

CERES/Terra ERBE-like TOA Fluxes: An Update Of FM-1 Vs. FM-2

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Abstract

An updated intercomparison between CERES/Terra monthly mean FM-1 and FM-2 ERBE-like TOA fluxes were presented using three additional data months from August to October 2000. In general, most of the differences between CERES/Terra FM-1 and FM-2 ERBE-like monthly mean fluxes can again be explained by the differences in sampling pattern of the two CERES instruments (i.e, RAP vs. cross-track scan mode sampling). In term of tropical mean TOA longwave/shortwave radiation, the CERES/Terra cross-track monthly mean ERBE-like data are always running higher/darker than their corresponding RAP data, respectively. Due to the three-months scan mode cycling nature of the two CERES/Terra instruments, it is recommended that data users should exercise cautions when using CERES/Terra ERBE-like monthly-mean TOA fluxes for climate study. Specifically, users should (1) separate CERES/Terra monthly mean data based on instrument scan mode operation, (2) use only CERES/Terra cross-track scan mode monthly mean data for climate study and long term comparison with ERBE monthly mean data set, and (3) avoid mixing CERES/Terra monthly mean data from different scan mode operations.

Lessons Learned From Last Meeting

- Performed Comparisons Using CERES/Terra FM-1 And FM-2 Data From March, April, And May 2000
- Zonal Mean Differences $< 2 \text{ Wm}^{-2}$ Except At Poles
- All-sky Regional Monthly Mean Differences Due Primarily To Temporal Sampling; Cross-track Mode Having Better Temporal Sampling --> **RAP Vs. Cross-track Sampling Issue**
- Clear-sky SW Differences Due To MLE Over Snow; RAP Mode Value Too Low --> **RAP Vs. Cross-track Sampling Issue**
- Clear-sky LW Differences ($< 0.5\%$) Appear To Be Instrument-Based; FM-1 Being Higher --> **Instruments Calibration Issue**
- SW Differences Depends On Viewing Zenith Angle; ADM Problem --> **RAP Vs. Cross-track Sampling Issue**

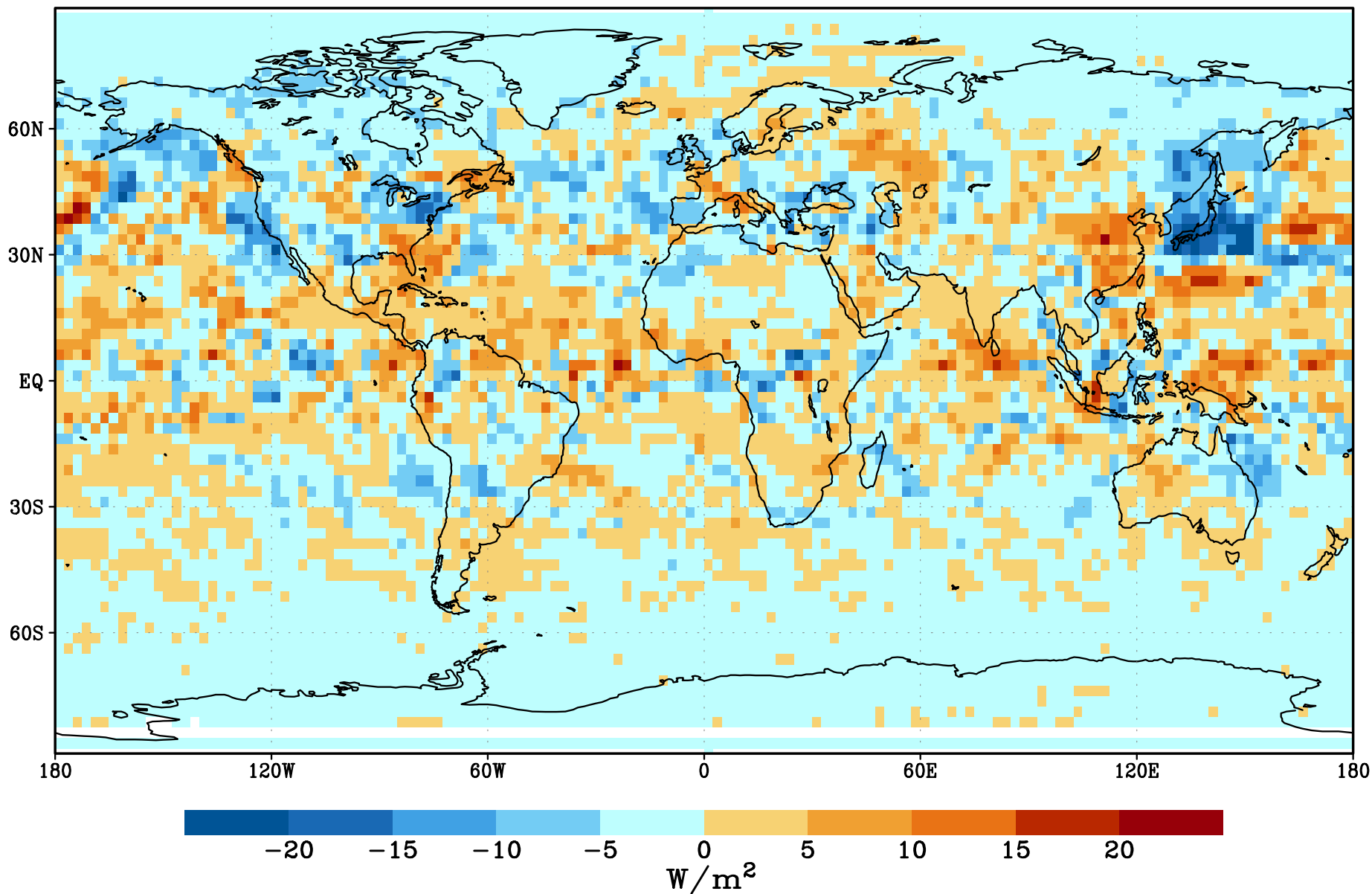
CERES/Terra Scan Mode Operation

Month (2000)	FM-1	FM-2
March	Both	Both
April	RAP	Cross-track
May	Cross-track	RAP
June	Cross-track	RAP
July	Cross-track	RAP
August	RAP	Cross-track
September	RAP	Cross-track
October	RAP	Cross-track
November	Cross-track	RAP

Source: http://asd-www.larc.nasa.gov/dsnyder/Terra/eos_ops.html

Total-Sky Shortwave Flux

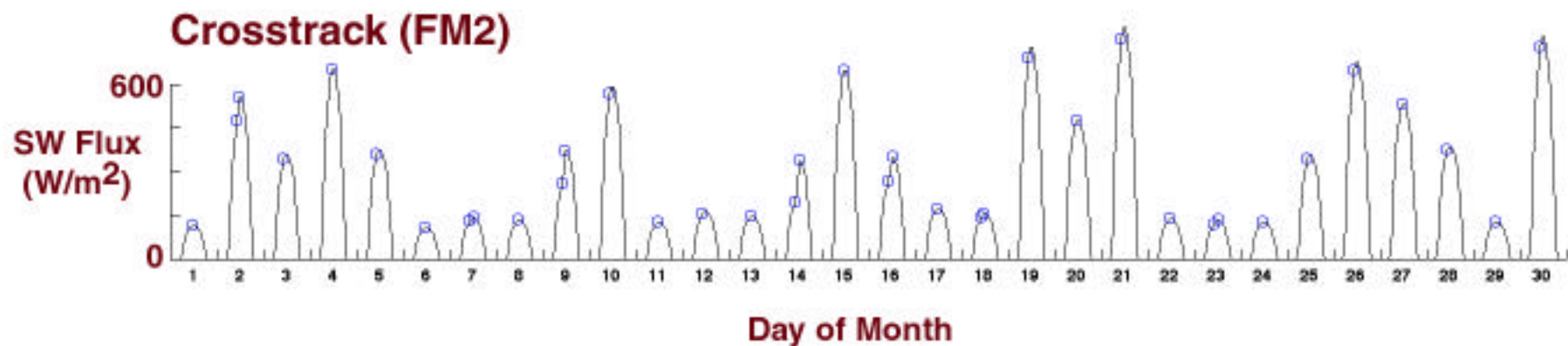
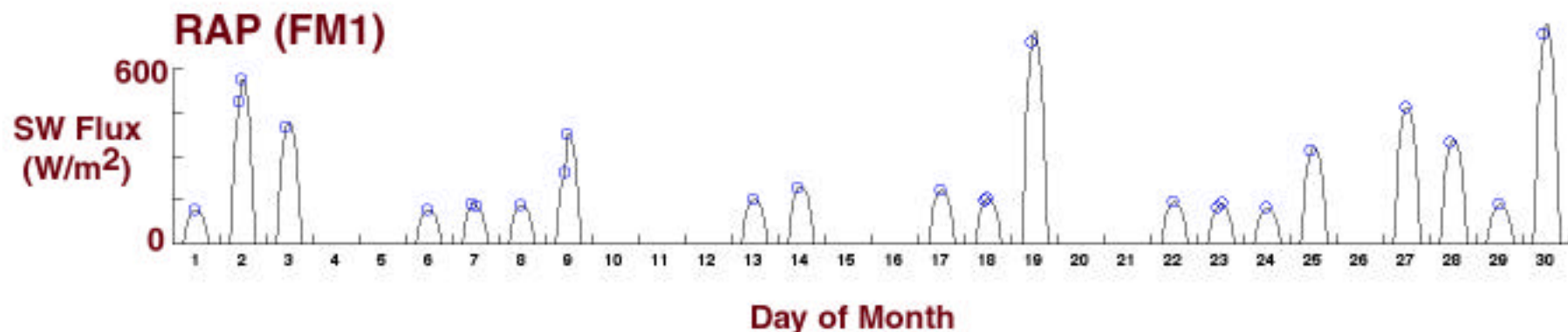
RAPS(FM1)-FAPS(FM2) CERES/Terra April 2000



Time Series of CERES ERBE-Like SW Flux

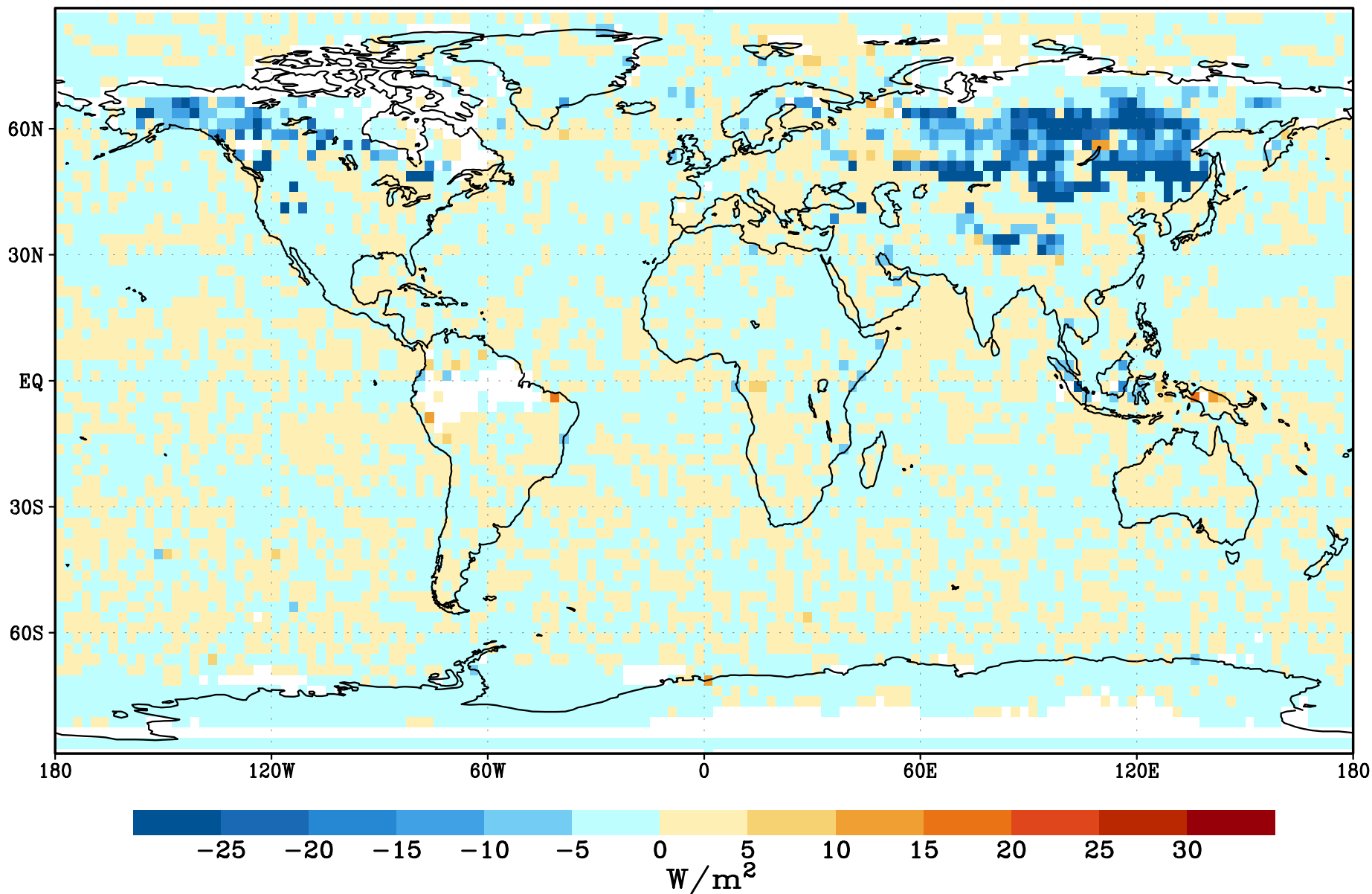
Terra
S. Japan

April 2000
33.75N 131.25E

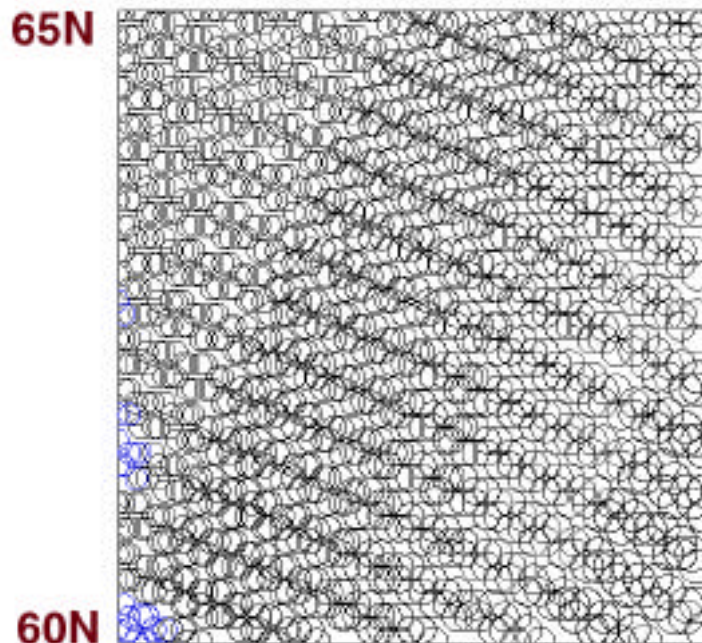


Clear-Sky Shortwave Flux

RAPS(FM1)-FAPS(FM2) CERES/Terra April 2000



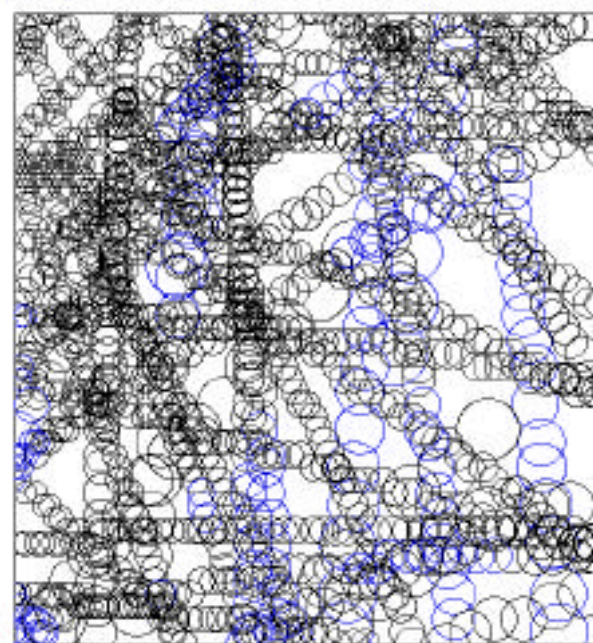
Comparison of Crosstrack and RAP ERBE-Like Scene ID (6 GMT May 16 2000)



Cross-Track (FM1)

60N

65N



RAP (FM2)

Blue = Clear Snow

Green = Clear Land

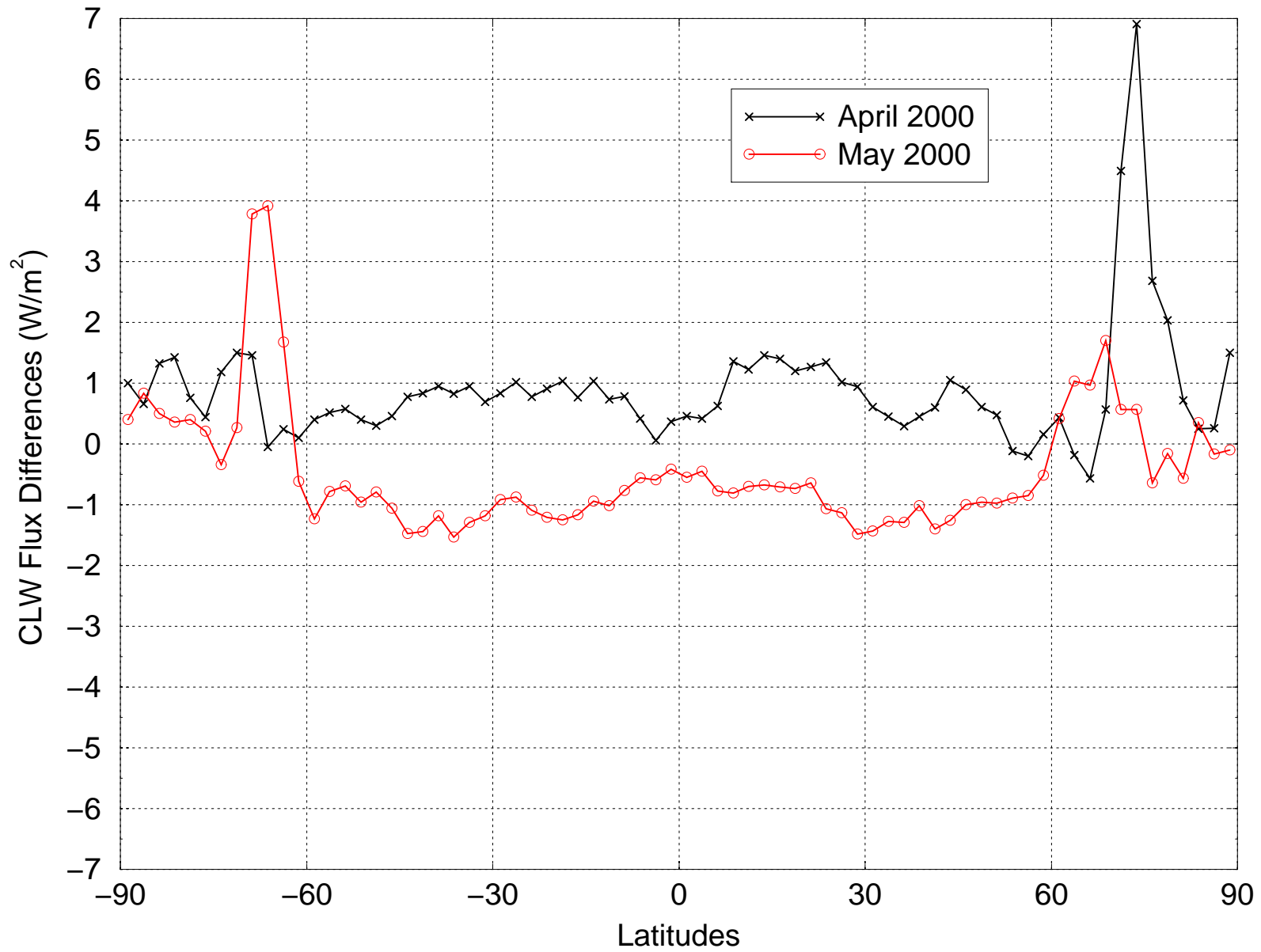
60N

80E

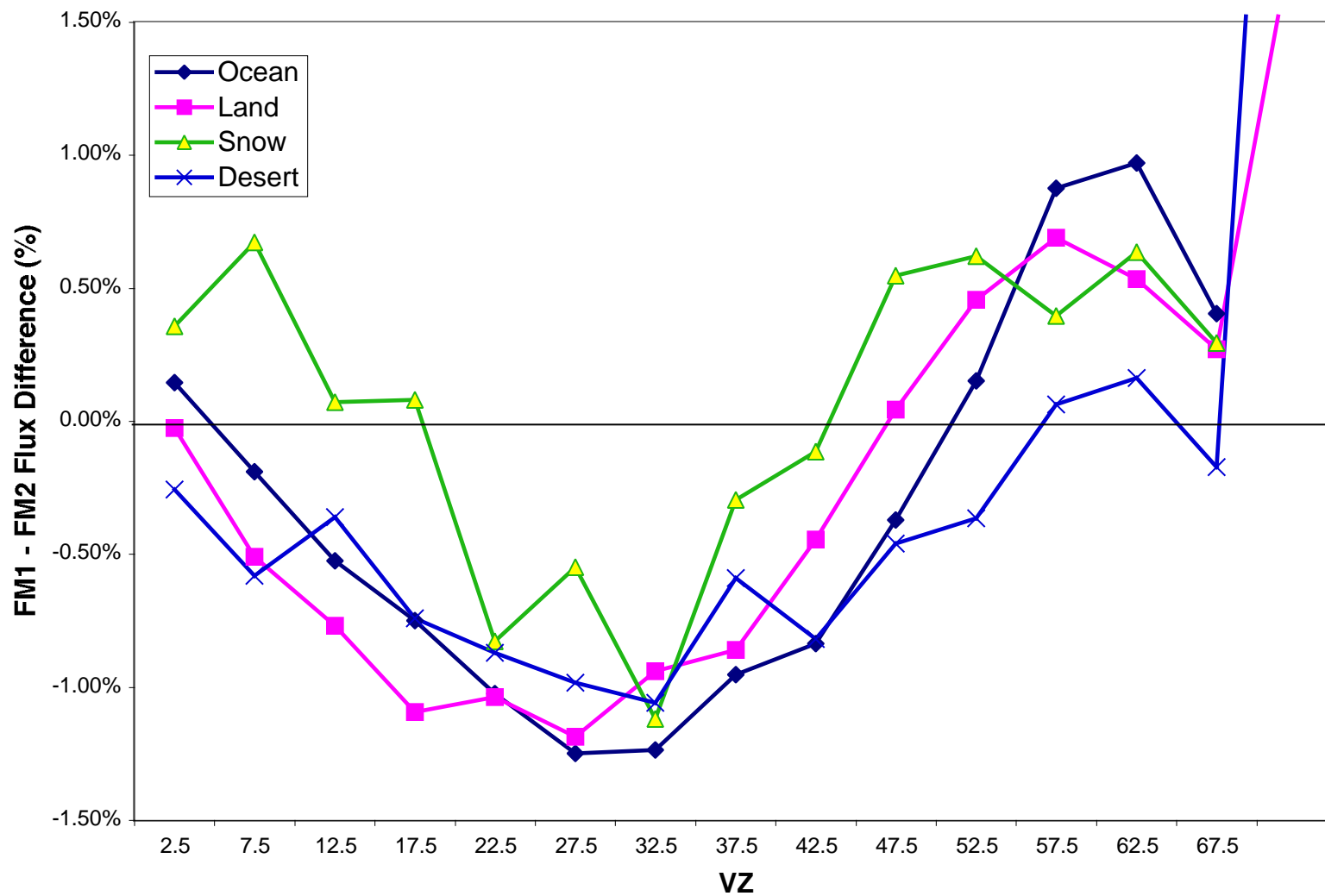
90E

Clear-Sky Longwave Zonal Differences

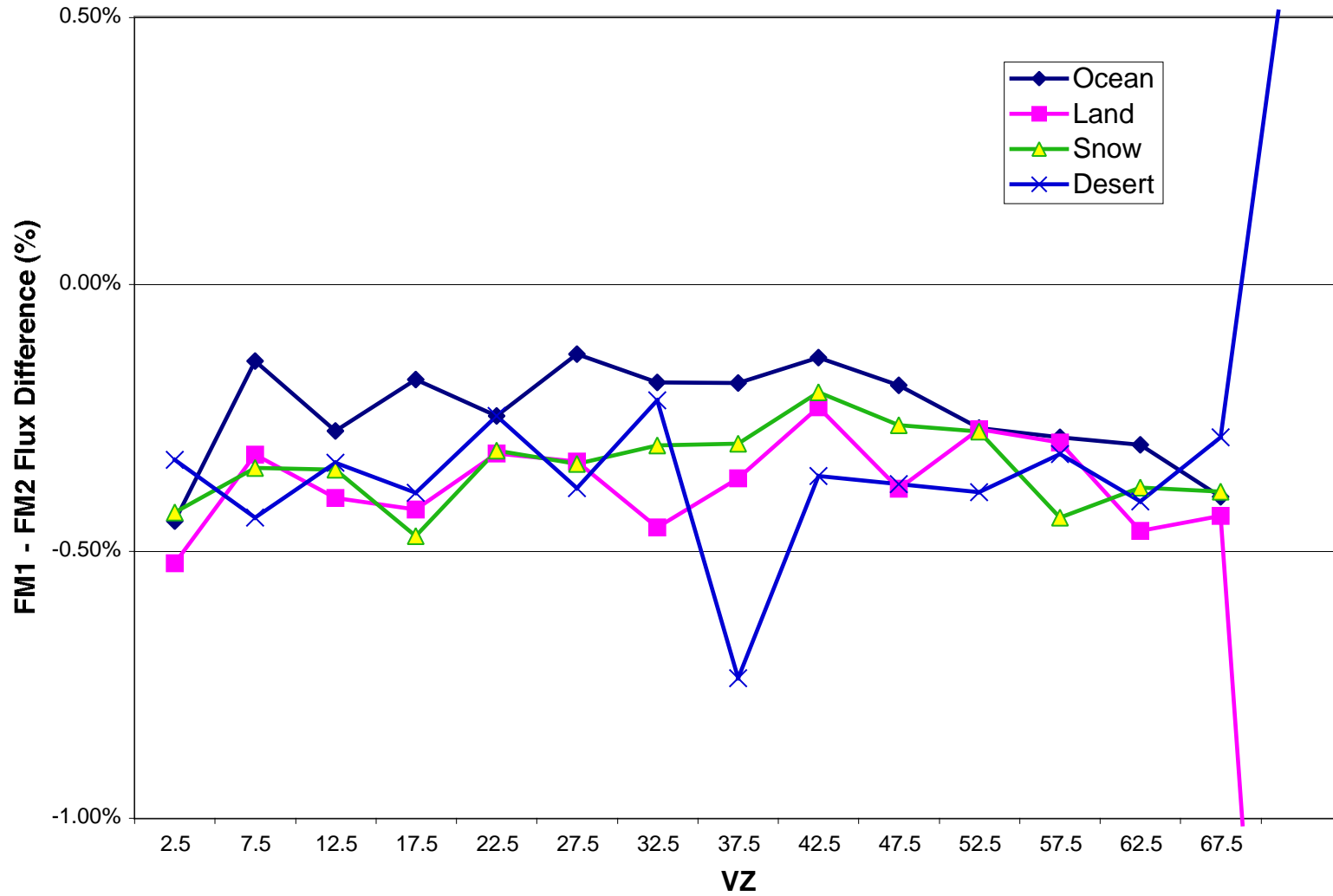
RAPS- FAPS CERES/Terra



Comparison of FM1 (Crosstrack) and FM2 (RAP) SW Fluxes (May 2000)



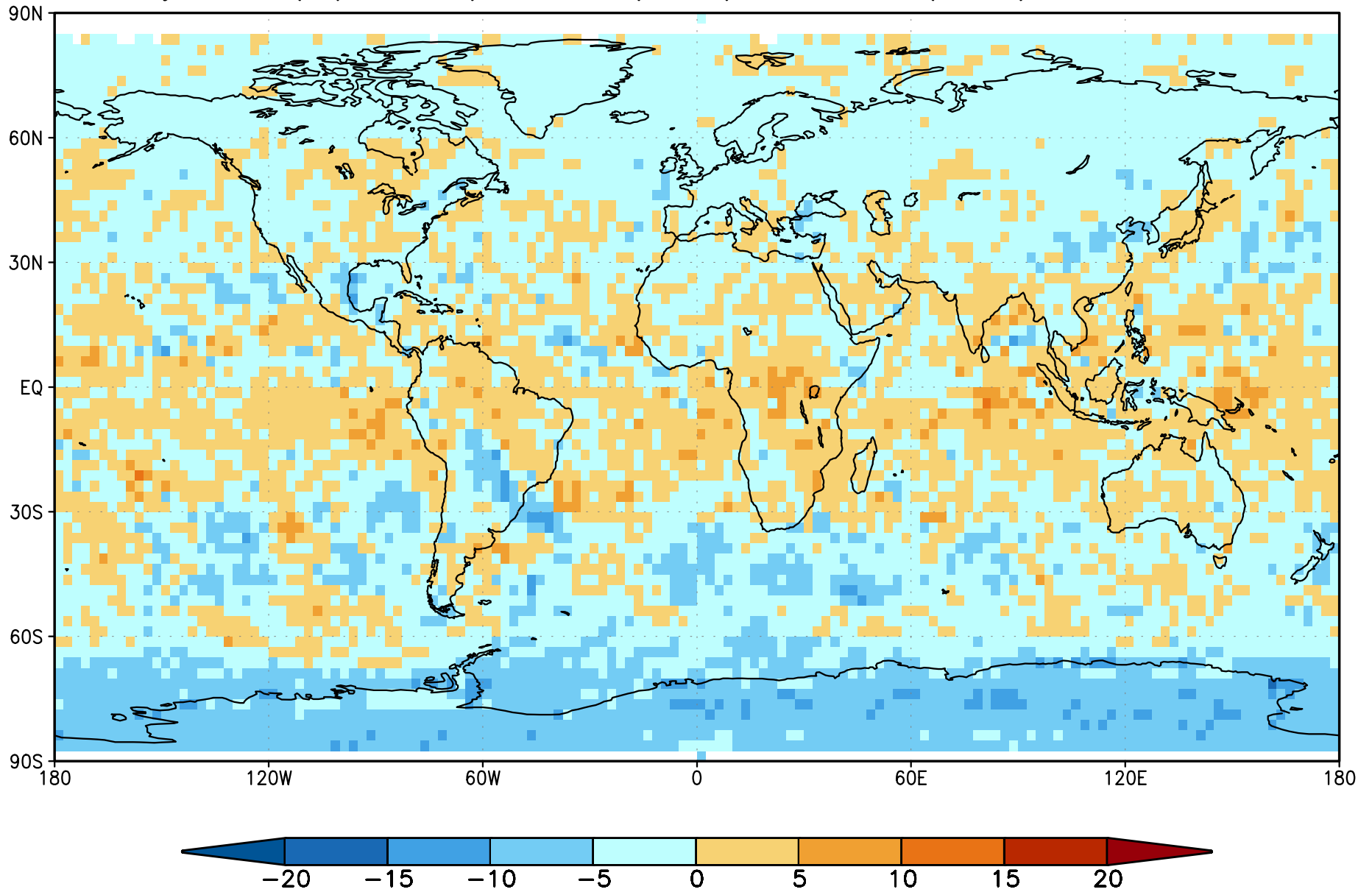
Comparison of FM1 and FM2 Crosstrack SW Fluxes (March 2000)



RAP Vs. Cross-track Comparisons: An Update

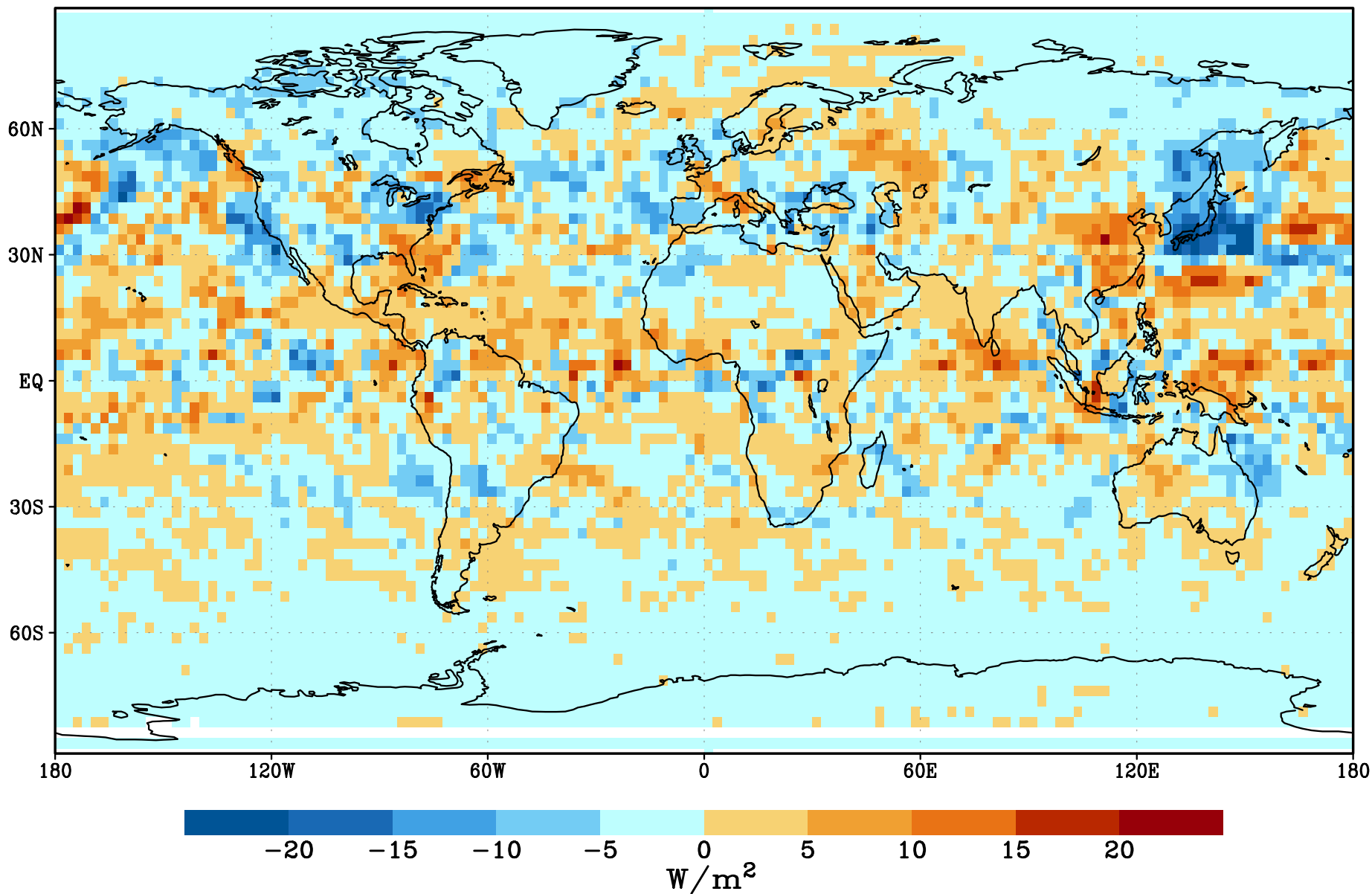
- Comparisons Of Monthly Regional, Zonal Mean, And Tropical Mean Flux Differences For
 - March 2000
 - April 2000
 - May 2000
 - **August 2000**
 - **September 2000**
 - **October 2000**

All-sky SW (W/m^2), RAPS(FM1) – FAPS(FM2), October 2000

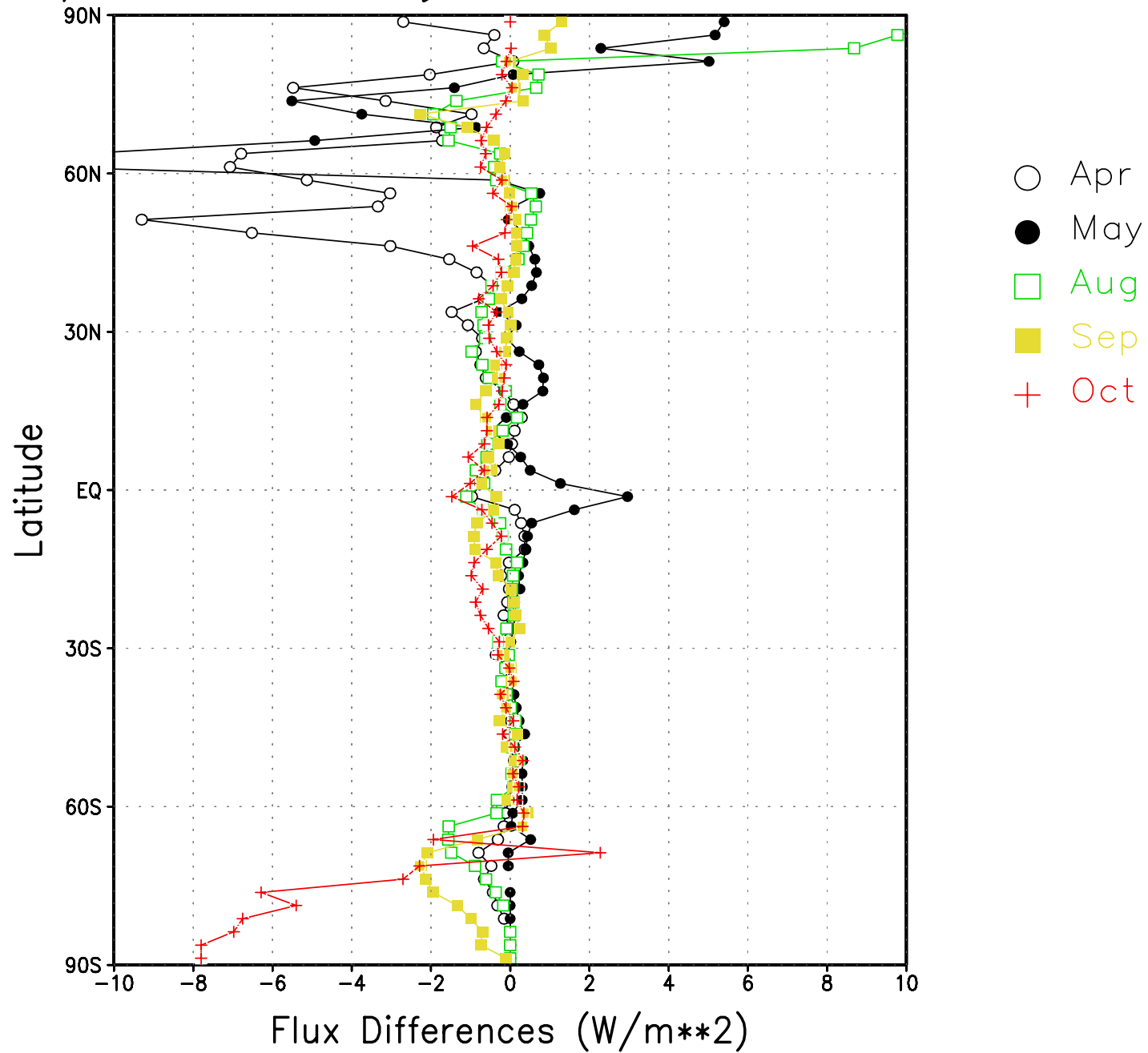


Total-Sky Shortwave Flux

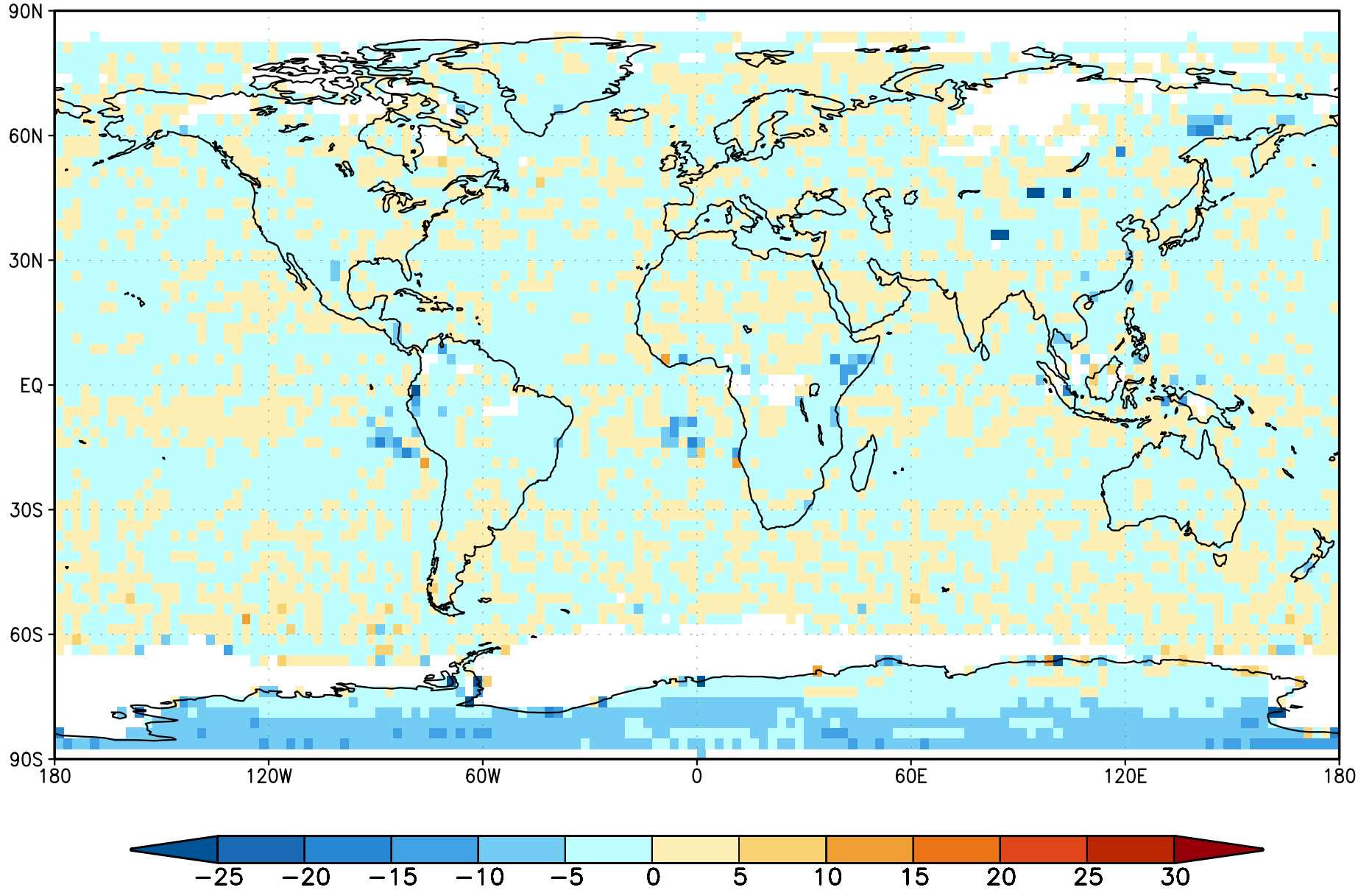
RAPS(FM1)-FAPS(FM2) CERES/Terra April 2000



CERES/Terra Clear-sky SW, RAP Minus Cross-Track

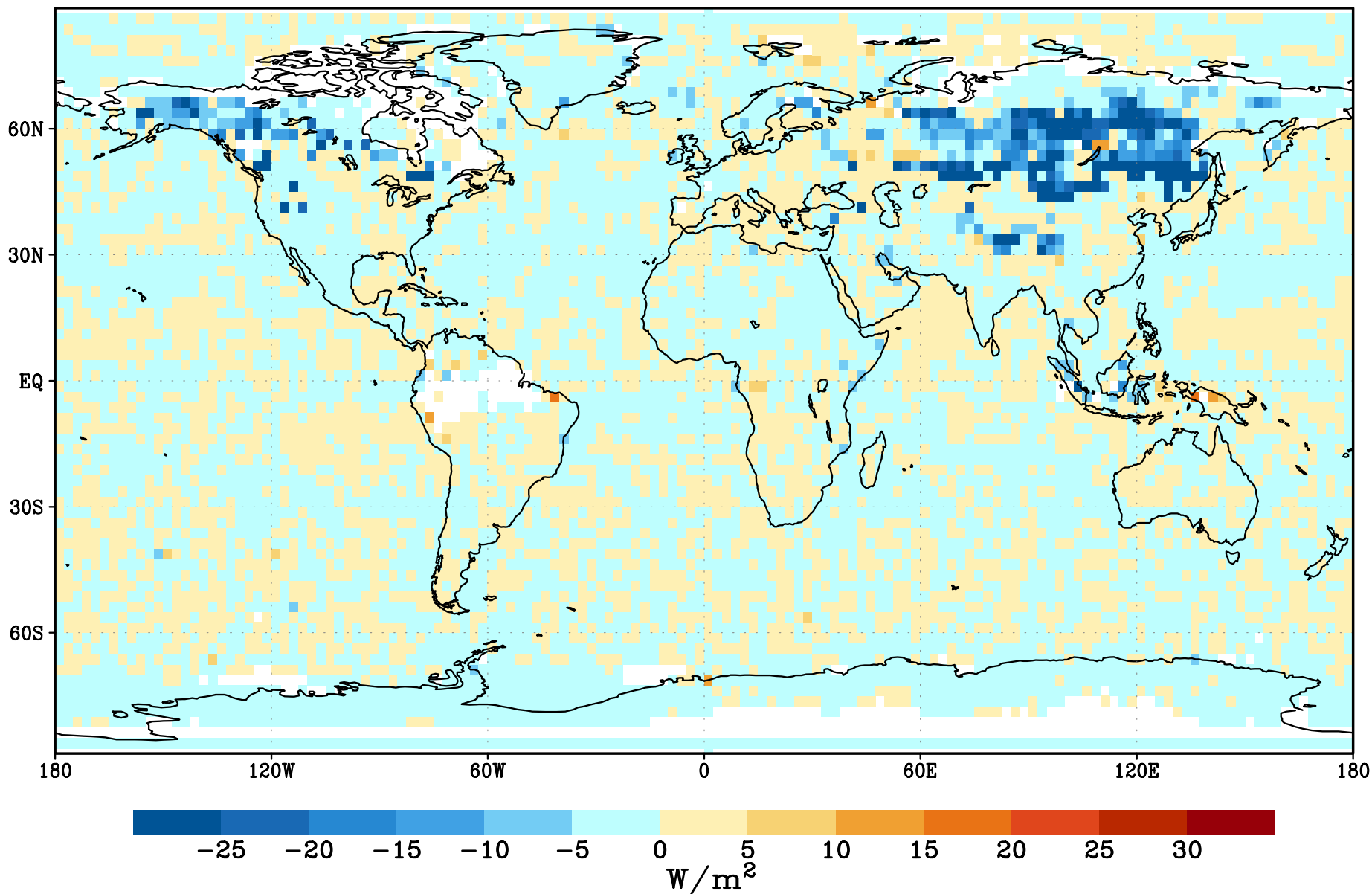


Clear-sky SW (W/m^2), RAPS(FM1) – FAPS(FM2), October 2000

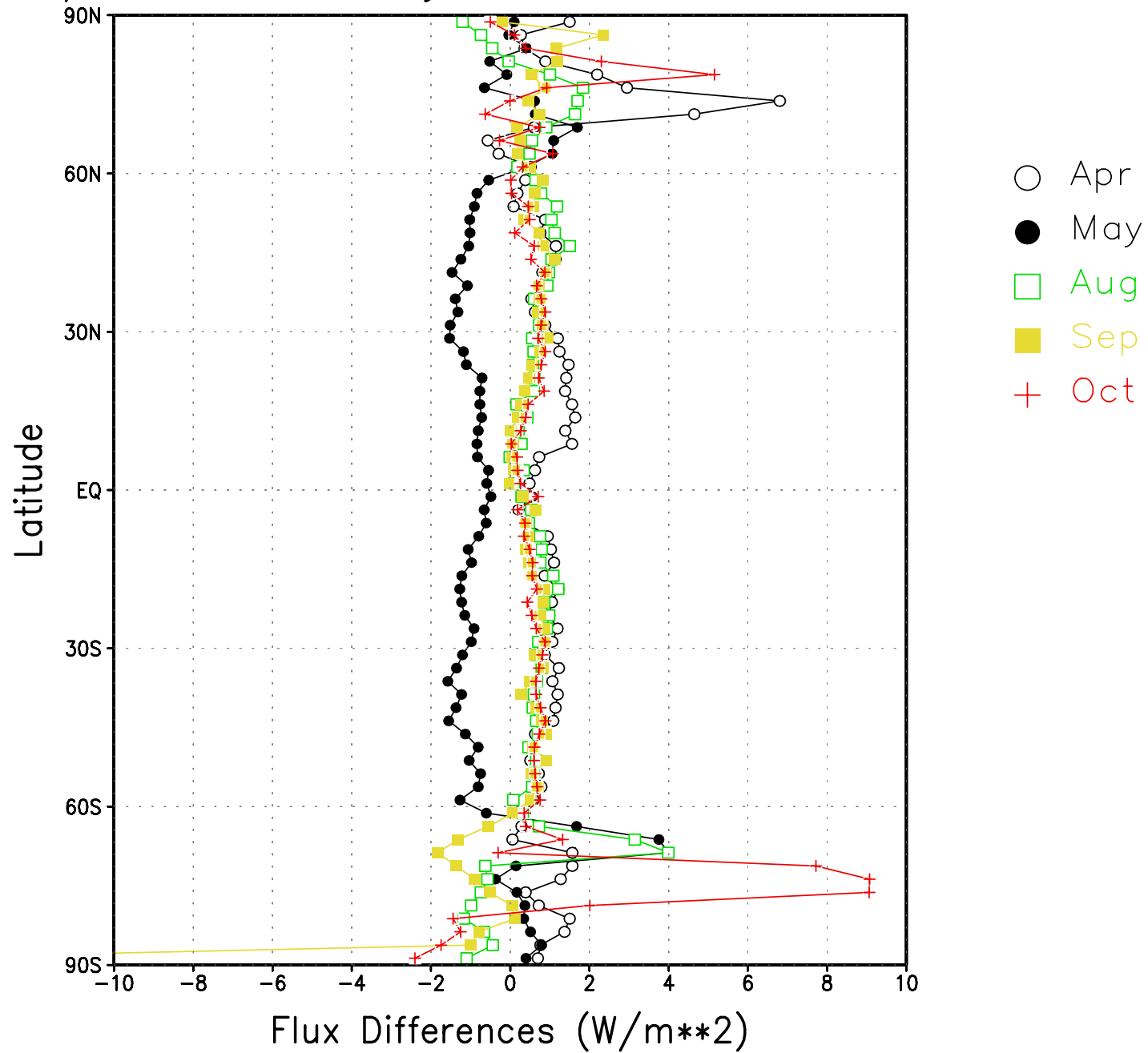


Clear-Sky Shortwave Flux

RAPS(FM1)-FAPS(FM2) CERES/Terra April 2000



CERES/Terra Clear-sky LW, RAP Minus Cross-Track



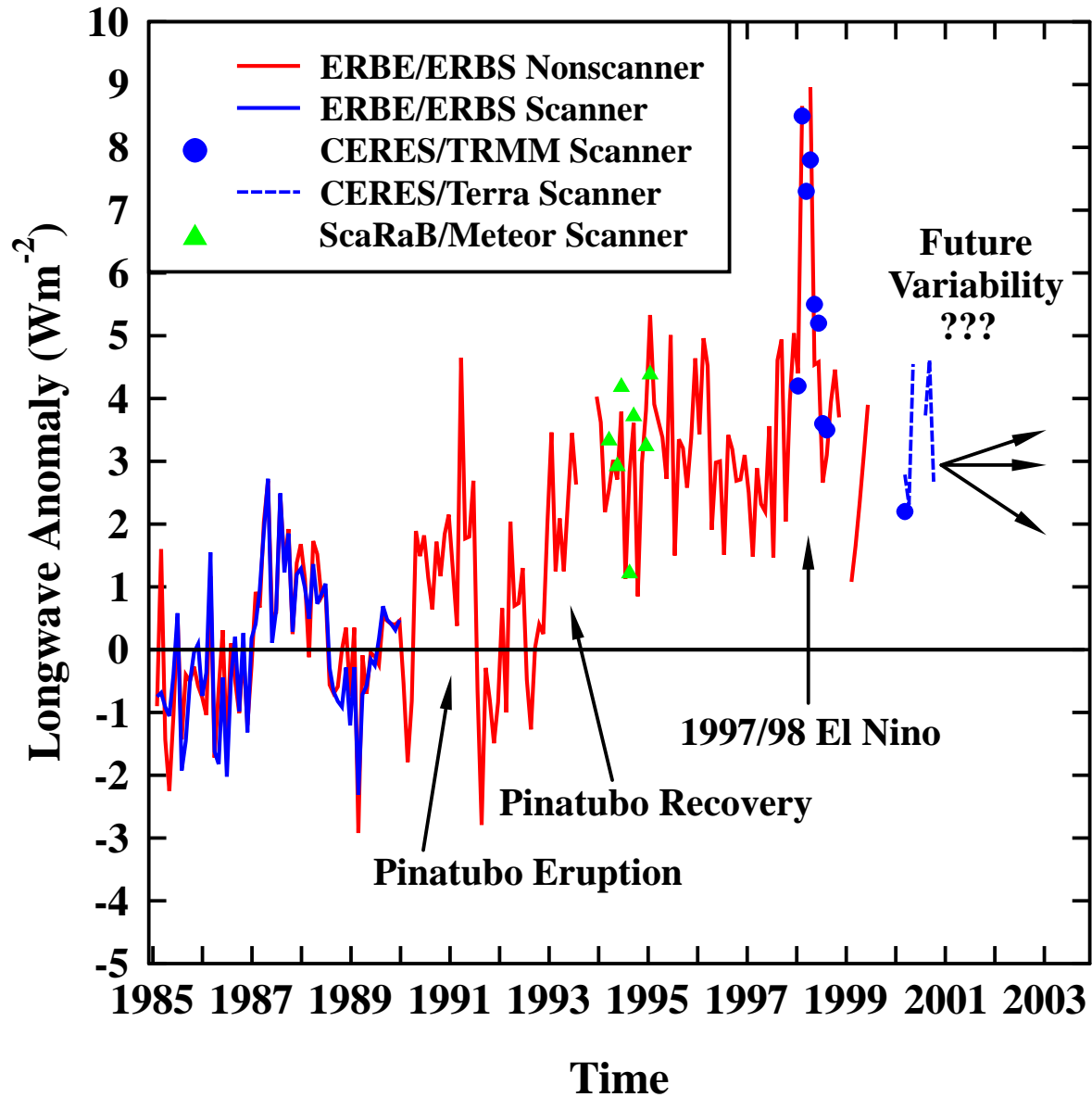
Tropical Mean **Longwave**/**Shortwave** Anomaly* Comparisons

Month (2000)	Cross-track	RAP	Xtrack-RAP
April	2.3/-6.6	1.6/-5.8	0.7/-0.8
May	4.6/-5.3	2.8/-4.7	1.8/-0.6
June	---	---	---
July	---	---	---
August	3.7/-5.0	3.2/-3.8	0.5/-1.2
September	4.6/-7.4	4.0/-6.4	0.6/-1.0
October	2.7/-4.3	2.0/-3.5	0.7/-0.8

* Anomaly Based On 1985 To 1989 ERBE/ERBS Scanner Period

Decadal Variability in Tropical Mean (20S - 20N) Longwave Radiation from 5 Different Broadband Instruments for 1985 - 2000

Anomalies Referenced to 1985 through 1989 Baseline



Summary

- Reproduced Most Of The Lessons Learned From Last Meeting Using Three New Data Months,
 - Clear-sky SW Differences Due MLE Over Snow
 - Instrument-Based Clear-sky LW Differences
- All-sky Regional RAP Minus Xtrack Differences Seem To Decrease With the New Data Months; Suggesting An Improvement In Temporal Sampling Of The RAP Data
- Tropical Mean Longwave/Shortwave Comparisons Shows Xtrack Data Running Higher/Lower Than RAP Data, Respectively, Throughout The Data Period

Recommendation

- Need To Separate CERES/Terra Data Based On Instrument Scan Mode Operation
- Use CERES/Terra Cross-track Scan Mode Data For Climate Study And Long Term Comparison With ERBE Data
- Avoid Mixing CERES/Terra Monthly Mean Data From Different Scan mode Operations