CERES/Terra Edition2 ERBE-like TOA Flux Time Series And Terra/ERBE-like Vs. Terra/SRBAVG

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Objectives

• Examine Time Series of CERES/Terra Edition2 Tropical Mean and Global Mean TOA Radiation Budgets

• Study the Interannual Variability of Tropical Mean and Global Mean TOA Radiation Fields

• Explore the Radiative Effects of the 2002 ENSO Event

• ERBE-like Vs SRBAVG Comparison for March 2000
Dataset


• Cross Track Mode Data Only and Contains Both FM1 and FM2 Data → Minimize Spatial Sampling Noise

• Clear-sky, All-sky Radiation Budget, Cloud Radiative Forcing, ENSO Regional Radiative Anomalies

• CERES/Terra SRBAVG Beta1 Data For March 2000
Time Series of ENSO Index

Multivariate ENSO Index

MEI Index

NOAA-CIRES Climate Diagnostics Center (CDC), University of Colorado at Boulder
Time Series of Tropical Mean (20N to 20S) TOA All-sky Radiation Budget

All: 256.2 +/- 1.6 Wm$^{-2}$
Normal: 256.2 +/- 1.7 Wm$^{-2}$
No Trend

All: 90.4 +/- 3.0 Wm$^{-2}$
Normal: 90.2 +/- 2.8 Wm$^{-2}$
No Trend

All: 62.2 +/- 15.7 Wm$^{-2}$
Normal: 63.1 +/- 15.9 Wm$^{-2}$
No Trend
Time Series of Tropical Mean (20N to 20S) TOA Clear-sky Radiation Budget

- **Clear-sky Tropical Mean (20N to 20S) Fluxes**
  - **CLW:**
    - All: 287.8 +/- 0.5 Wm\(^{-2}\)
    - Normal: 287.9 +/- 0.5 Wm\(^{-2}\)
    - No Trend
  - **CSW:**
    - All: 46.0 +/- 1.0 Wm\(^{-2}\)
    - Normal: 46.0 +/- 1.0 Wm\(^{-2}\)
    - No Trend
  - **CNET:**
    - All: 75.1 +/- 14.4 Wm\(^{-2}\)
    - Normal: 75.6 +/- 14.5 Wm\(^{-2}\)
    - No Trend

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Time Series of Tropical Mean (20N to 20S) TOA Cloud Radiative Forcings

All: 30.9 +/- 1.2 Wm^{-2}
Normal: 30.9 +/- 1.4 Wm^{-2}
No Trend

All: -43.7 +/- 2.8 Wm^{-2}
Normal: -43.5 +/- 2.8 Wm^{-2}
No Trend

All: -12.6 +/- 3.0 Wm^{-2}
Normal: -12.4 +/- 2.9 Wm^{-2}
No Trend
Interannual Variability of Tropical Mean TOA All-sky Radiation Budget

Interannual Variability: 0.2 to 2.4 Wm$^{-2}$

Interannual Variability: 0.2 to 2.6 Wm$^{-2}$

Interannual Variability: 0.1 to 2.9 Wm$^{-2}$
Interannual Variability of Tropical Mean TOA Clear-sky Radiation Budget

Interannual Variability: 0.0 to 1.2 Wm\(^{-2}\)

Interannual Variability: 0.0 to 1.2 Wm\(^{-2}\)

Interannual Variability: 0.0 to 1.6 Wm\(^{-2}\)
Interannual Variability of Tropical Mean TOA Cloud Radiative Forcings

Interannual Variability: 0.1 to 1.6 Wm\(^{-2}\)

Interannual Variability: 0.0 to 2.2 Wm\(^{-2}\)

Interannual Variability: 0.1 to 1.7 Wm\(^{-2}\)
ENSO Regional TOA Longwave Anomalies

All-sky Longwave Anomalies, 12/2002 Minus 12/2001
All-sky shortwave Anomalies, 12/2002 Minus 12/2001
All-sky Net Anomalies, 12/2002 Minus 12/2001
Time Series of Global Mean TOA All-sky Radiation Budget

All-sky Global Mean Fluxes

- LW:
  - All: 239.2 +/- 2.9 Wm$^{-2}$
  - Normal: 238.9 +/- 3.0 Wm$^{-2}$
  - No Trend
- SW:
  - All: 98.2 +/- 5.0 Wm$^{-2}$
  - Normal: 98.3 +/- 5.3 Wm$^{-2}$
  - No Trend
- NET:
  - All: 7.0 +/- 7.1 Wm$^{-2}$
  - Normal: 7.8 +/- 7.4 Wm$^{-2}$
  - No Trend
Time Series of Global Mean TOA Clear-sky Radiation Budget

All: 266.5 +/- 2.1 Wm^-2  
Normal: 266.3 +/- 2.0 Wm^-2  
No Trend

All: 49.1 +/- 1.8 Wm^-2  
Normal: 49.2 +/- 1.8 Wm^-2  
No Trend

All: 29.2 +/- 9.7 Wm^-2  
Normal: 30.0 +/- 10.2 Wm^-2  
No Trend
Time Series of Global Mean TOA Cloud Radiative Forcings

**Global Mean Cloud Forcings**

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**LWCRF**

- All: 26.9 +/- 1.2 Wm\(^{-2}\)
- Normal: 26.9 +/- 1.3 Wm\(^{-2}\)
- No Trend

**SWCRF**

- All: -48.4 +/- 3.4 Wm\(^{-2}\)
- Normal: -48.6 +/- 3.7 Wm\(^{-2}\)
- No Trend

**NETCRF**

- All: -21.9 +/- 3.2 Wm\(^{-2}\)
- Normal: -22.0 +/- 3.4 Wm\(^{-2}\)
- No Trend
Interannual Variability of Global Mean TOA All-sky Radiation Budget

Interannual Variability:
- 0.1 to 1.0 Wm\(^{-2}\)
- 0.0 to 3.6 Wm\(^{-2}\)
- 0.1 to 2.5 Wm\(^{-2}\)
Interannual Variability of Global Mean TOA Clear-sky Radiation Budget

Interannual Variability:
- CLW: 0.0 to 1.3 Wm\(^{-2}\)
- CSW: 0.0 to 1.5 Wm\(^{-2}\)
- CNET: 0.0 to 1.2 Wm\(^{-2}\)
Interannual Variability of Global Mean TOA Cloud Radiative Forcings

- Interannual Variability: 0.0 to 1.5 Wm$^{-2}$
- Interannual Variability: 0.0 to 2.4 Wm$^{-2}$
- Interannual Variability: 0.0 to 1.6 Wm$^{-2}$
ERBE-like Vs SRBAVG
Regional All-sky Longwave Radiation

Terra March 2000 Monthly Mean
ERBElike - GeoCERES
TOA Total-Sky Longwave Radiation Difference
ERBE-like Vs SRBAVG
Regional All-sky Shortwave Radiation

Terra March 2000 Monthly Mean
ERBElke - GeoCERES
TOA Total-Sky Shortwave Radiation Difference
ERBE-like Vs SRBAVG
Regional All-sky Net Radiation

Terra March 2000 Monthly Mean
ERBElike - GeoCERES
TOA Total-Sky Net Radiation Difference
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ERBE-like Vs SRBAVG
Zonal Mean Longwave Radiation

Terra March 2000
Monthly Mean TOA Radiative Flux
ERBE-like Vs SRBAVG
Zonal Mean Shortwave Radiation
Summary

- Time Series of CERES/Terra Edition2 Tropical Mean and Global Mean TOA Radiation Budgets Show No Statistical Significant Trend During the First 34 Months of Data
- Interannual Variability of Tropical Mean Can Be up to 2.5, 1.5, 2.0 Wm\(^{-2}\) for All-sky Radiation, Clear-sky Radiation and Cloud Radiative Forcing, Respectively
- Interannual Variability of Global Mean Can Be Larger or Smaller Than the Interannual Variability of Tropical Mean, Depending on the Specific Variables
- Regional Radiative Effects of the 2002 ENSO Event Are Large; Can Be up to 70 to 80 Wm\(^{-2}\), Even Thought Their Tropical Mean Values Are Small.
- ERBE-like Minus SRBAVG: Large ERBE-like Zonal Mean Clear-sky Bias Away from the Tropics; Small Positive ERBE-like Zonal Mean All-sky LW Bias in Most Zones; Large Latitudinal Dependence in the ERBE-like Zonal Mean All-sky SW and Net Flux Bias.