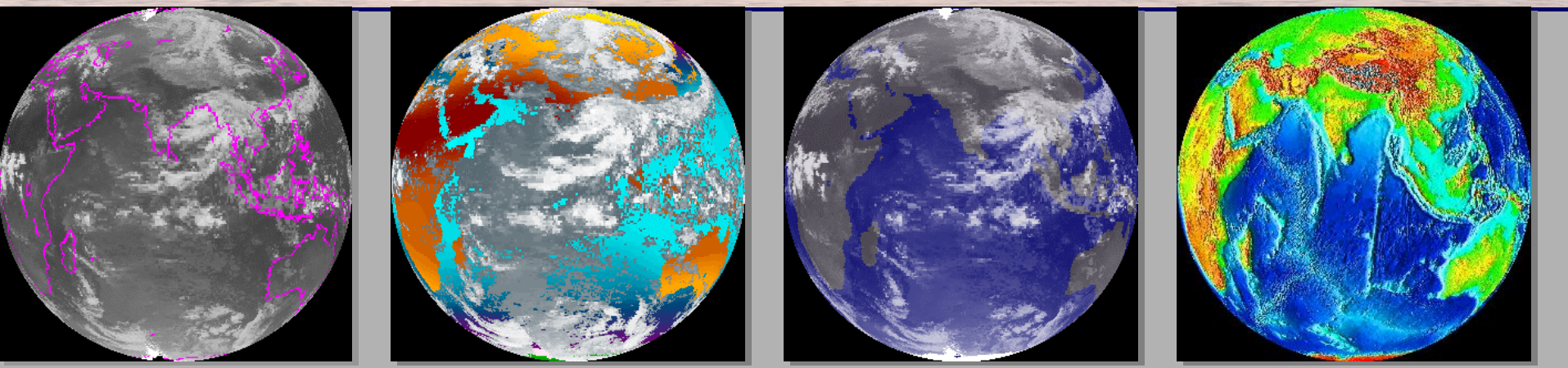


Australian Preparations for GIFTS

-J. F. Le Marshall

W. L. Smith, L. M. Leslie

R. G. Seecamp, A. Rea, M. Dunn

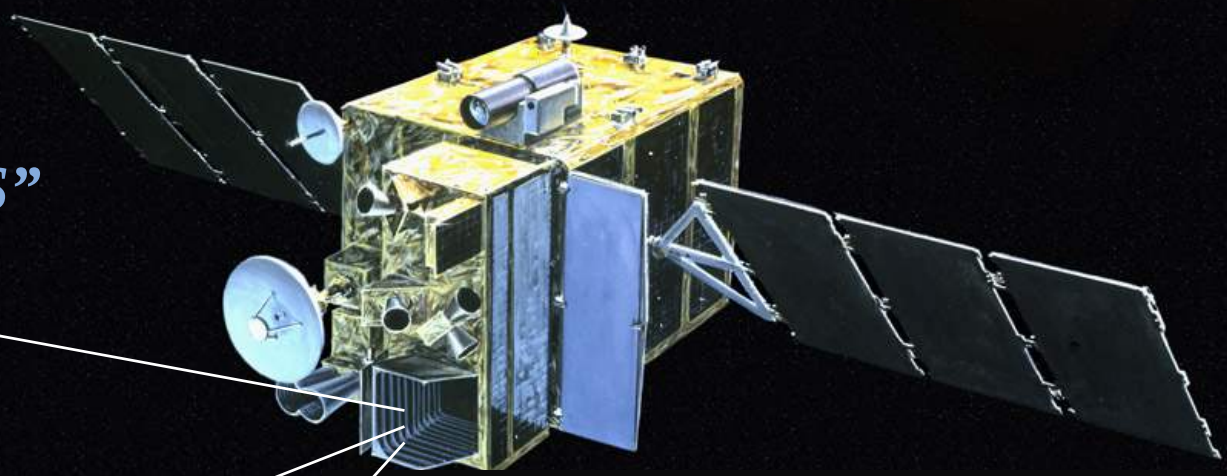
Geostationary Imaging Fourier Transform Spectrometer

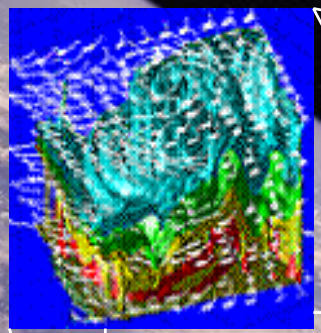
GIFTS – *A revolutionary weather observation tool*

NASA , U Wisc., Utah St. U., NOAA, Navy/AF, BoM (Australia)

New Technology for Atmospheric Temperature, Moisture, Chemistry, &*Winds*

EO-3 "GIFTS"





4-d Digital Camera:

Horizontal: Large area format Focal Plane detector Arrays

Vertical: Fourier Transform Spectrometer

Time: Geostationary Satellite

GIFTS Program Concept

TECHNOLOGY

Imaging Interferometer
- *Cryogenic Michelson Interferometer*
- *Laser Metrology System*
- *On-Board Calibration*

LFPA and Cryogenic Cooling
- *128 x 128 Infrared Detector Arrays*
- *Redundant Cryo-Coolers*

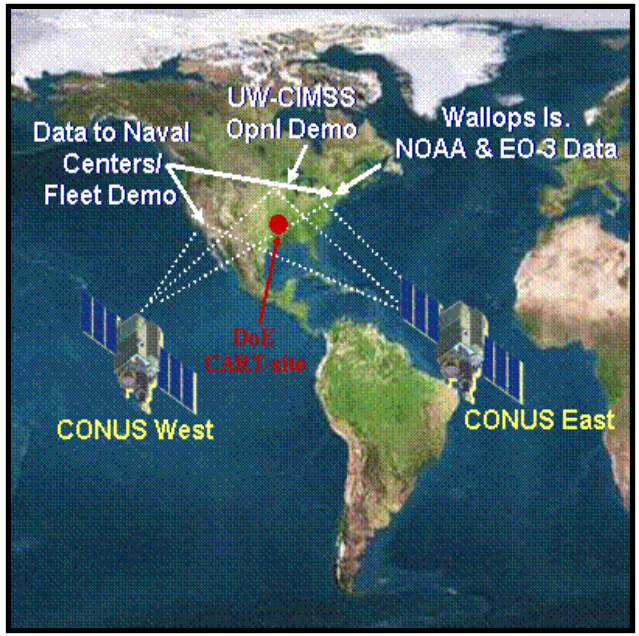
High Speed Signal Processing
- *Rad-Hard Analog to Digital Converters*
- *PowerPC Rad750*

Data Compression
- *Rad-Hard Processors*

Pointing and Control
- *Star Tracker*
- *512 x 512 Visible Detector Array*

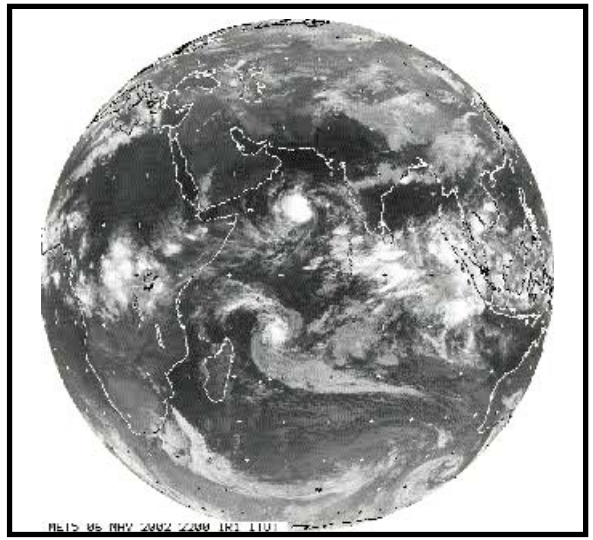
Lightweight Optics
- *SiC Telescope*

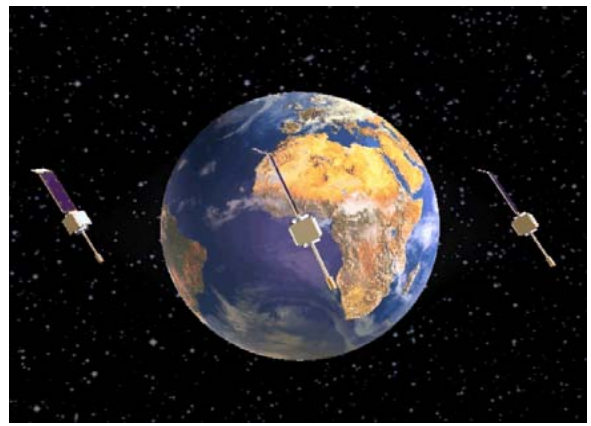
VALIDATION



INFUSION

Indian Ocean Ops



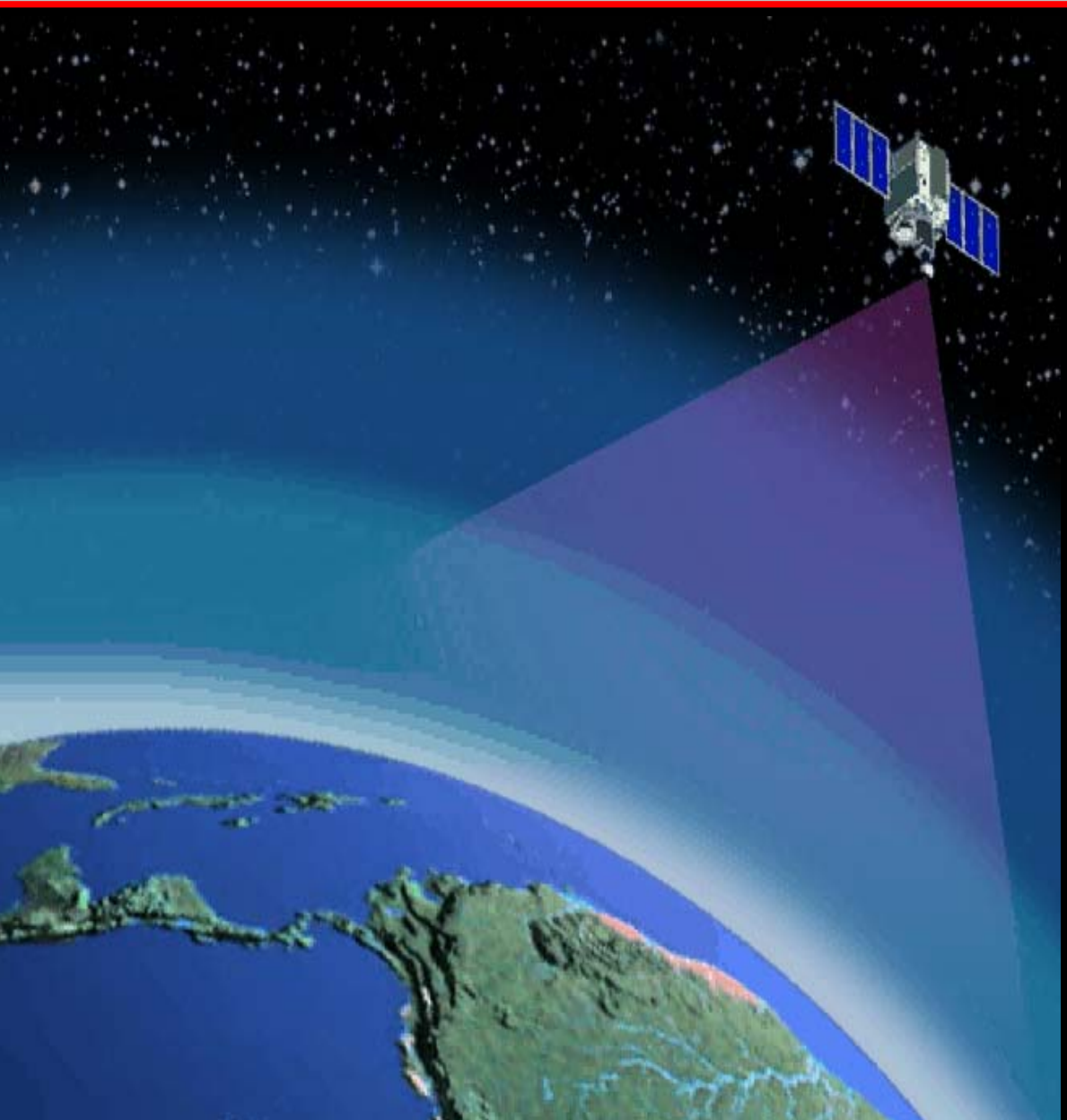


NASA - Demonstrate Wind Sounding Measurement Concept & Validate the Technologies

NOAA - Demonstrate Operational Utility & Infuses Technology into NOAA instruments

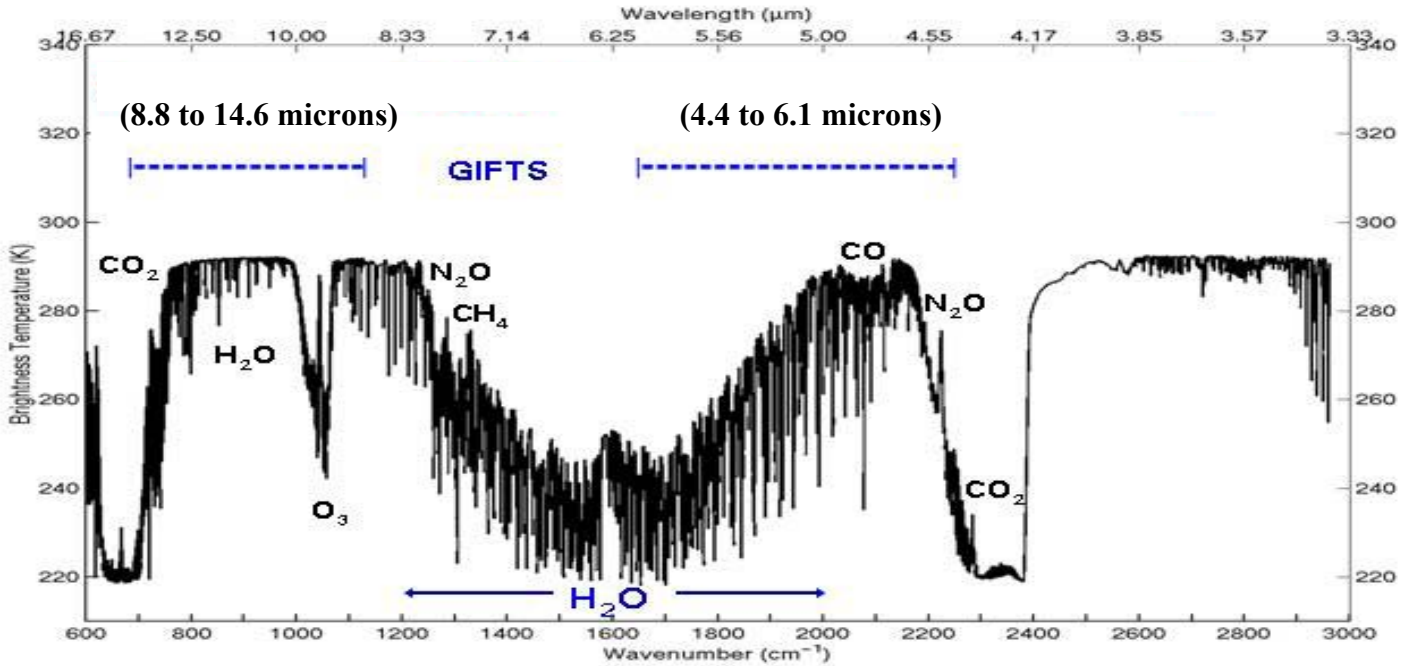
Navy - Provides Advanced Imaging/Sounding Data Products for Fleet Operations

GIFTS Sampling Characteristics



- **Two 128x 128 Infrared focal plane detector arrays with 4 km footprint size**
- **A 512 x 512 Visible focal plane detector array with 1 km footprint size**
- **Field of Regard 512 km x 512 km at satellite sub-point**
- **Ten second full spectral resolution integration time per Field of Regard**
- **~ 80,000 Atmospheric**

GIFTS IR Measurements and Products



Products:

Water vapor (soundings, fluxes, winds)

Temperature (sounding, stability)

Carbon monoxide concentration (2 Layers)

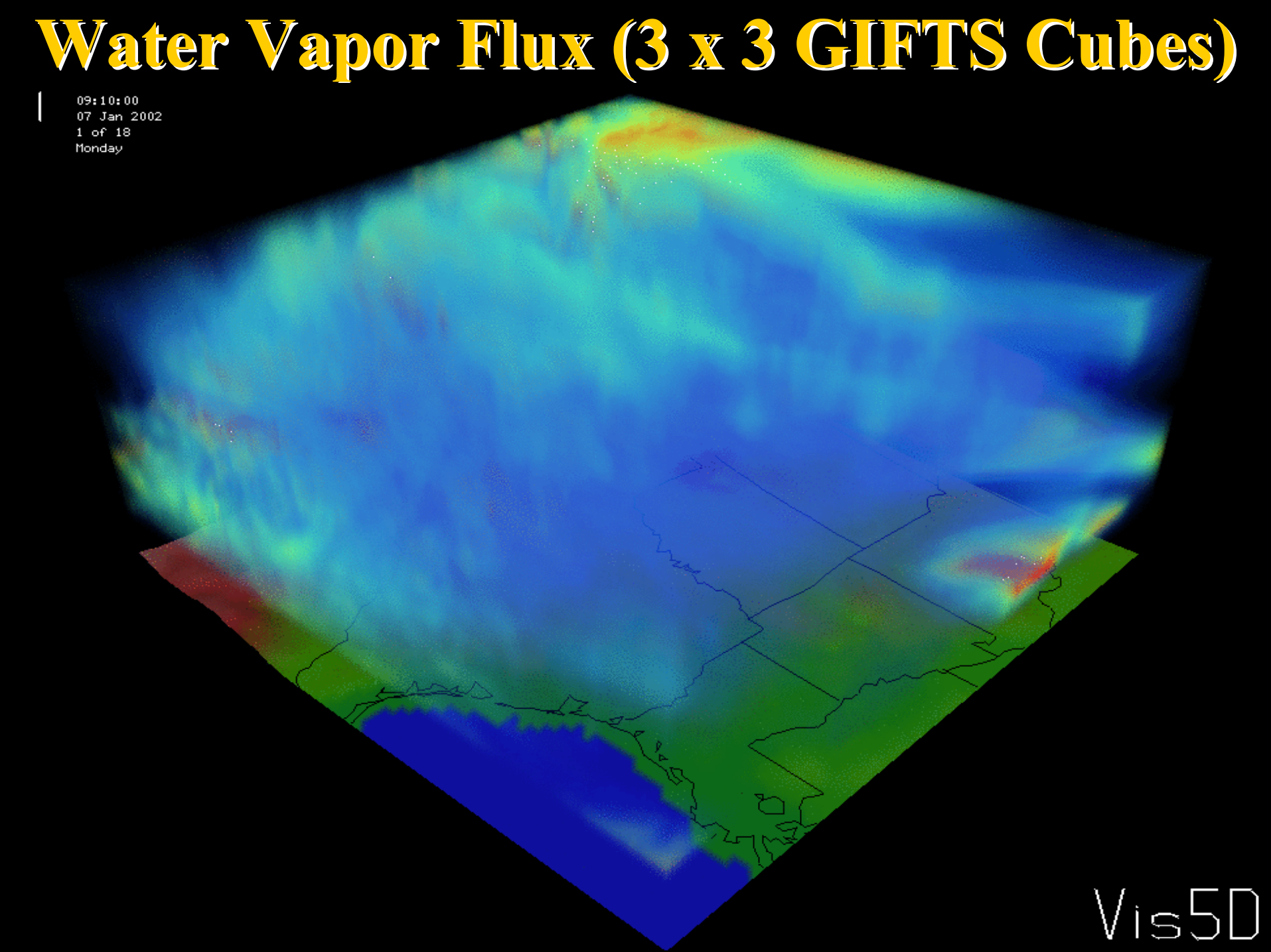
Ozone concentration (4 Layers)

Surface Temperature and emissivity

Clouds (altitude, optical depth, microphysical properties, winds)

Mineral Dust / Aerosol Concentration and Depth

Water Vapor Flux (3 x 3 GIFTS Cubes)



Wind Measurement

00:26:00
14 Sep 98
1 of 3
Monday

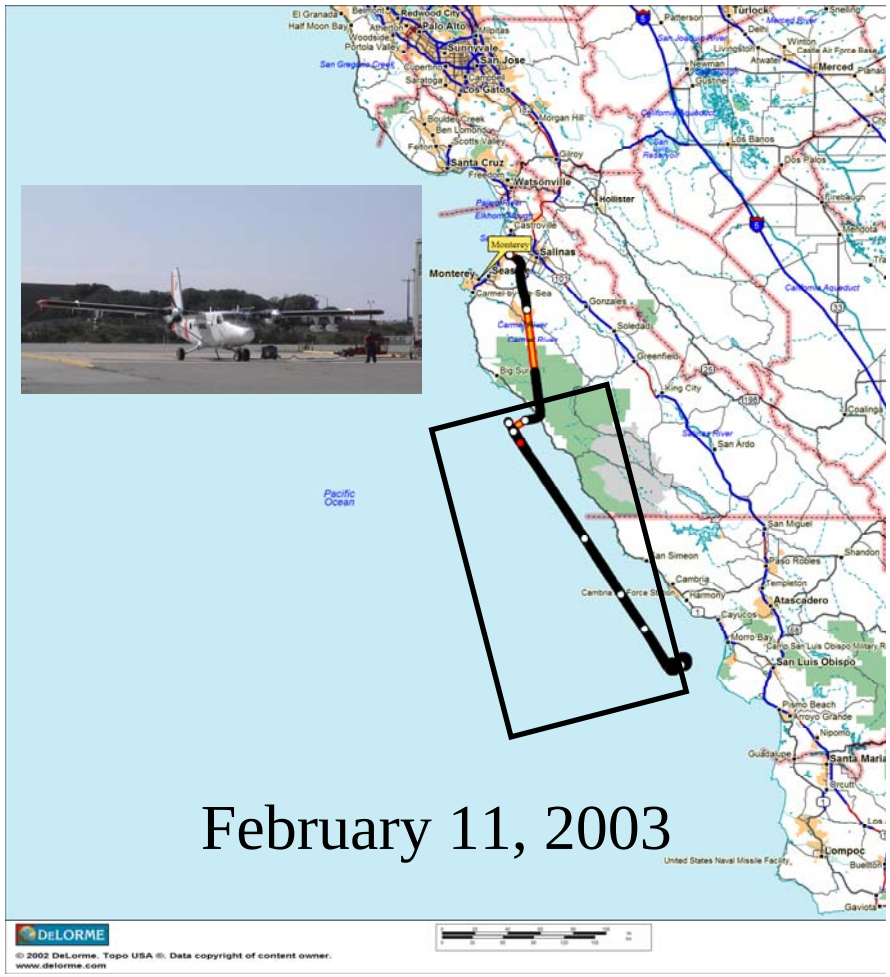
NAST-I water vapor retrieval
200 hPa Relative Humidity (%)

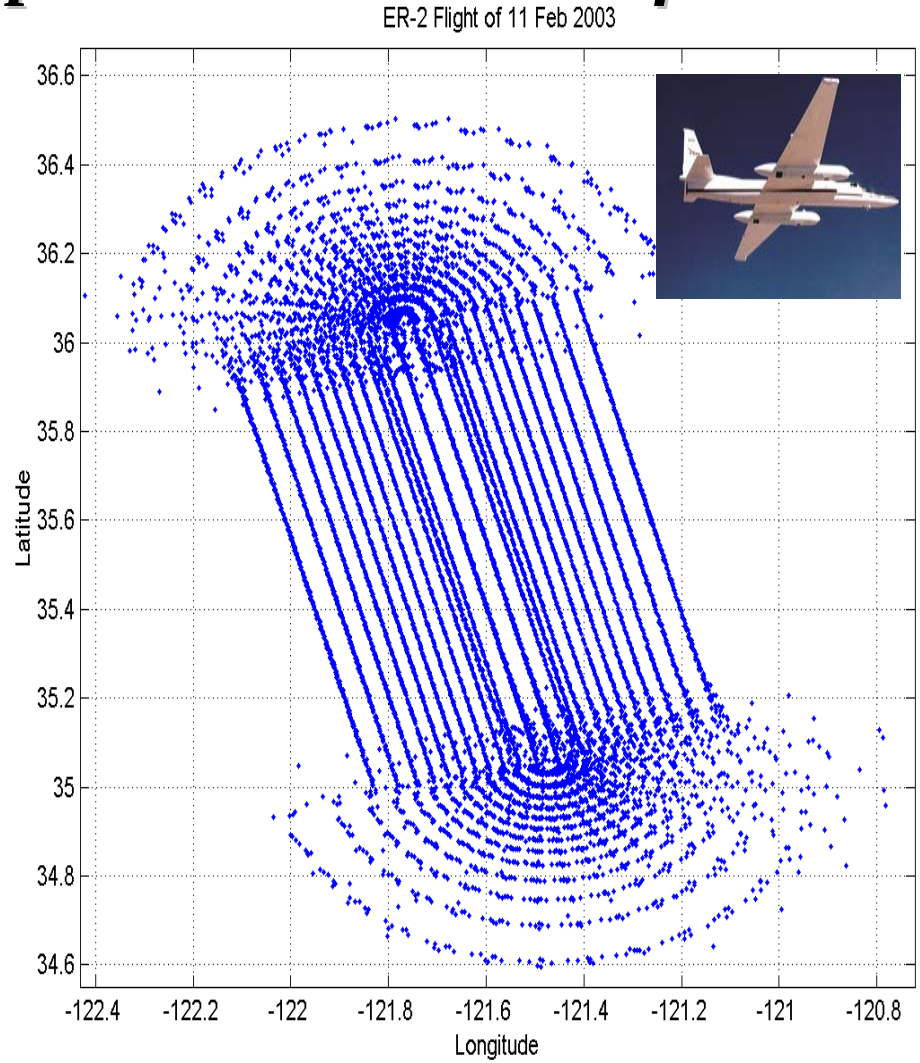
δt~35 min

NAST-I Water Vapor Tracking Demonstrates GIFTS Wind Profiling Technique

60 km x 40 km

NAST Under flight by Twin Otter Doppler Wind LIDAR Is Used to Validate Water Vapor Tracer Wind Profiles*

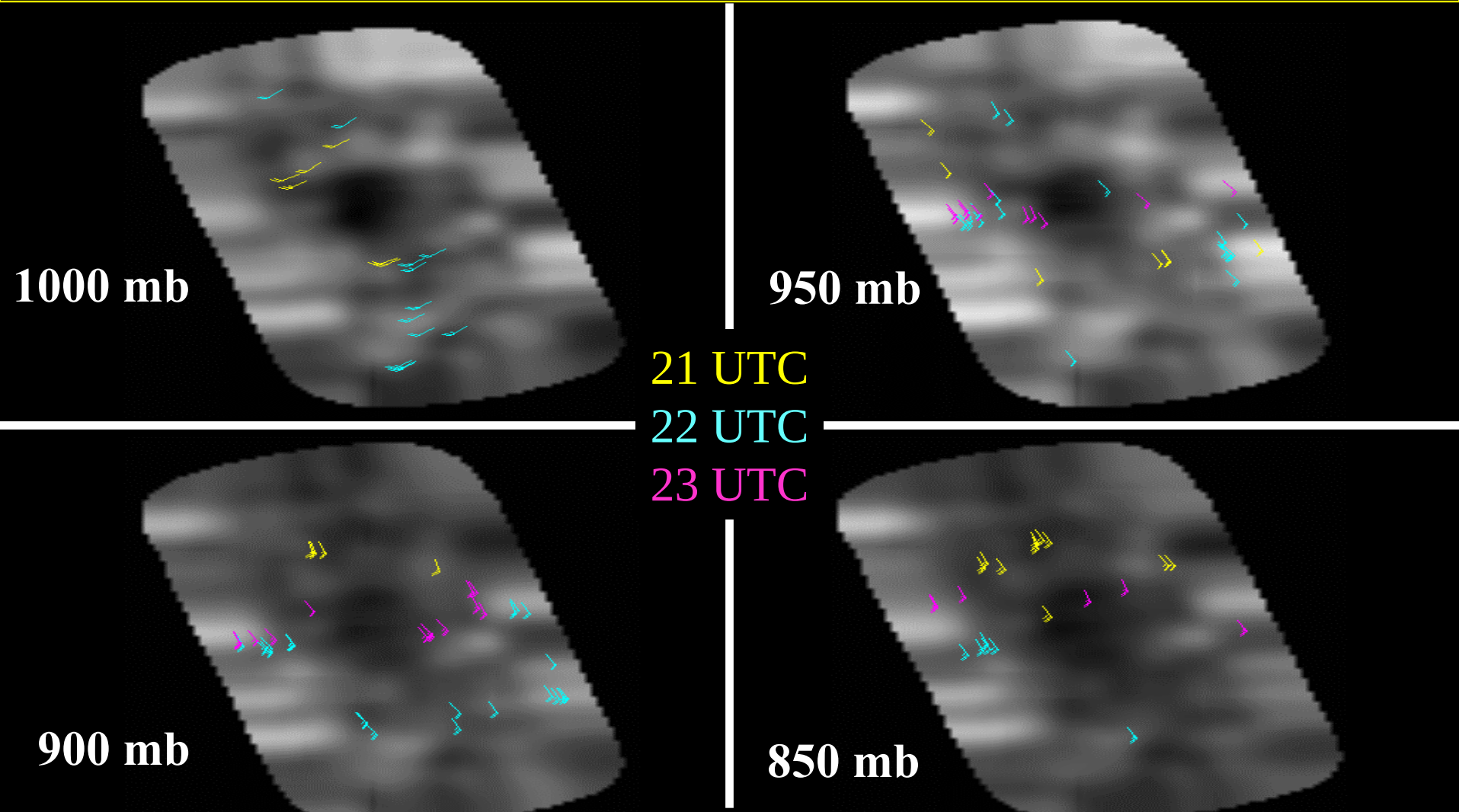




TODWL & NAST Observation Tracks

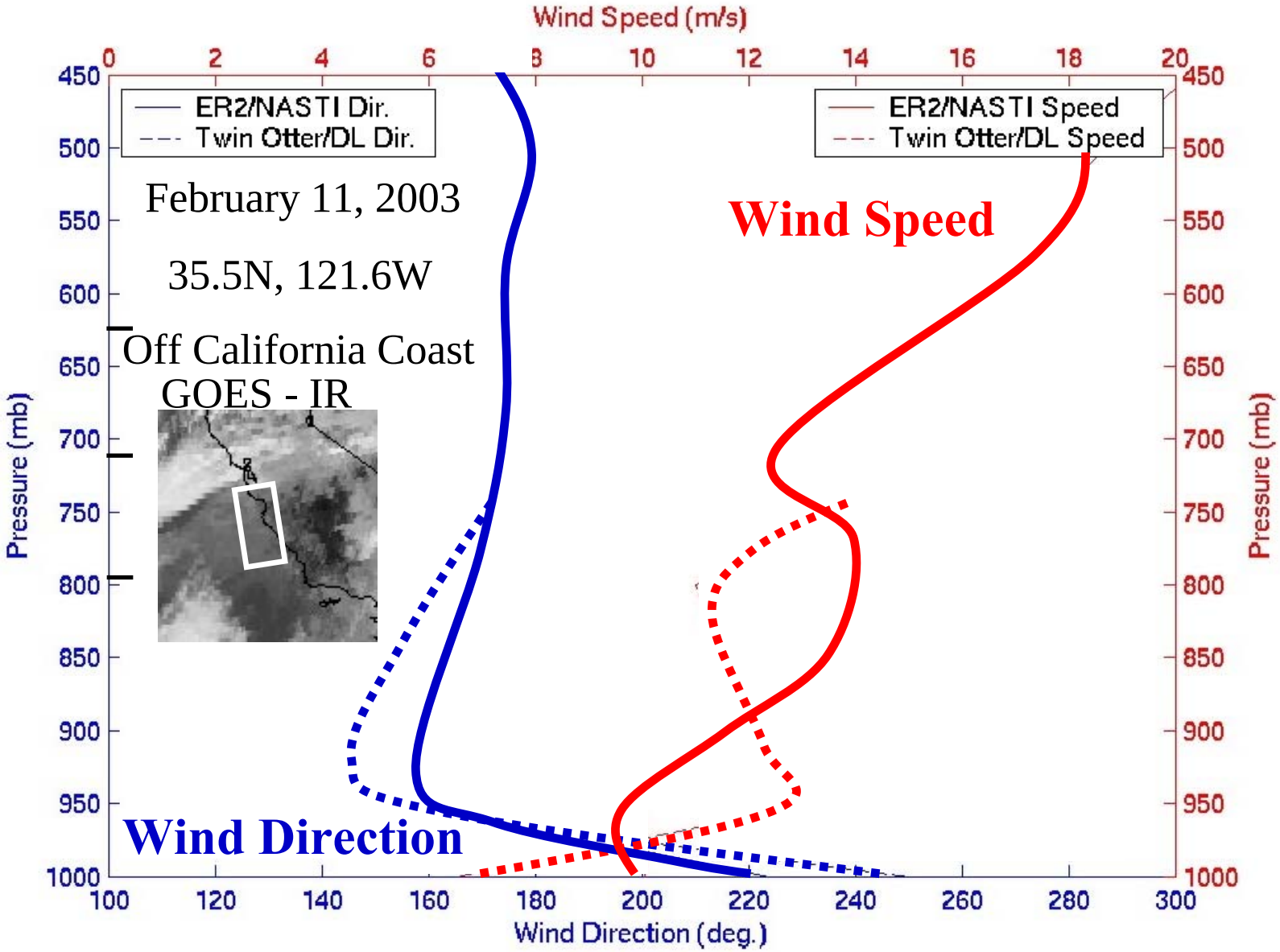
*** Courtesy of G. D. Emmett, Simpson Weather Associates**

Automated NAST Water Vapor Profile Tracer Winds Possess Excellent Time and Space Continuity*

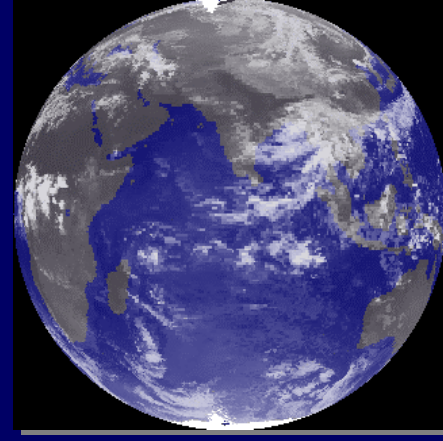


* Tracer winds produced by University of Wisconsin WINDCO program

NAST H_2O Profile Winds Compare Favorably With Twin Otter Doppler LIDAR Winds (δ < 3 m/s)



GIFTS - Anticipated Australian Contribution



- provide groundstation
- data reception
- data processing
- product generation
- product distribution to weather services and global NWP centres
- archive

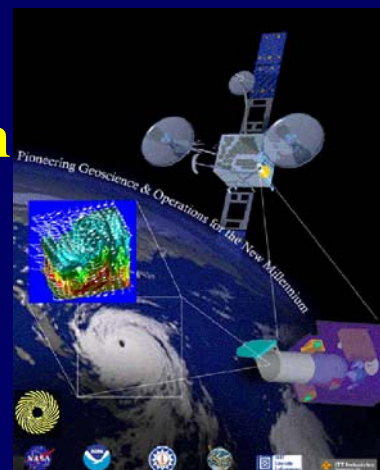
Groundstation

- Ground Station in WA
- microwave link to receiving station
- Processing, archive and distribution

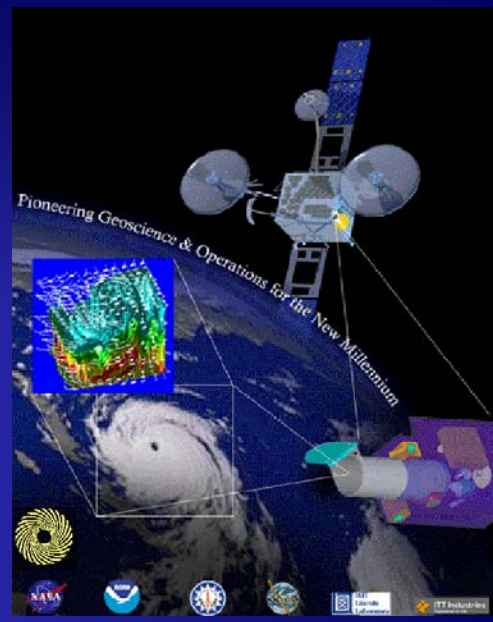
Processing

- PC cluster approach
- Consistency with SSEC/US processing i.e. similar systems
- Transition from Pacific/Atlantic to Indian Ocean seamless (products and archive)

Archive and Dissemination



GIFTS



Day 1 Products

- Radiance Products
  - * Selected channels
  - * Superchannels
  - * Eigenvectors
  - * Pre Launch Data
- Winds - conventional tracking / clear air 4D Var.
- Temperature and Moisture Soundings
- Sea Surface Temperature and Emissivity
- Land Surface Temperature and Emissivity
- O_3 amount and profile

GIFTS Winds

Image Processing

- Combining 10 second cubes to provide continuous fields
- Tracking of cloud features
- Multi-channel height assignment
- Tracking of moisture features on pressure surfaces

4-D Var.

- 10 second cubes used to provide T(p), r(p)
- 4-D Var. used to solve for $\underline{v}$.
- later 4-D Var. used with Radiance product to solve for $\underline{v}$.

Status of EO-3 Mission

- All of the new GIFTS Technologies are developed, being tested, and meeting or exceeding requirements.
- Instrument is expected to be completed, tested, and launch ready by the end of 2005
- Currently identifying a spacecraft opportunity for a 2006-2009 launch, possibly through the US Air Force space test program
- Australian Bureau of Meteorology to support GIFTS data acquisition, processing, distribution, and archival for an eastern hemisphere satellite position