

TEMPORAL SPECTRA OF EARTH RADIATION BUDGET COMPONENTS

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OBJECTIVES

- Examine Temporal Spectra Of Earth Broadband Radiation Budget Using The New NASA Global Satellite Measurements From The Clouds And The Earth's Radiant Energy System (CERES) Mission.
 1. Broadband Outgoing Longwave Radiation (OLR)
 2. Broadband Reflected Solar Radiation (RSR)
- Extract And Inspect The Intraseasonal Variability Of OLR And RSR With Period Of 20 To 60 Days From The Spectra Dataset.

(Significant Structures Of Variabilities At Intraseasonal Time Scale May Indicate Possibility Of Predictive Capability Beyond The Traditional 14 Days Limit.)

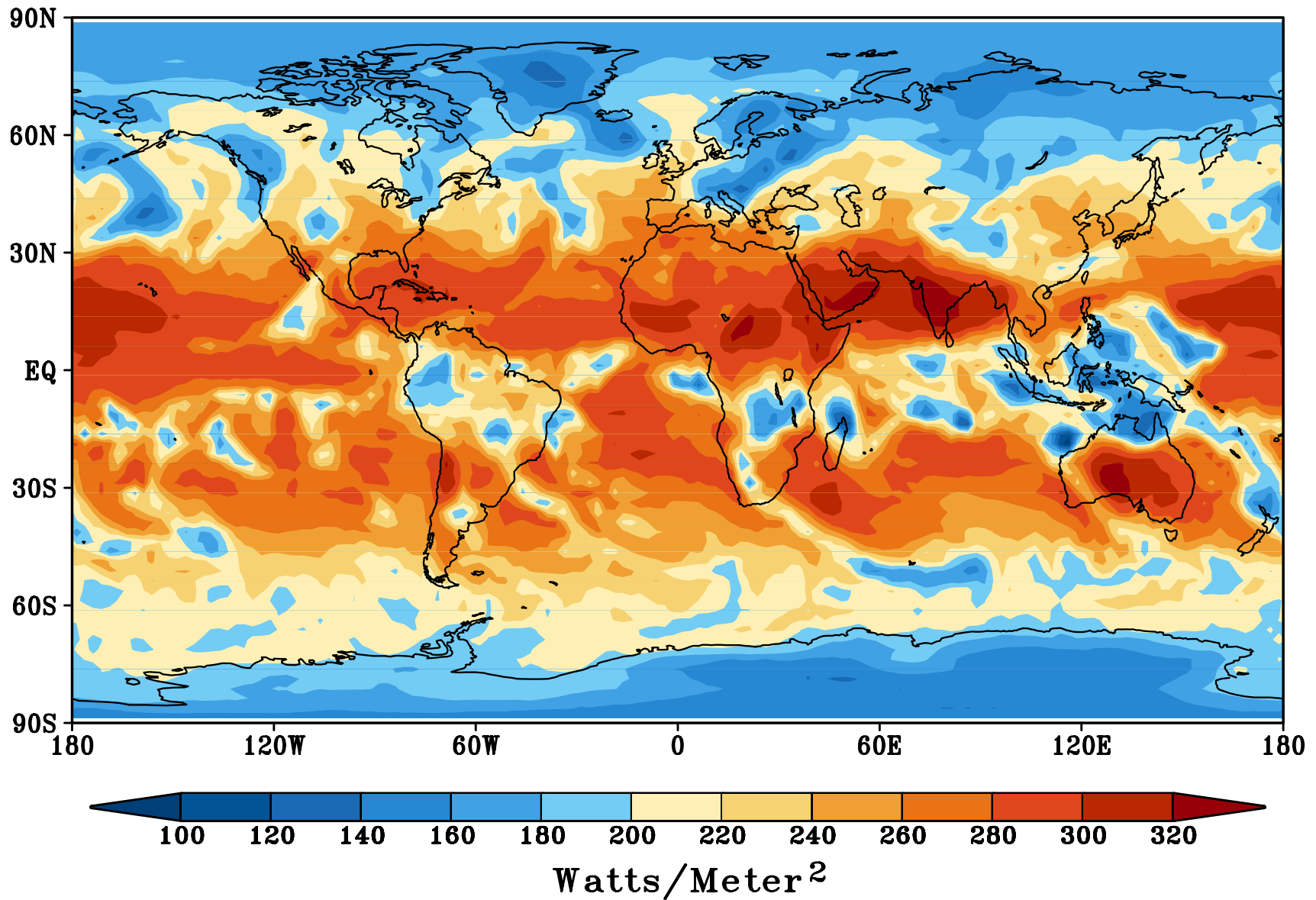
RADIATION BUDGET DATASET

- NASA CERES Instruments Aboard The Earth Observing System (EOS) Terra Spacecraft.
- CERES/Terra ERBE-Like Edition 1 ES-4G Dataset Obtained From NASA Langley Atmospheric Sciences Data Center.
- First Year Of Global Daily Mean OLR And RSR: March 1st, 2000 To February 28th, 2001.
- Global Daily Mean Values Of OLR And RSR Are Mapped Onto A 2.5-Degree Equal Angle Grid System.
- Each Daily Map Of OLR And RSR Contains 10,368 Grid Values.
- There Are 365 Daily Maps Per Year.

METHODOLOGY

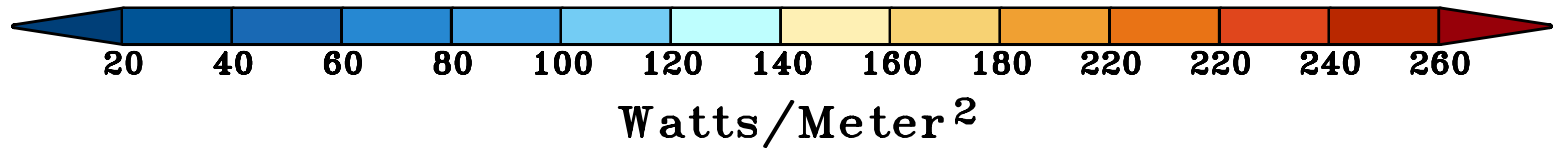
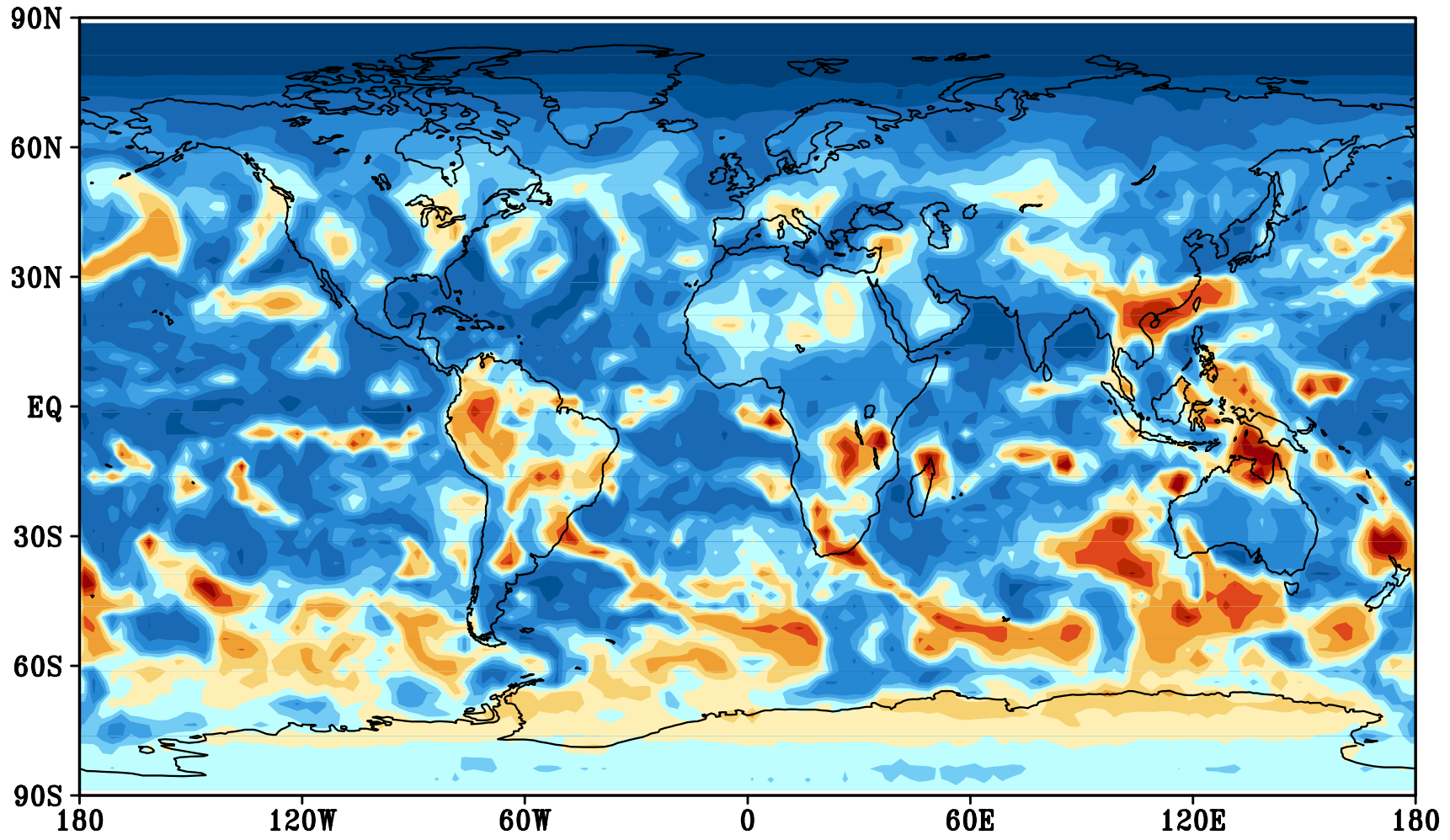
- Rearrange The OLR And RSR Daily Map Data Into 10,368 Regional Time Series.
- Fourier-Analyze Each Regional OLR And RSR Time Series For Period From 2 Days To A Year.
- Compute The Temporal Spectral Power Of OLR And RSR For Each Region By Taking The Square Of The Fourier Amplitude.
- Partially Integrate All 10,368 Temporal Spectra With Period Of 20 To 60 Days To Extract The Partial Variances Of Regional OLR And RSR At Intraseasonal Time scale.
- Recombine Each Regional OLR And RSR Partial Variance To Form A Corresponding Global Map Of Intraseasonal Variability.

Outgoing Longwave Radiation
CERES/Terra, 2.5-degree ERBE-like, March 1, 2000

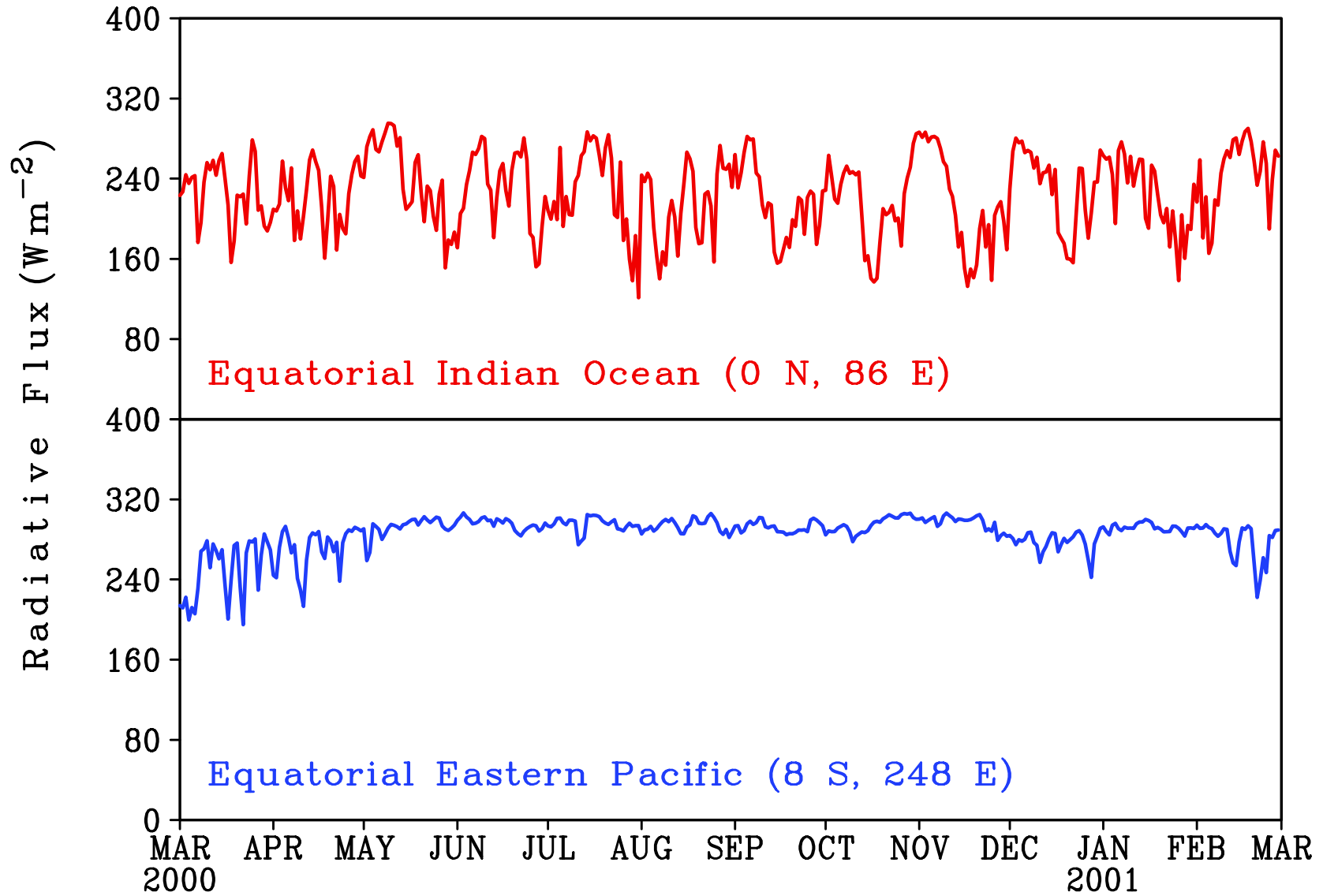


Reflected Solar Radiation

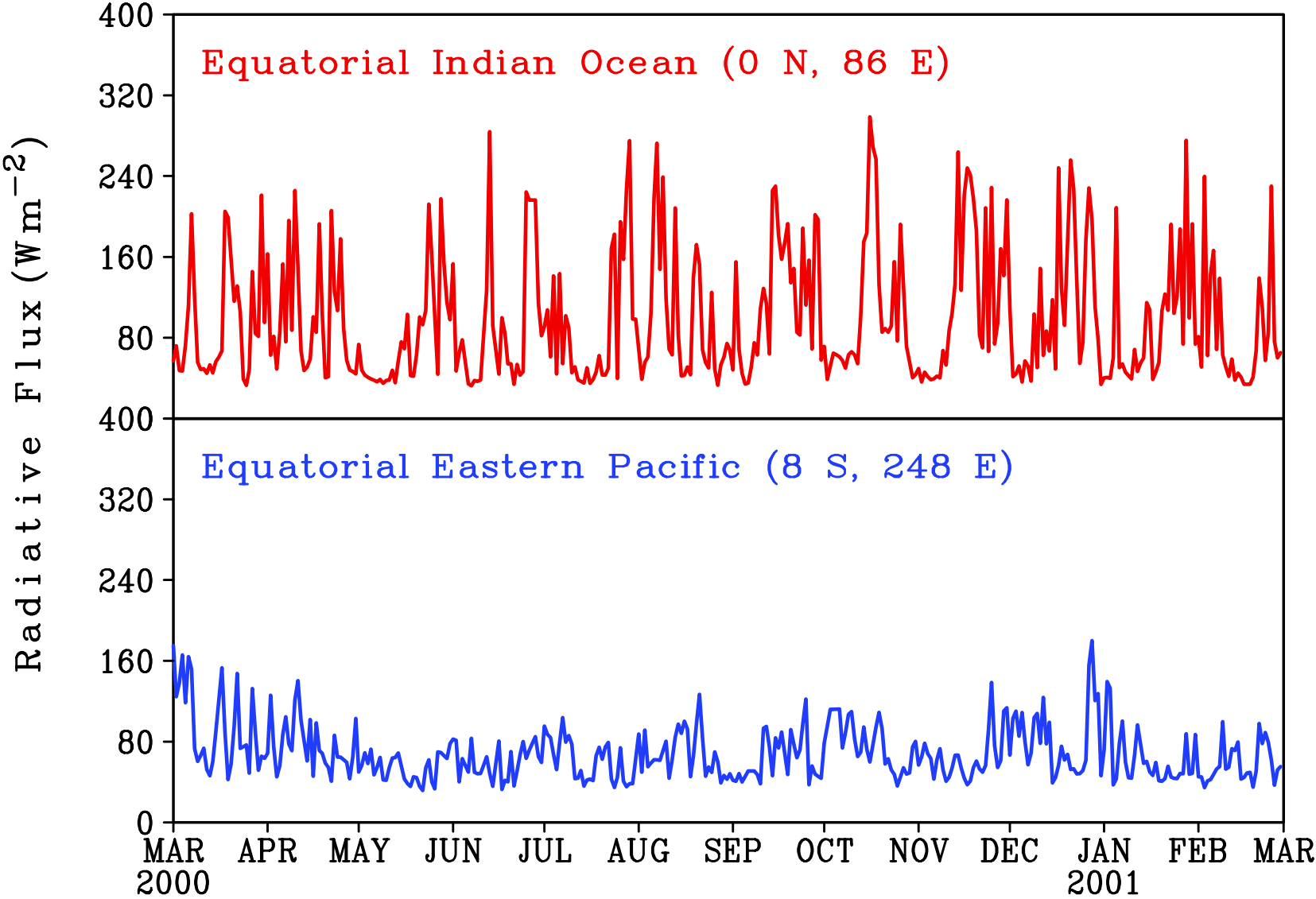
CERES/Terra, 2.5-degree ERBE-like, March 1, 2000



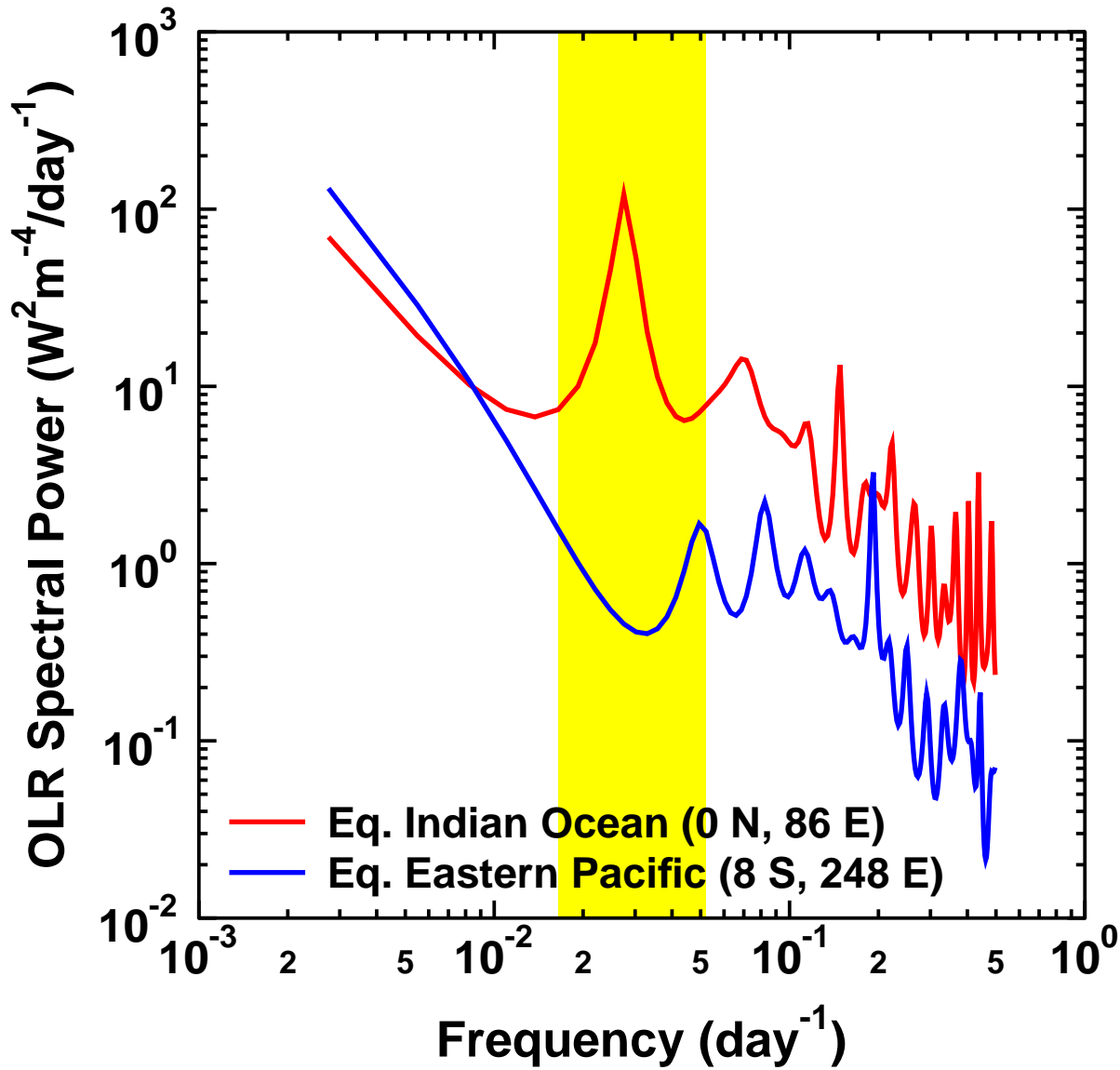
Time Series of CERES Outgoing Longwave Radiation



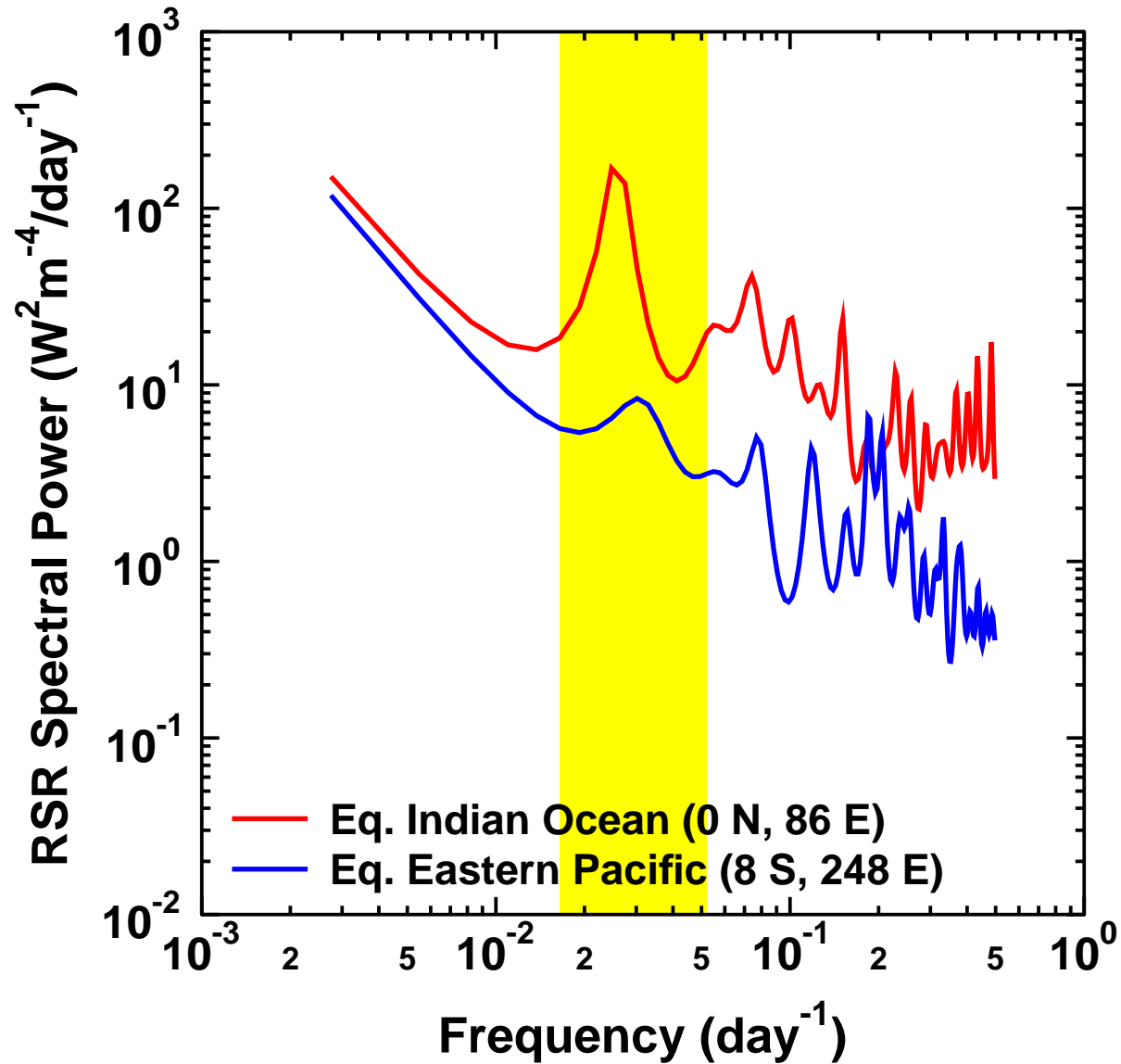
Time Series of CERES Reflected Solar Radiation



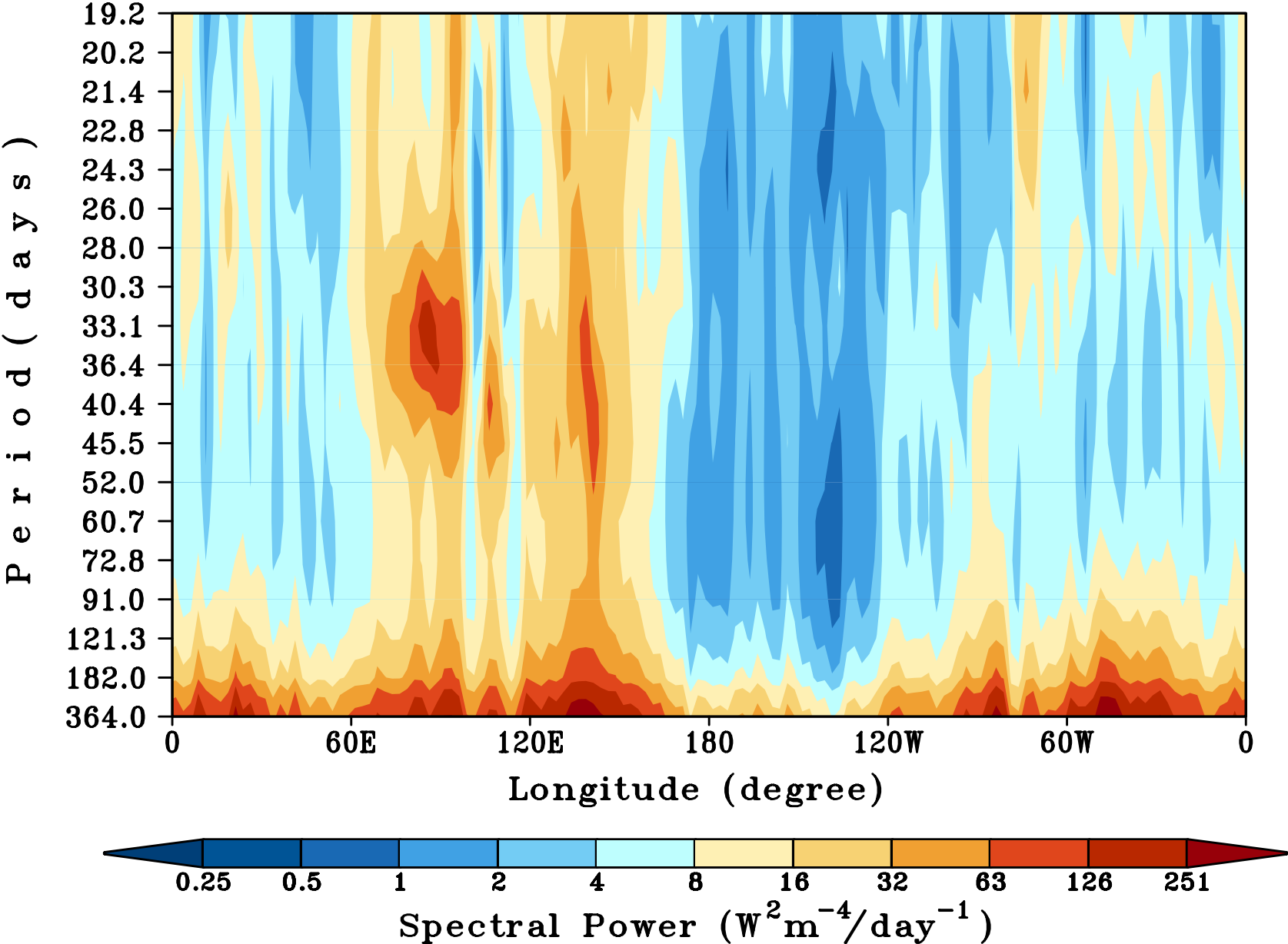
Temporal Spectra of Outgoing Longwave Radiation



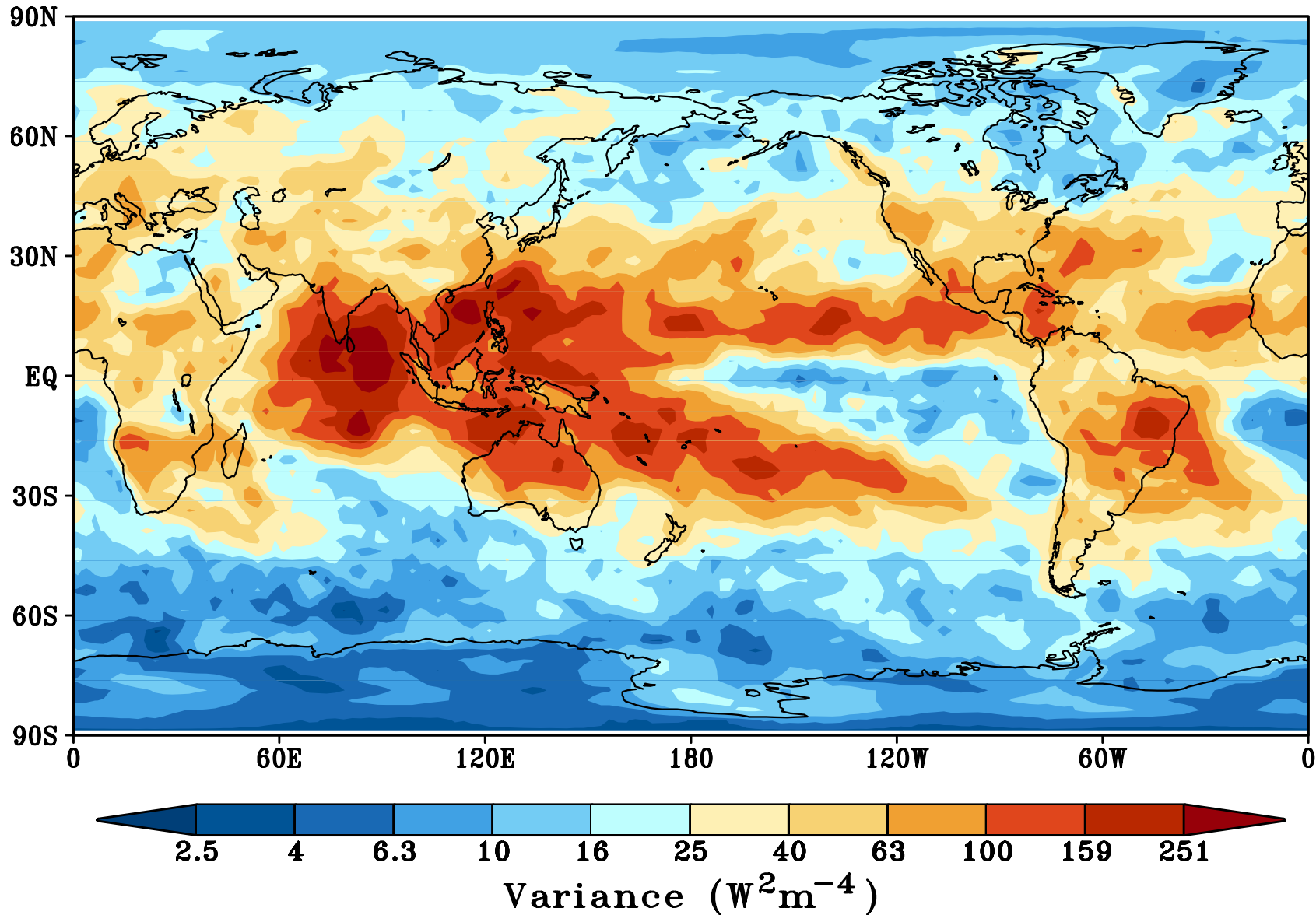
Temporal Spectra of Reflected Solar Radiation



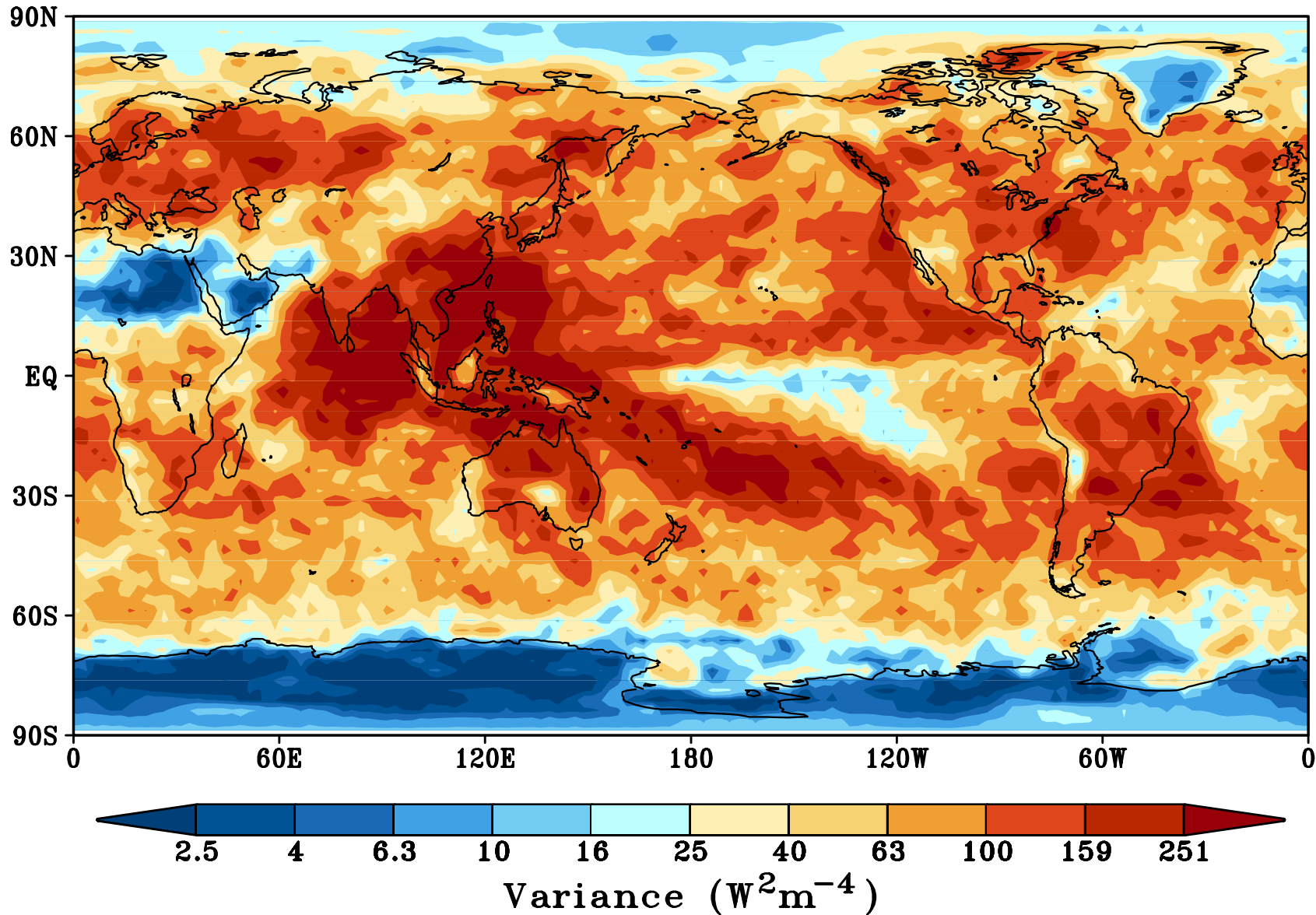
Temporal Spectra of CERES/Terra RSR at Equator



Intraseasonal Variability of Outgoing Longwave Radiation Derived From CERES/Terra Observations



Intraseasonal Variability of Reflected Solar Radiation Derived From CERES/Terra Observations



SUMMARY

- OLR And RSR Data Show Significant Intraseasonal Variations, Especially In The Tropics, With Effects Propagating To Higher Latitudes.
- These Intraseasonal Variations Are Due To Weather Patterns Which Persist Well Beyond The Traditional Limit Of Predictability And Require Additional Research To Understand.
- Intraseasonal Variations In OLR Are Strong Over The Indian Ocean And Subcontinent, Southeast Asia And Indonesia, And Amazon Region. These Variation Are Due To Variability In High Altitude Thick Clouds.
- Some Intraseasonal Variations In RSR Are Similar To Those Of OLR (i.e., Caused By Effects Of High Clouds). In Addition, There Are Also Intraseasonal RSR Variations Over Pacific Ocean West Of The Coast of North And South America, And In Europe. These Additional RSR Variations Are Due To Variability In Low Altitude Clouds.