

Real Time Mission Monitoring



Support of the Tropical Composition, Cloud and Climate Coupling (TC⁴) Experiment

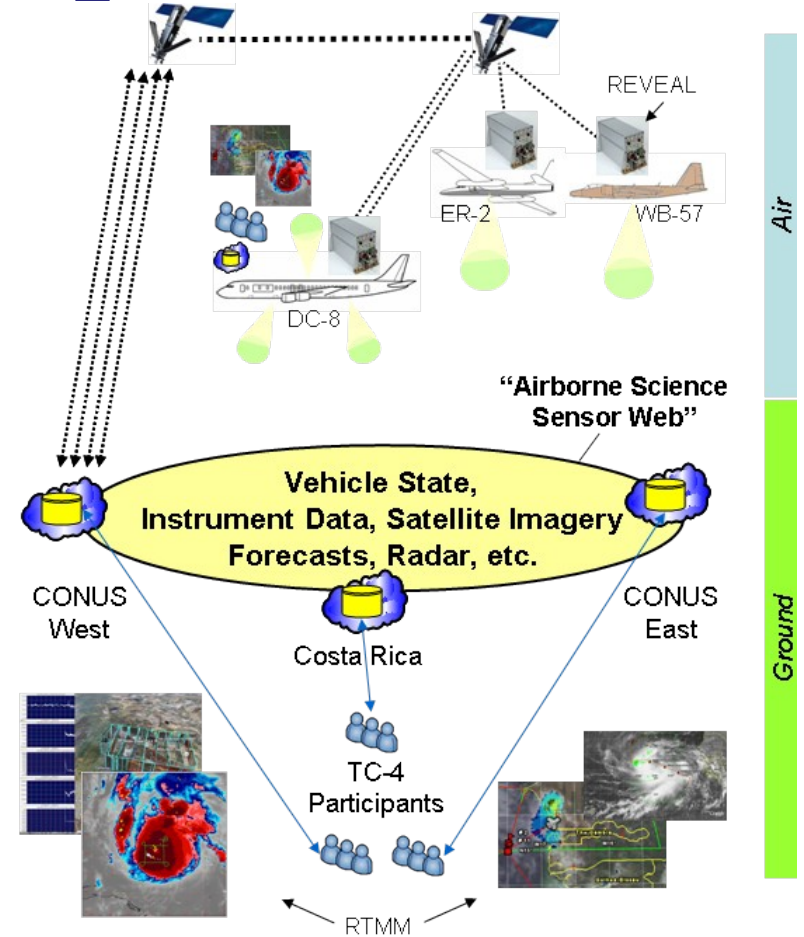
*Science Team Meeting
25-27 April 2007*



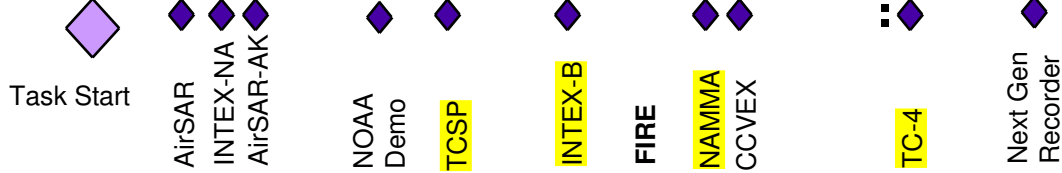
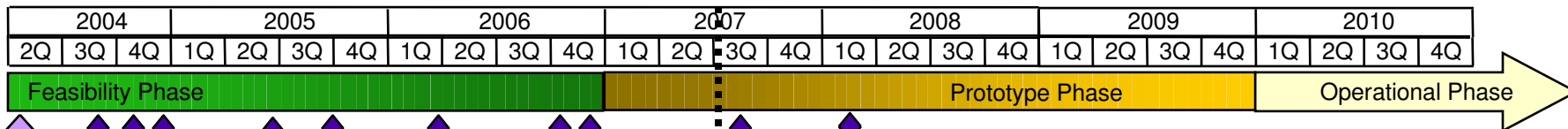
Suborbital Telepresence

Objectives

- Develop/demonstrate low-cost products and services for airborne science
 - ❑ Situational awareness, decision support
 - ❑ Sensor web: *i.e.* Instrument interaction/C4I
- Necessary on future autonomous vehicles, but value in application to *all* platforms
- Onboard system focus: payload needs
 - ❑ Acquisition, integration, recording, processing, communications mgmt services
- Terrestrial system focus: operation needs
 - ❑ Data processing, fusion, distribution, display, playback services

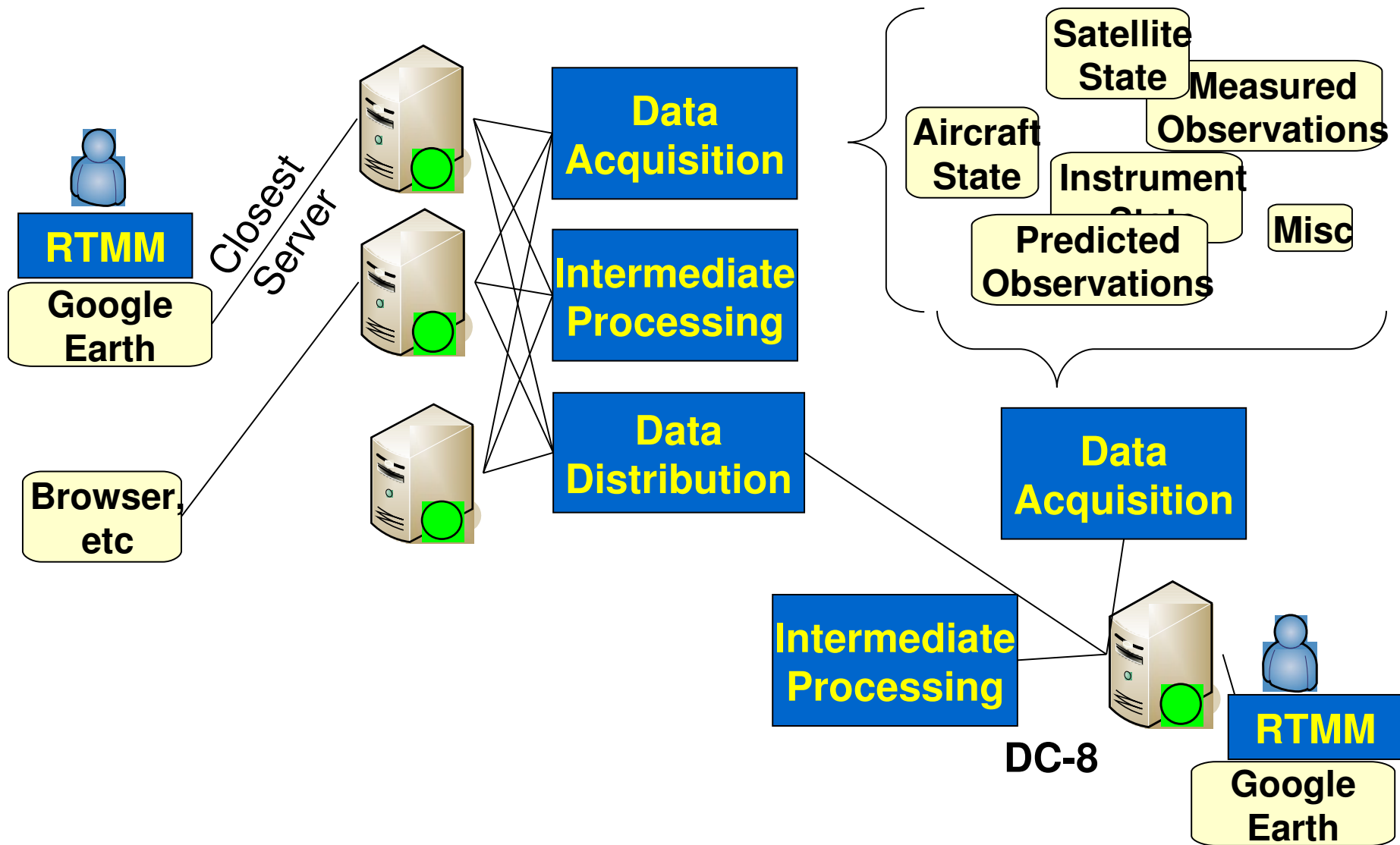


today





Notional Architecture





What is RTMM?

The Real Time Mission Monitor (RTMM) is an interactive visualization application that provides situational awareness and enables adaptive and strategic decision making.



- Utilizes distributed web-based architecture
- Leverages satellite-aircraft communications strategies
- Monitor aircraft tracks
- Access and display satellite, sub-orbital, and surface measurements
- Visualize model output parameters
- Integrated with an easy-to-use freely available visualization package
- Built upon a solid heritage of field campaign real time monitoring applications

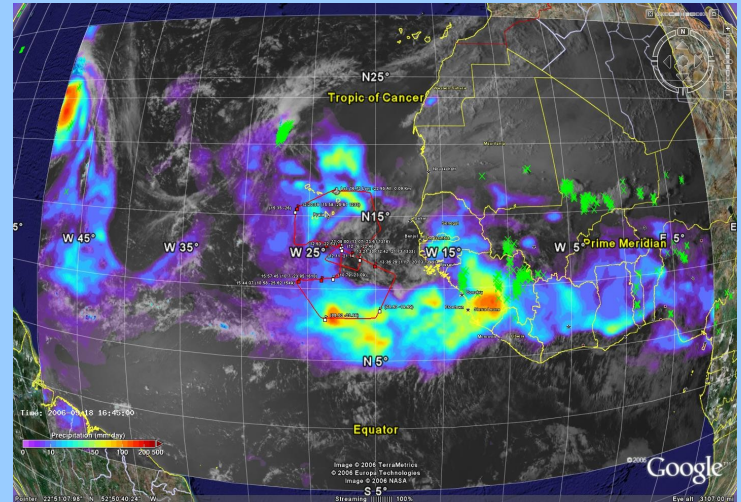




Planning, Support, and Analyses

RTMM facilitates:

-  Pre-flight planning
-  In-flight monitoring and adaptive flight management strategies
-  Post-flight analyses, research, and assessments (in playback mode)

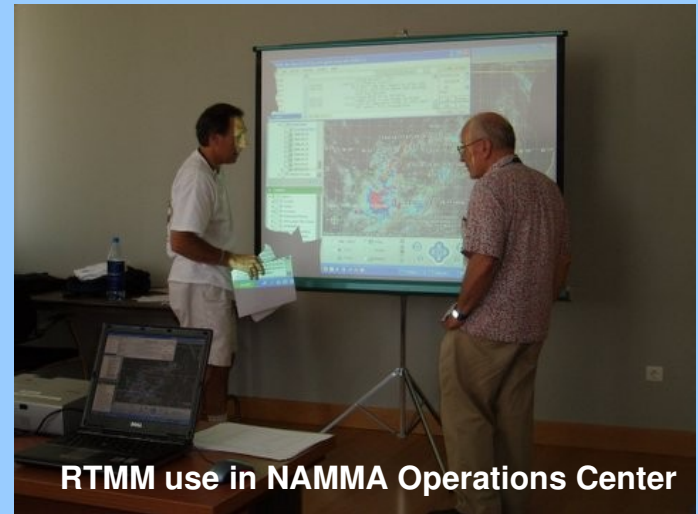





User-base and Application

 RTMM is available for use by:

-  Program Managers
-  Mission Scientists
-  Mission Management
-  Research Scientists
-  Educators/Students
-  Science Attentive Public



 RTMM enables real time collaborations

 RTMM capability now available on-board the DC-8 aircraft itself during flights



Example: Operations Support

The screenshot displays the Google Earth interface with a satellite mission path overlaid on a false-color satellite image of West Africa. The path is a red line connecting several way points: Santa-Luzia, Praia, Maio, Sal, Dakar, Banjul, Bissau, Ilha Bolama, Conakry, and Freetown. A green line also connects Sal, Praia, Maio, and Dakar. A red circle is drawn around Dakar. The map shows cloud cover and precipitation intensity in shades of blue and green. The interface includes a 'Places' sidebar on the left with various satellite data layers, a 'Layers' sidebar, and an XChat window in the bottom-left corner. The XChat window shows a chat log with messages from participants like Ed, mikedouglas, GoodmH, and Carls_DC8. A mouse cursor is visible over the map near Dakar.

Real Time Mission Monitor window

XChat window

Google Earth interface elements:

- Places sidebar: Band 8 9.7 um Ozone, Band 9 10.8 um TTR surfac, Band 10 12.0 um IR surfac, GOES 12 NAMMA, GOES 12 GFAB, Other Satellite Products, OSTIA SST (Daily), SMG/SEVIRI (Available soon), Radar (Simulated), Lightning, ZEUS (Last hour), ZEUS (Last 30 Minutes), ZEUS (Last 15 Minutes), ATD (Last hour), ATD (Last 30 Minutes), ATD (Last 15 Minutes), Way points, 2006-08-25, Dropsonde (Available soon), Model Overlay, Miscellaneous, URLs, Aerosonde Hurricane Mission.
- Layers sidebar: terrain, roads.
- XChat window: Chat log with messages from Ed, mikedouglas, GoodmH, and Carls_DC8.



Satellite FOV & Instrument Data

The screenshot displays the Google Earth interface with a satellite mission monitor overlay. The main map shows a satellite's field of view (FOV) as a red and blue shaded area over the Pacific Ocean, with a flight track in red and blue. A weather radar overlay is visible, showing precipitation intensity. The interface includes a search bar, a 'Places' sidebar with a tree view of mission data, and a 'Layers' panel at the bottom.

Search: Fly To: Find Businesses, Directions. e.g., 1600 Pennsylvania Ave, 20006

Places: My Places, Temporary Places, Real-Time Mission Monitor, RTMM Instructions, NAMMA Mission, Playback, Full Control, Basic Control, Flight, Speed, Action, Play, Pause, Rewind, Time, POST VIEW, NAMMA Domain, Other Views, DC-8 Flight Track, MSG, GOES 12, Satellite Overpass, Lightning, Way Points, Dropsonde, URLs

DC-8 Alt 4,734 Km Speed 161.09 heading -153.82

D20060912_122059_P.1 061529235 NAMMA, RF#13 McDonnell Douglas DC-8, N817NA

Aspen V2.6.5, 12 Sep 2006 13:29 UTC

MSG IR 10.8

2006-09-12 14-00-00

Pointer lat: 6.984321° lon: -10.099206°

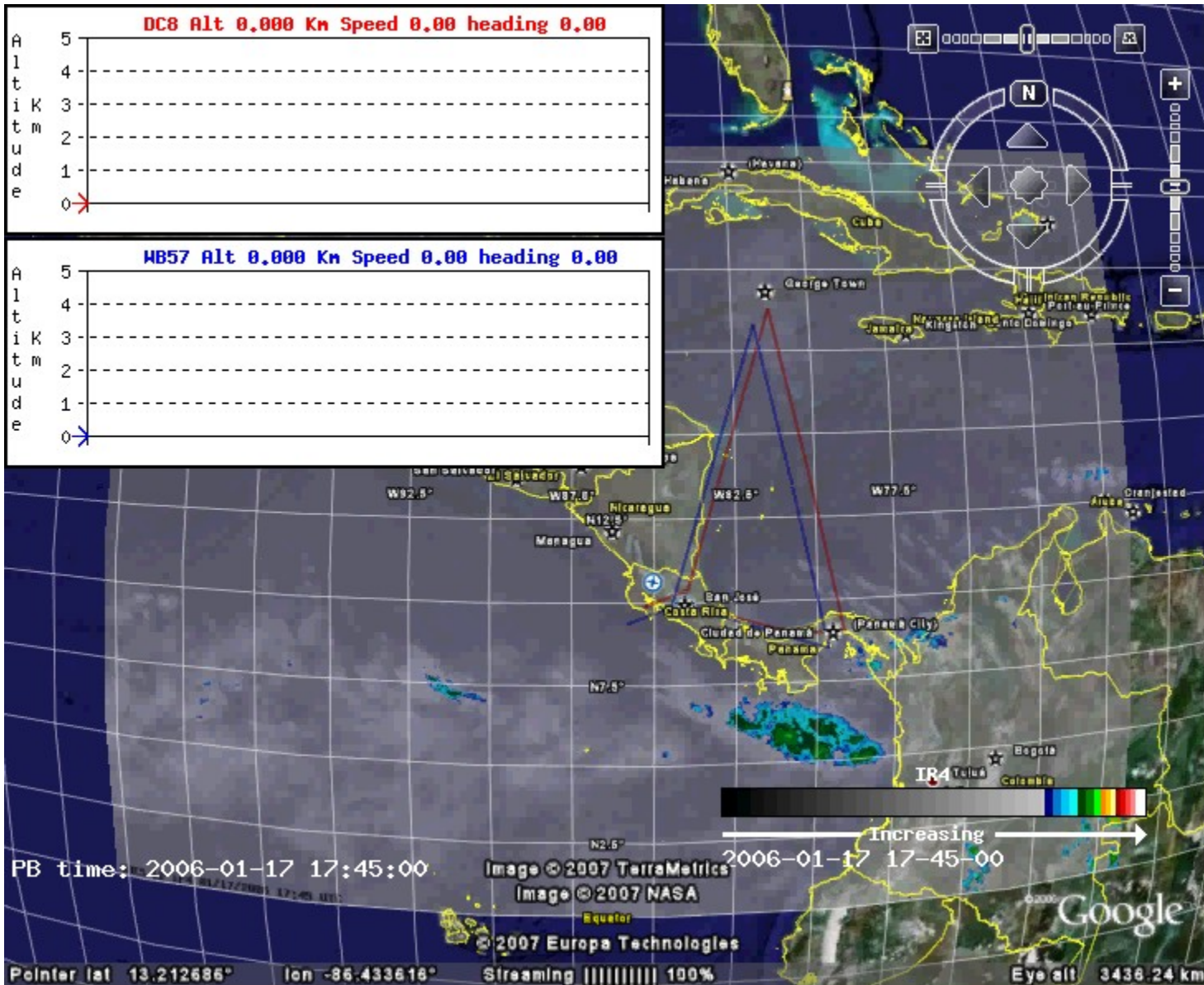
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Streaming 100%

Eye alt 2691.87 km



Example: TC⁴ Simulation





TC4: RTMM Data Sources

 Data Sets planned or available for TC⁴ (we can add to these)

Satellite Imagery

- GOES-E, GOES-10 (vis, infrared, 15 min update, some rapid scan)
- Satellite & instrument FOVs – current and predicted tracks
- Satellite products (e.g., to support postflight activities)

Model Output

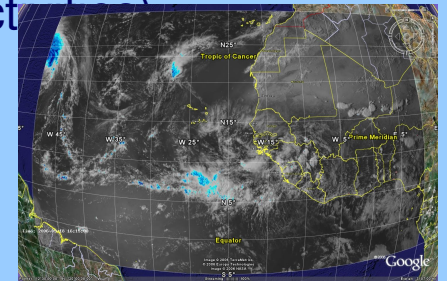
- GEOS-5, WRF, NCEP, MM5, other

Aircraft Instruments

- Flight tracks (waypoint, real time tracks, etc.)
- Dropsonde (time/locations and skew-T)
- Aircraft Instruments: health/status, data, cmd/cntrl (case-by-case) (LASE, Dial, AMPR, MTP, SSFR, CAFS, PANTHER, ...)

Surface and Balloon Observations

- Radar (NPOL, SMART)
- Lightning (Vaisala long range, Costa Rica lightning, WWLLN)
- TicoSonde
- Other (NATIVE)



 Playback capabilities available for review and analyses



TC4: Additional Inputs Sought

- Questionnaire has been developed by TC⁴ Suborbital Telepresence and RTMM team to help identify and prioritize additional data acquisition, integration, management and display tasks that might be pursued beyond existing baseline.
- Responses can be given to Richard Blakeslee or Larry Freudinger or emailed to:
ssp-global-range-staff@lists.nasa.gov
- URLs for accessing and testing the RTMM will be provided soon to the TC⁴ Science team