



# NOAA Near Real-Time AIRS Processing System: Using MODIS with AIRS

W. Wolf<sup>1</sup>, T. King<sup>1</sup>, L. Zhou<sup>1</sup>,  
M. Goldberg<sup>2</sup>, and C. Barnett<sup>2</sup>

<sup>1</sup>QSS Group Inc, Lanham, MD, USA

<sup>2</sup>NOAA-NESDIS, Camp Springs, MD, USA



# Outline

- Instrumentation
- Processing System
- Current data sets being distributed
- New data sets that are available
- Data sets that will be available



# Instruments on AQUA Satellite

- Atmospheric Infrared Sounder (AIRS) – Grating Spectrometer with 2378 channels that has spectral coverage from 3.7 to 15.4 microns.
- Advance Microwave Sounding Unit (AMSU) – Microwave sounder with 15 channels in the spectral range of 27 to 89 GHz.
- Humidity Sounder for Brazil (HSB) – Microwave sounder with 4 channels in the spectral range of 150 to 187 GHz.
- Moderate Resolution Imaging Spectroradiometer (MODIS) - 36 spectral bands ranging from 0.4 - 14.4 microns.

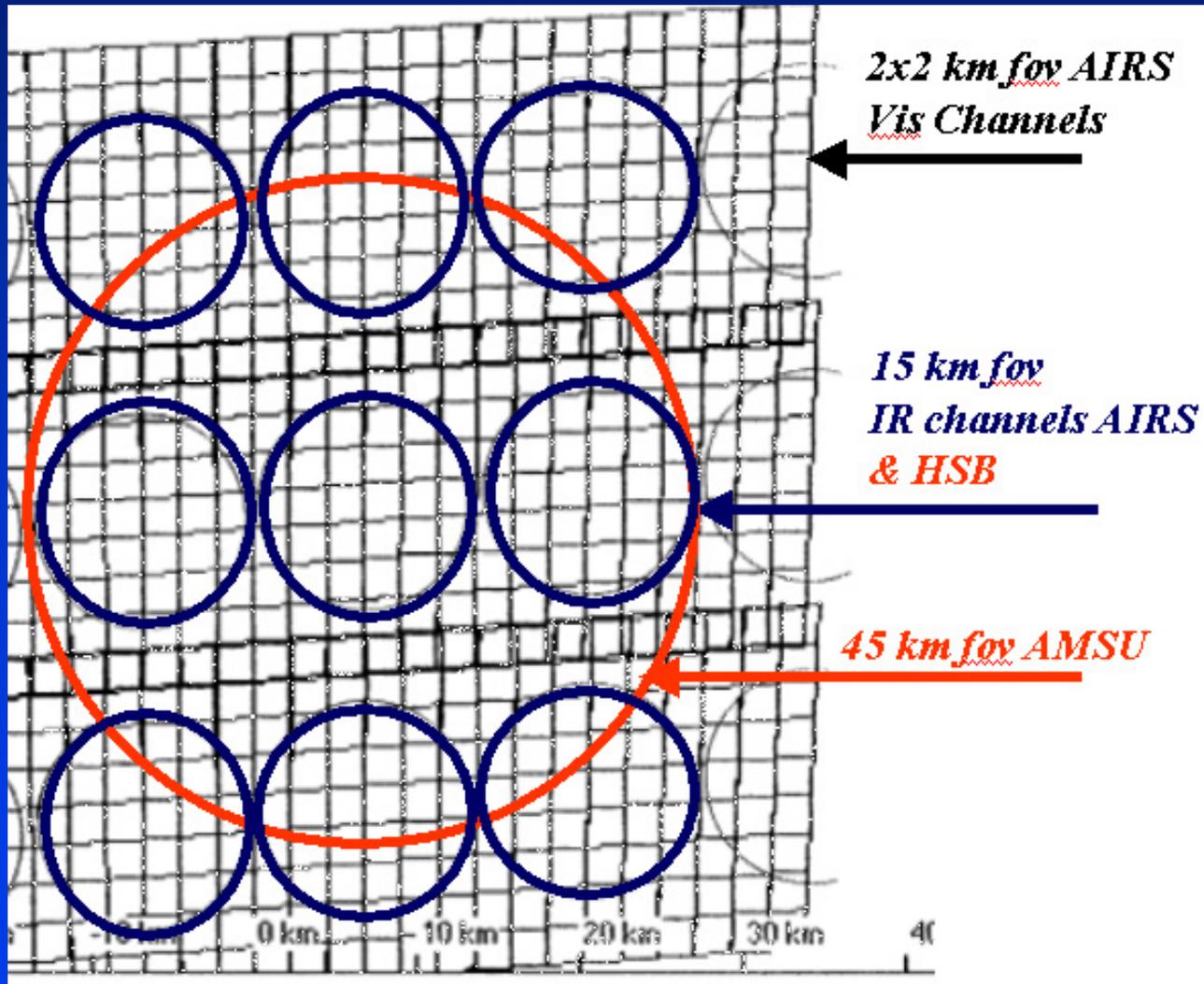


# Granule Processing

- AIRS/AMSU/HSB Granules
  - » 6 minutes of data
  - » 90 AIRS/HSB footprints per scanline
  - » 135 AIRS/HSB scanlines per granule
  - » 30 AMSU footprints per scanline
  - » 45 AMSU scanlines per granule
- MODIS Granules
  - » 5 minutes of data
  - » 1354 MODIS footprints per scanline
  - » 2040 MODIS scanlines per granule



# AIRS/AMSU/HSB Golf Ball





# AIRS Processing System

- Receive the Level 0 AQUA data in near real-time from EDOS
- 85% of the data is received within 2 hours of observation
- At least 98% of the AIRS/AMSU/HSB data is distributed to the users in under 3 hours
- NOAA/NESDIS/STAR processes AIRS, AMSU and HSB data
- NOAA/NESDIS/OSDPD processes MODIS and AMSR-E data



# Software

- JPL AIRS Package version 4.0.9.0
- SDP Toolkit version 5.2.10
- Additional Software:
  - » RBD to PDS converter framework supplied by Paul Haggerty (STC) at OSDPD
  - » GBAD PDS to DAAC L0 converter provided by Charlie Hoisington (SSAI) at GSFC
  - » BUFR Table and Converter provided by Jack Woollen of NCEP.
  - » MODIS/AIRS collocation code was provided by Fred Nagle of CIMSS.



# Current Products



# Deliverable BUFR Files

- 281 AIRS channel set, 15 AMSU channels, 4 HSB channels, 1 FOV per golf ball, every other golf ball (2 files)
- 324 AIRS channel set, 15 AMSU channels, 4 HSB channels, 1 FOV per golf ball, every other golf ball (2 files)
- 324 AIRS channel set, 15 AMSU channels, 4 HSB channels, 9 FOV per golf ball, every other golf ball

# Deliverable BUFR Files (cont)



- AMSU data only, full resolution
- HSB data only, full resolution (until Feb 2003)
- AIRS principal components, 1688 AIRS channels are contained in the data set, 1 FOV per golf ball, every other golf ball.



# NWP Customers

- NCEP
- DAO
- CMC
- JMA
- FNMOC
- UK-Met Office
- ECMWF
- Meteo-France
- DWD
- BMRC (Australia)



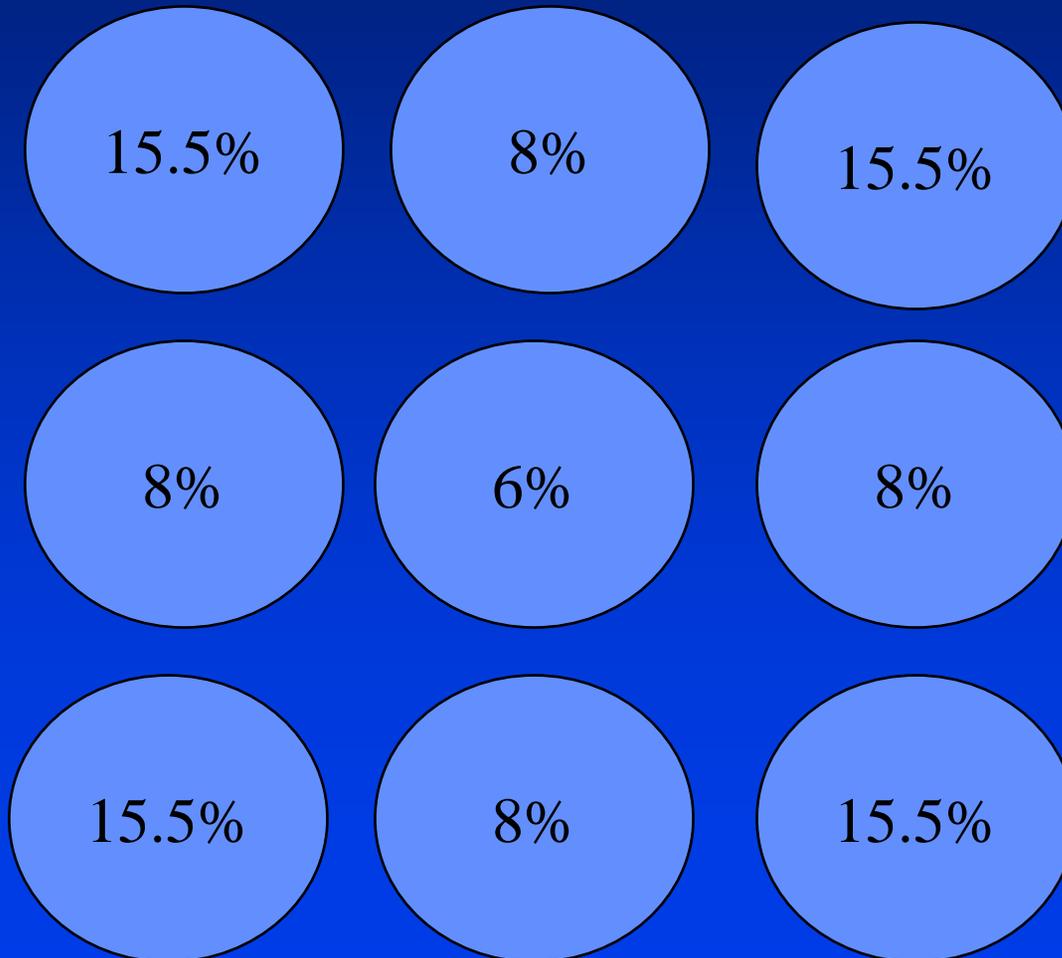
# New Products



# Data for NWP Centers

- NWP centers would like the clearest FOV
- Center FOV is not optimal
- Use AIRS only data for timely product delivery
- Use MODIS and AIRS data for delayed product delivery

# Warmest FOV Distribution for a Golfball Over One Day





# Warmest Golfball FOV

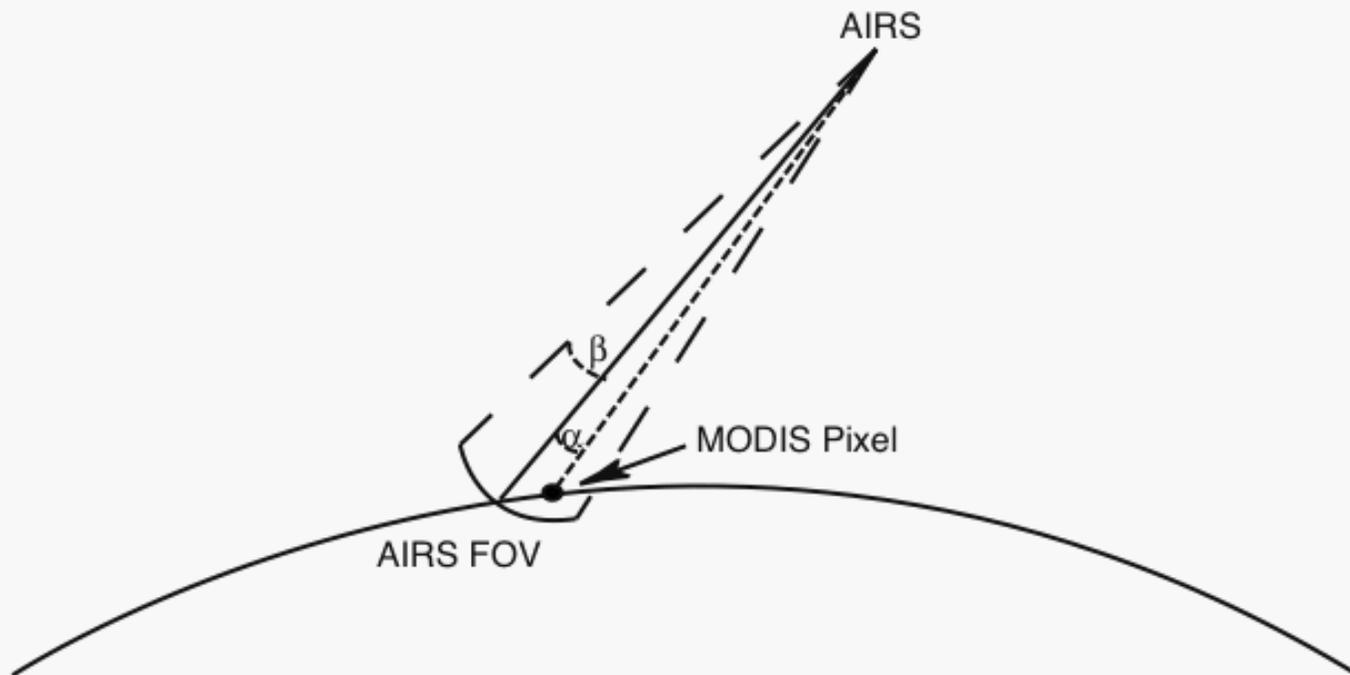
- Only uses AIRS data
- Determine the warmest FOV in the golfball using channel 1292 ( $1231.890 \text{ cm}^{-1}$ )
- Output BUFR format is the same

# MODIS Collocation with AIRS



- Code developed by Fred Nagle at CIMSS (Wisconsin)
- Find MODIS footprints that fall within an AIRS footprint
- Weight the MODIS footprints using the AIRS spatial weighting function
- Average the MODIS footprints within the AIRS footprint to create MODIS golfballs

# MODIS Collocation with AIRS -- Concept



# Collocated MODIS Golfball Data



- Averaged MODIS radiances and reflectances
- Averaged Clear MODIS radiances and reflectances (using cloud mask confidently clear flag)
- Cloud Fraction
- Number of points in the cloudy and clear averages
- Highest cloud top temperature and pressure (from the one km MODIS data)

# Clearest AIRS FOV using MODIS Cloud Fraction



- Use collocated MODIS cloud fraction to determine the clearest AIRS FOV
- Same output BUFR format as other files
- Store MODIS cloud fraction for the AIRS clearest FOV in the BUFR file



# IASI BUFR Files

- Currently simulate IASI data and store it in the EUMETSAT L1C binary format.
- Have code to spatially and spectrally subset the IASI data
- Have code to convert the IASI radiances into principal components
- Will have test BUFR files within one month



# Summary

- Near Real-Time AIRS/AMSU/HSB System is in place
- Currently distributing the AIRS data for the center FOV for each golfball
- New data set containing the warmest AIRS FOV for each golfball
- New data set containing the clearest AIRS FOV for each golfball determined using collocated MODIS data