TEMPORAL SPECTRA OF EARTH RADIATION
BUDGET COMPONENTS

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OBJECTIVES


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.
- 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

Equatorial Indian Ocean (0 N, 86 E)

Equatorial Eastern Pacific (8 S, 248 E)
Time Series of CERES Reflected Solar Radiation

Equatorial Indian Ocean (0 N, 86 E)

Radiative Flux (Wm\(^{-2}\))

Equatorial Eastern Pacific (8 S, 248 E)

MINION 2000  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  JAN  FEB  MAR  2001
Temporal Spectra of Outgoing Longwave Radiation

Eq. Indian Ocean (0 N, 86 E)
Eq. Eastern Pacific (8 S, 248 E)
Temporal Spectra of Reflected Solar Radiation

RSR Spectral Power (W² m⁻² day⁻¹)

Frequency (day⁻¹)

- Eq. Eastern Pacific (8 S, 248 E)
- Eq. Indian Ocean (0 N, 86 E)
Temporal Spectra of CERES/Terra OLR at Equator

Longitude (degree)

Period (days)

Spectral Power (W^2 m^-4 day^-1)
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.