TISA Status

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28th CERES Science Team Meeting
Norfolk, Virginia
May 6-8, 2003
Outline

• Data Products
  – GEO
  – TRMM/Terra SRBAVG
  – TRMM SYN
  – Aqua SFC

• Validation
  – SRBAVG vs. surface sites
  – LW Direct Integration
  – March 2000 TRMM/Terra

• Proposed New Products
  – Subsampling
  – High resolution
  – New global domain averages
TISA Data Product Status

G GEO

• Terra G GEO (Val) delivered & running at ASDC
  – Running complete year
  – Testing calibration

• Improvements included
  – Surface emissivity turned on
  – High sza visible issue resolved
  – New time-dependent calibrations (from Minnis/Doelling)

• Current work
  – GMS navigation
  – Surface albedo
  – New satellites
VIRS vs GOES-8
0.65 µm channel

Slope = 1.36e-4
Offset = 0.83
TISA Data Product Status
SRBAVG / SFC

- TRMM SRBAVG archived
  - Results and validation shown at September meeting
  - Validation continues
- Beta Terra SRBAVG
  - First new generation global monthly mean product
- SRBAVG / ES-9 comparisons
- March 2000 Terra vs TRMM studies
- SFC
  - Terra Beta in archive
  - Aqua Beta delivered
March 2000 TRMM vs Terra

• Interpolation algorithms can be tested
  – Terra - sun-synchronous; TRMM - precessing
  – Compare TRMM measured fluxes and clous properties at Terra observation times
  – Repeat using TRMM observations/Terra interpolation

• Initial results
  – Define baseline using coincident TRMM and Terra observations
    1. LW: \( \Delta = 2.0 \text{ W/m}^2; \sigma = 8.9 \text{ W/m}^2 \)
    2. SW: \( \Delta = 1.8 \text{ W/m}^2; \sigma = 39.7 \text{ W/m}^2 \)
  3. Back off to SFC to look at view angle effects
Iris Hypothesis Redux

- Analysis redone using interpolated data
- Results re-confirm prior findings
- Slopes more negative than SSF analysis
  - from identification of cloudy moist region
- Some day/night differences
TISA Data Product Status
FSW / SYN / AVG

• New product in development
  – Creates 3-hourly global synoptic fields
  – TRMM Beta due by end of year

• Interpolated TOA flux/cloud product (TSI) delivered
  – Input to SARB calculations

• Developing 3-hourly integration algorithms
1-hourly TOA LW Flux for SYN
SYN - Next Steps

- Run SARB code with TSI inputs
- Compare time series with surface sites
- Produce 3-hourly integrated fluxes
- Produce AVG/ZAVG
Recent Validation Results

• **Direct Integration**
  – Review SW results
  – New LW results

• **Surface Flux Comparisons**
  – Instantaneous comparisons
  – Monthly means
SW Direct Integration Approach

• Comparison performed on 10° x 10° grid
• May/June/July SRBAVG vs 2 TRMM precession cycles
• Direct Integration
  – Use CERES SSF footprint data from 2 46-day precession cycles
  – Save mean albedo vs sza (5° bins)
  – Integrate using correct solar weighting
• SRBAVG data
  – Combine 1° grid data on 10° grid from 3 months
GEO - Direct Integration Albedo

-0.05               0.00               0.05
# Summary of SW Direct Integration Results

<table>
<thead>
<tr>
<th>30N - 30S</th>
<th>nonGEO (CERES DRM)</th>
<th>GEO (CERES DRM)</th>
<th>GEO (ERBE DRM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Albedo Difference</td>
<td>0.001 (0.6%)</td>
<td>0.002 (0.6%)</td>
<td>-0.001 (-0.4%)</td>
</tr>
<tr>
<td>RMS Difference</td>
<td>0.006 (2.6%)</td>
<td>0.006 (2.7%)</td>
<td>0.011 (4.8%)</td>
</tr>
</tbody>
</table>

Study repeated for 9-month TRMM period - No significant change
LW Direct Integration Approach

• Comparison performed on 5° x 5° grid
• May/June/July SRBAVG vs 2 TRMM precession cycles
  – Need 3 months to define diurnal cycle
• Direct Integration
  – Use CERES SSF footprint data from 2 46-day precession cycles
  – Save mean TOA LW flux vs. local time (24 hours)
  – Average diurnal cycle to get 3-month mean
• SRBAVG data
  – Combine 1° grid data on 5° grid from 3 months
Temporal Interpolation of TOA LW Flux
E. Sahara 24.5N 20.5E
Monthly Mean GEO-nonGEO Total-sky LW Flux Diurnal Range

February

May

NASA Langley Research Center / Atmospheric Sciences
Saharan Diurnal Cycle From Direct Integration
May-July 1998
Summary of LW Direct Integration Results

<table>
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<th>nonGEO (CERES DRM)</th>
<th>GEO (CERES DRM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Flux Difference</td>
<td>-0.19 (0.1%)</td>
<td>-0.15 (0.10%)</td>
</tr>
<tr>
<td>RMS Difference</td>
<td>0.64 (0.3%)</td>
<td>1.04 (0.4%)</td>
</tr>
</tbody>
</table>
SRBAVG vs. Surface Flux Comparisons

Instantaneous
Comparison with Surface-Based Measurements

ARM SGP CF         February 1998

Downwelling LW Flux  Region Number: 19163  Data Date: 02/1998

Fluxes, W/m²

- Ground Data
- GCEO method

Local Time

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Comparison of SRBAVG Total-sky Downwelling Flux with Surface Observations
ARM SGP Central Facility  February 1998

SW
Mean = 20.2
RMS = 95.6

LW
Mean = -2.9
RMS = 24.8
## CERES-Surface Downwelling Fluxes

**ARM SGP CART Site**  All TRMM Months  
**Mean and ($\sigma$) in %**

<table>
<thead>
<tr>
<th></th>
<th>Interpolated fluxes</th>
<th>Matched observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SW Model A Clear</strong></td>
<td>2.1 (9.0)</td>
<td>2.9 (6.0)</td>
</tr>
<tr>
<td><strong>SW Model B Clear</strong></td>
<td>-0.5 (9.0)</td>
<td>-1.8 (4.3)</td>
</tr>
<tr>
<td><strong>SW Model B All-sky</strong></td>
<td>-0.1 (20.5)</td>
<td>2.7 (13.9)</td>
</tr>
<tr>
<td><strong>LW Model A Clear</strong></td>
<td>2.0 (7.7)</td>
<td>-0.9 (6.9)</td>
</tr>
<tr>
<td><strong>LW Model B Clear</strong></td>
<td>-1.8 (3.5)</td>
<td>-1.7 (5.8)</td>
</tr>
<tr>
<td><strong>LW Model B All-sky</strong></td>
<td>1.5 (6.4)</td>
<td>-1.0 (5.8)</td>
</tr>
</tbody>
</table>
SRBAVG vs. Surface Flux Comparisons

Monthly Mean
CERES SRBAVG vs. BSRN
Monthly Mean Surface DLW
All 9 TRMM Months
CERES SRBAVG vs. BSRN
Monthly Mean Surface DLW
All 9 TRMM Months (No Tatano)
CERES SRBAVG vs. BSRN
Monthly Mean Surface DLW
All 9 TRMM Months (Day vs. Night)
CERES SRBAVG vs. BSRN
Monthly Mean Surface DSW
All 9 TRMM Months
Future Plans

• Finish development of SYN
• Global energy balance from Terra SRBAVG
• SRBAVG / SRB comparisons
• March 2000 Terra/TRMM study
  – Quantify interpolation errors for all parameters
  – Cloud interpolation improvements
• GERB comparison
• New products
  – Reduced volume products
  – Higher vertical resolution SYN
  – New global domain averages
    • Blue World - ice-free ocean domain
    • Green world - snow-free land domain
    • White world - Snow world (land only), sea-ice world, and glacier world