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AIRS Quality Assessment Activities

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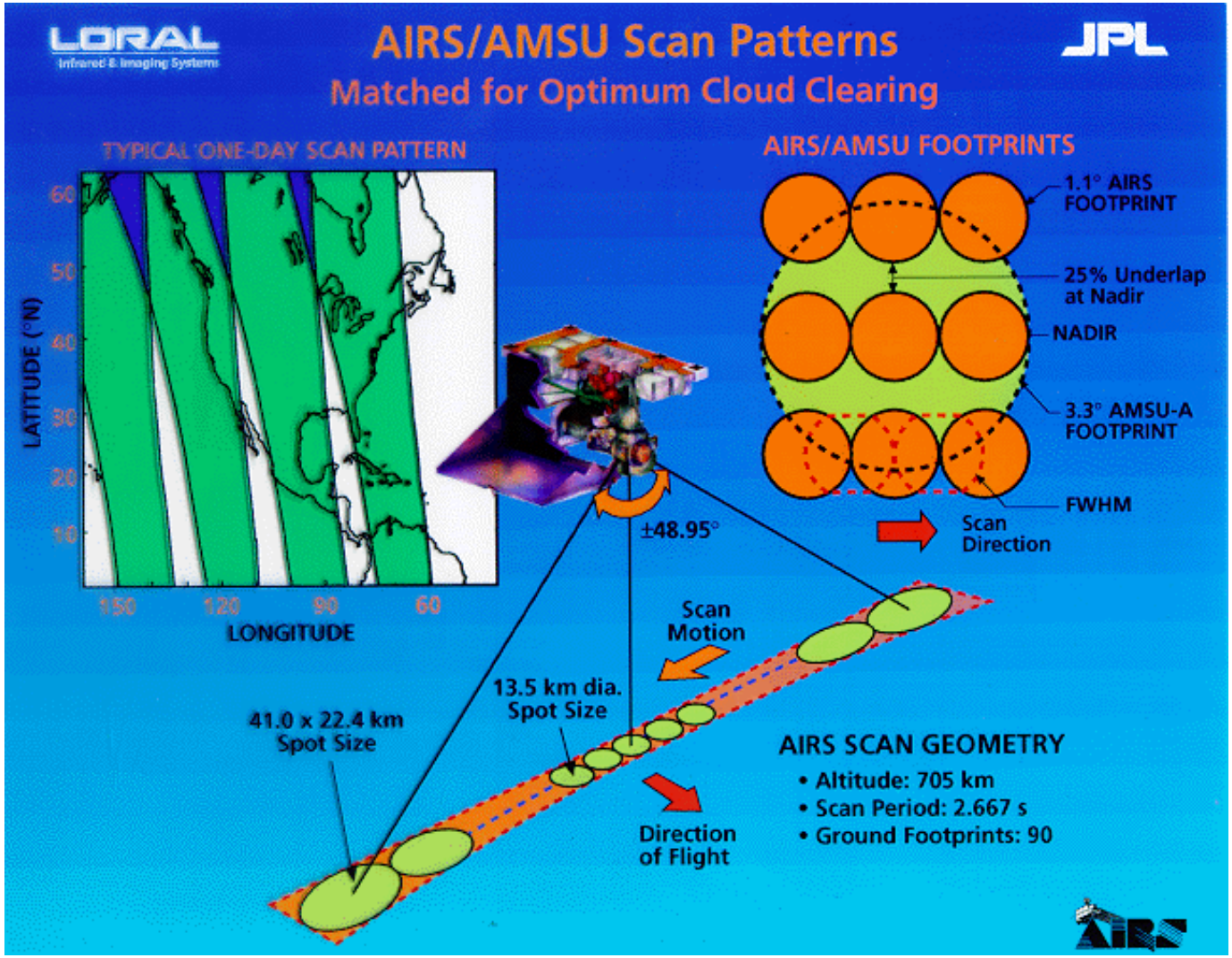
The AIRS Sampling Geometry



AIRS Data Processing

- Geophysical quantities are retrieved from spectral information at the density of the AMSU footprints (45 km diameter at nadir).
- An AIRS data granule spans six minutes in time. It contains:
  - 45 AMSU scanlines, each 30 footprints wide
    - 1350 footprints (and independent retrievals)
  - 135 AIRS scanlines each 90 footprints wide
  - 135 HSB scanlines each 90 footprints wide
  - A swath of Vis / NIR images with 2.8 km resolution
- *QA Information is defined at footprint, scanline, and granule densities*

AIRS Data Processing

- During the first year the DAAC will provid Level 0 products and process 50% to Level 1B.

  The AIRS TLSCF will generate for initial verification and early validation:
  - *Level 1A Products*: geolocated instrument counts
  - *Level 1B Products*: calibrated radiances
  - *Level 2 Products*: geophysical quantities retrieved from radiances and cloud cleared radiances

The AIRS QA Challenge

- Daily AIRS / AMSU / HSB Products contain
  - *HSB Level 1*: 2,916,000 spectra (4 points)
  - *AMSU Level 1*: 324,000 spectra (15 points)
  - *AIRS Level 1*: 2,916,000 spectra (2378 points)
  - *Level 2*: 324,000 geophysical retrievals and cloud cleared radiances
    - Geophysical Retrievals
      - Temperature and Water Vapor profiles
      - Water Vapor, Liquid Water and Ozone burdens
      - Cloud Properties (fraction, cloud top p,T)
      - Surface Skin Temperature and Surface Emissivities
    - Cloud-Cleared AIRS Radiances
- Product Granule Sizes (240 granules per day)
  - L1B - AMSU (0.3 MB), HSB (1.4 MB), AIRS (128 MB), VIS (16.6 MB)
  - L2 - Physical Retrievals (4.6 MB), Cloud Cleared Radiances (13.4 MB)

AIRS QA Has Several Components

- Integrity of the end-to-end system on a continuing basis (instrument, downlink, data processing, product)
  - Automatic QA
  - Manual QA by Science Team (and DAAC, ultimately)
  - Long-term trend monitoring
  - Long-term comparison with correlative data sets

We don't fix the Granule, we fix the process

AIRS Automatic QA

- Readiness of files and maintaining processing success
- Some parameters will automatically trigger notification e.g. :
  - Number of missing footprints within a granule
  - Number of floating point exceptions within a granule
- Others parameters will be monitored to ensure that the instruments and algorithms are stable. These are not PSAs. e.g. :
  - Many instrument engineering parameters
  - Number of microwave-only retrievals within granules

AIRS Manual QA

- Two aspects to Manual QA
  - Routine monitoring of a select set of parameters at the TLSCF, e. g.:
    - Number of footprints with insufficient radiance information to perform retrieval
    - Number of unsatisfactory retrievals
  - Investigation at the TLSCF of anomalies reported by Automatic QA or revealed by routine monitoring

Trend Analysis

- Some parameters will be monitored over short or long time periods. THE classic example:
  - How do the calibration coefficients vary over
    - Orbit (day/night; South Atlantic Anomaly)?
    - Orbit repeat cycle (233 orbits, approximately 15 days)?
    - Lunar Cycle?
    - Year (Long term changes in instruments)?

Note: More than PSAs will be monitored. For example, calibration coefficients are defined per scanline.

Long-Term Comparison

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- At some point the validation comparisons become long-term monitoring, e.g. :
  - Comparison with operational radiosondes
  - Comparison with operational marine buoys
  - Occasional dedicated radiosonde launches

Why? The system might be stable and internally self consistent, but drifting.

Current (and Future) AIRS QA Emphasis

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- Identify which of hundreds of QA parameters will be most useful for
  - Automatic QA
  - Manual QA
  - Trend Analysis
- Develop a PGE to extract QA parameters from products for detailed analyses and trending