TRMM Edition 2b TISA Products
Validation and Readiness

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Time Interpolation and Spatial Averaging (TISA)

Overview of Talk

• Product descriptions and schedules
• Progress since January
• Construction of directional models
• Using geostationary data
  – Calibration of imager data
  – Comparisons with ISCCP
  – The search for satellite-to-satellite discontinuities
• GEO-enhanced data
  – Time sampling discussion
  – A look at net fluxes and cloud forcing
• What’s next?
Where TISA Fits Into CERES Processing

CERES Instrument Data

Geolocate & Calibrate 1

ERBE-Like Inversion 2

ERBE-Like Averaging 3

Clouds & TOA Flux 4

Grid TOA & SRB 9

Monthly TOA & SRB 10

SARB 5

Grid Geo Data 11

Grid SARB 6

Time Interpolate SARB 7

Monthly Mean SARB 10
Upcoming TRMM TISA Products

- Subsystem 10 (Data Product: SRBAVG)
  - Two Interpolation Methods (GGEO & non-GGEO)
  - Uses Cloud Properties from GGEO Data
  - Clear Sky Interpolation Using GGEO
  - Total-sky Fluxes Derived Using ERBE-like ADMs
  - Surface Fluxes

- Subsystem 9 (Data Product: SFC)
  - Gridded SSF
  - Used as input to producing SRBAVG

- Subsystem 11 (Data Product: GGEO)
  - Gridded Geostationary imager data
  - Used for temporal interpolation
  - Not archived
TRMM TISA Schedule

• SRBAVG
  – Beta3 released to public this week
  – Beta4 delivered and ready to process
  – Edition2b due for delivery in late June

• SFC
  – Beta2 released to public
  – Beta4 delivered and ready to process
  – Edition2b due for delivery in early June

• GGEFO
  – Not an archival product
  – Beta4 delivered and ready to process
  – Edition2b due for delivery in mid June
Status of TOA and Surface Products

- **GGEO**
  - 8 months of GGEO run
  - Calibration comparisons with ISCCP underway
- **SRBAVG**
  - DRMs developed
  - VIRS only cloud product added
  - Clear-sky GEO SW eliminated
  - CERES ADMs used with GGEO SW
    - New NB-BB relationship
  - GGEO LW clear-sky now fit at end of month
  - Debugging in progress
- **SFC/FSW**
  - Format finalized - reorganized by region
  - ERBE-like averages eliminated
  - Clear-sky redefined as < 0.1%
- Validation in progress
## Major Hurdles

<table>
<thead>
<tr>
<th>Issue</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total-sky LW algorithm</td>
<td>Done</td>
</tr>
<tr>
<td>Clear-sky LW algorithm</td>
<td>Improved</td>
</tr>
<tr>
<td>Total-sky SW algorithm</td>
<td>Set</td>
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<tr>
<td>– Directional Models</td>
<td>Done</td>
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<tr>
<td>– New ADMs</td>
<td>Done</td>
</tr>
<tr>
<td>Clear-sky SW algorithm</td>
<td>Done</td>
</tr>
<tr>
<td>VIRS/GGEO cloud issues</td>
<td>Revised cloud product</td>
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<tr>
<td>SFC &amp; SRBAVG HDF Formats</td>
<td>Done</td>
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<tr>
<td>Data Quality Summaries</td>
<td>Written</td>
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<tr>
<td>Collection Guide</td>
<td>In Progress</td>
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<tr>
<td><strong>GGEO calibration</strong></td>
<td>In Progress</td>
</tr>
<tr>
<td><strong>Validation</strong></td>
<td>In Progress</td>
</tr>
</tbody>
</table>
Minor Hurdles

- Fix net flux  
- Add lat/lon to SRBAVG  
- Default vs. 0. fluxes  
- Twilight correction  
- Integrated solar for Sfc fluxes  
- Add separate cal for desert  
- Cloud interpolation issues  
- Raw SW averages  
- Minor DRM adjustments  
- Limit high SZA data

Fix identified
Fix identified
Fix identified
Algorithm ready
Algorithm ready
Algorithm ready
In testing
In testing
In testing
In testing
ERBE-like Directional Models
(Albedo as a Function of Solar Zenith Angle)

• Use models for albedo interpolation
  – Biggest effect is on non-GEO means
  – Less important for 3-hourly G GEO data

• Ensure consistency with CERES ADMs
  – Scene types based on ADMs
  – Percentile method on hold
Using Imager Data from Geostationary Satellites for Interpolation (GGEO)

• **Current Work**
  – Comparisons with VIRS
  – Comparisons with ISCCP

• **Effects on fluxes**
  – GEO vs. nonGEO differences
    • Diurnal Range
    • Meridional Gradients
    • Net fluxes
    • Cloud Forcing
  – Search for artifacts
    • Longitudinal differences
    • Calibration sensitivity tests
VIRS/GEO Comparisons

- Looked at all 8 months
  - Results similar to February/July results shown in 01/02

- Viewing and Solar Zenith Dependence

- Regional differences

- Deep convective cloud albedo comparisons
  - code obtained but not implemented
### GEO-VIRS Differences (Feb 1998)

<table>
<thead>
<tr>
<th></th>
<th>Cloud Fraction</th>
<th>Cloud T (K)</th>
<th>Optical Depth</th>
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<tbody>
<tr>
<td>GOES-8</td>
<td>+0.01</td>
<td>+0.3</td>
<td>-1.8</td>
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<tr>
<td>GOES-9</td>
<td>0.00</td>
<td>+0.2</td>
<td>-1.6</td>
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<tr>
<td>METEOSAT-5</td>
<td>+0.10</td>
<td>+0.6</td>
<td>-2.2</td>
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<tr>
<td>GMS-5</td>
<td>0.00</td>
<td>+3.8</td>
<td>-1.8</td>
</tr>
</tbody>
</table>
Viewing Zenith comparisons

- VIRS Ocean
- VIRS Land
- GOES-8 Ocean
- GOES-8 Land
Solar Zenith Comparisons

![Graph showing Solar Zenith Comparisons](image)

- **VIRS Ocean**
- **VIRS Land**
- **GOES-8 Ocean**
- **GOES-8 Land**

Cloud Fraction

Cloud Temperature
GEO/ISCCP Comparisons

- Eight months of data
  - Individual comparisons for each satellite
  - ISCCP DX data on GEO grid

- Zonal cloud property comparisons

- Instantaneous matched radiance and cloud properties
  - 2°x2° grid used to reduce ISCCP spatial noise
  - Data binned to look for trends

- Final comparison waiting for GEO cal
ISCCP-GEO SW Radiance Difference (%)
ISCCP-GEO Cloud Fraction Difference (%)
ISCCP-GEO IR Temperature Difference (%)
ISCCP-GEO Cloud Temperature Difference (%)
Zonal Mean Cloud Fraction

**VIRS**  **GOES-8**  **ISCCP**

Day

Night

Latitude
Zonal Mean Cloud Temperature

Day

Night

Latitude

VIRS  GOES-8  ISCCP
GEO/nonGEO differences

- Diurnal Range
- Meridional Gradients
- Net fluxes
- Cloud Forcing
TRMM February SW Sampling

0  30  60
Number of hours

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Beta3 GEO-nonGEO Diurnal Range Difference (W/m²)
GEO-nonGEO Zonal Mean Differences

GEO - nonGEO LW Difference (W/m²)

Total-sky LW

Clear-sky LW

GEO - nonGEO SW I

Total-sky SW
Beta3 GEO-nonGEO Net Flux Difference
Beta3 GEO SW Cloud Forcing
Beta3 GEO-nonGEO SW Cloud Forcing Difference (W/m²)
Beta3 GEO-nonGEO Net Cloud Forcing Difference (W/m²)
In Search of... GEO Artifacts

- Use difference images (net flux; cloud forcing) to look for the dreaded ISCCP rings

- Study longitude gradient pictures for satellite boundaries

- Focus on local hourly means
SW Flux longitude gradient test

GEO-enhanced SW, Neighbour Gridbox Differences, Feb 199[...]

NASA Langley Research Center / Atmospheric Sciences
LW Flux longitude gradient test

GEO-enhanced LW, Neighbour Gridbox Differences, Feb 199
Future Plans

- Finalize Algorithms
  - Finalize DRM
  - Finalize Geostationary Calibrations
  - Fine-tune LW Clear-sky Algorithms
  - Correct minor problems
- Continued Validation
  - Nine Months of TOA and Surface Flux Comparisons
  - Direct integration validation of DRMs
  - Flux histogram comparisons
  - VIRS/GEO/ISCCP comparisons
  - Continue search for GEO artifacts
- Scheduled Edition2b deliveries in June