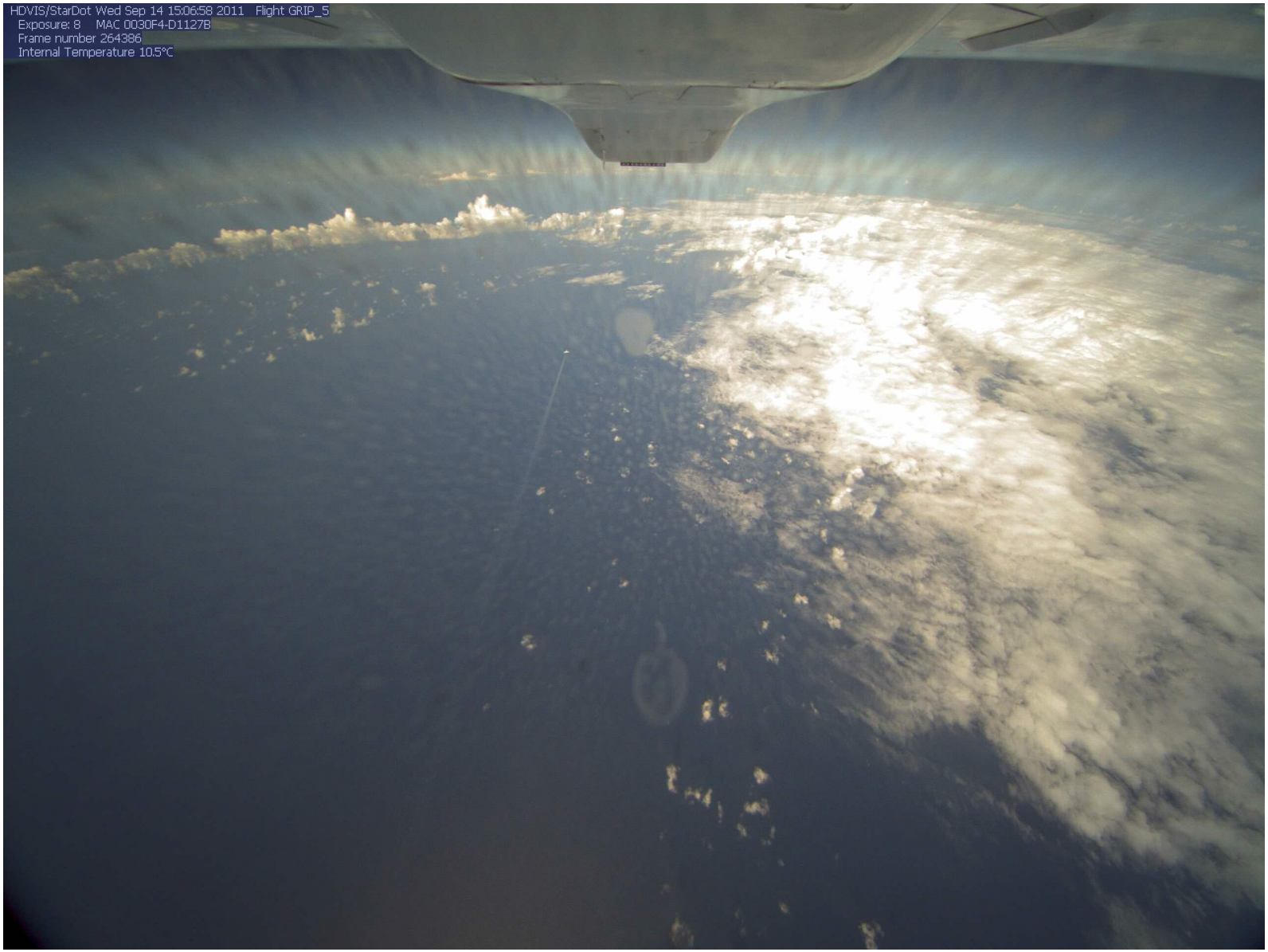
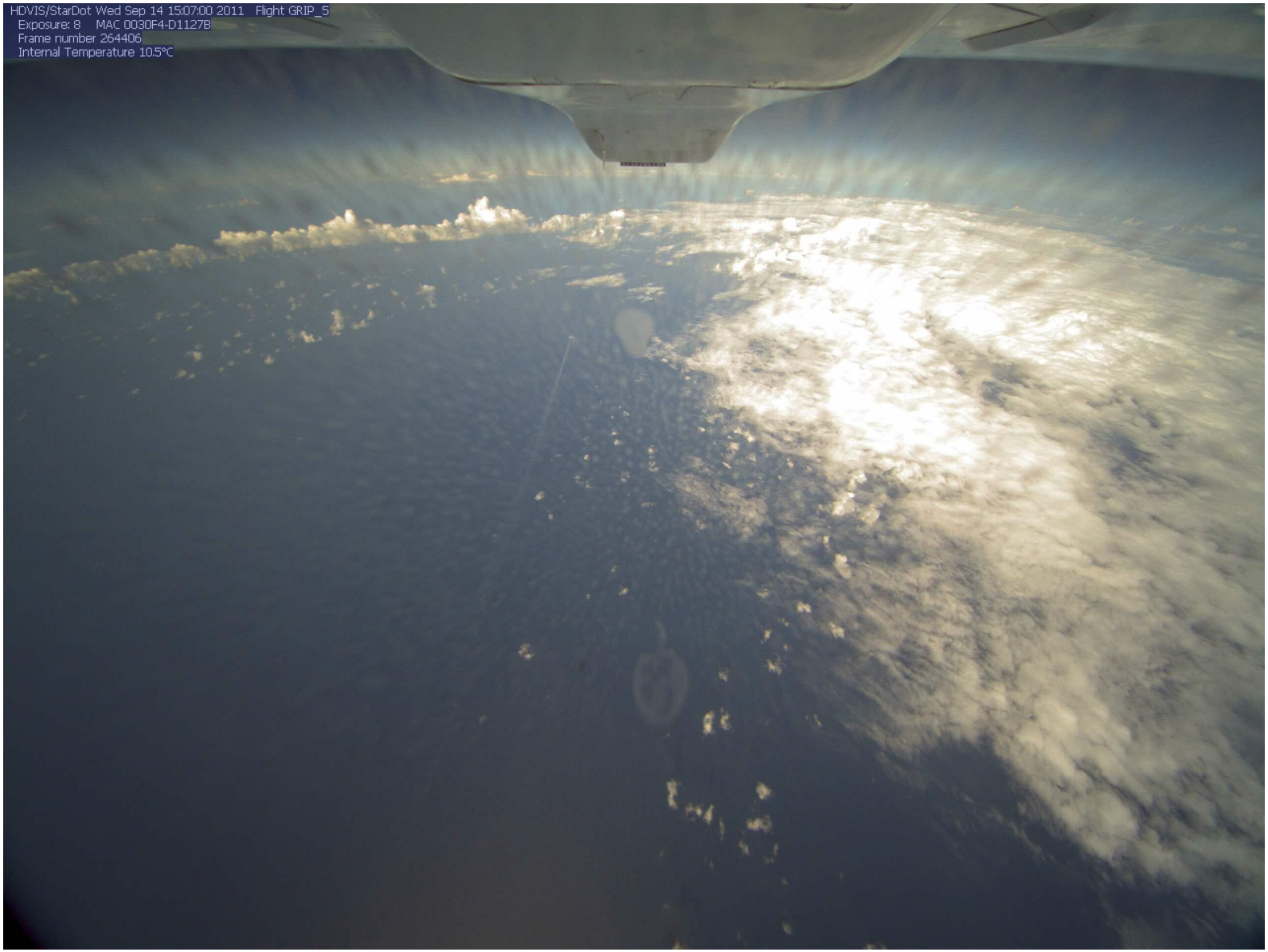
HDVis Image of NOAA G-IV Underpass



HDVis Image of NOAA G-IV Underpass



HDVis Image of NOAA G-IV Underpass



HDVis Image of NOAA G-IV Underpass