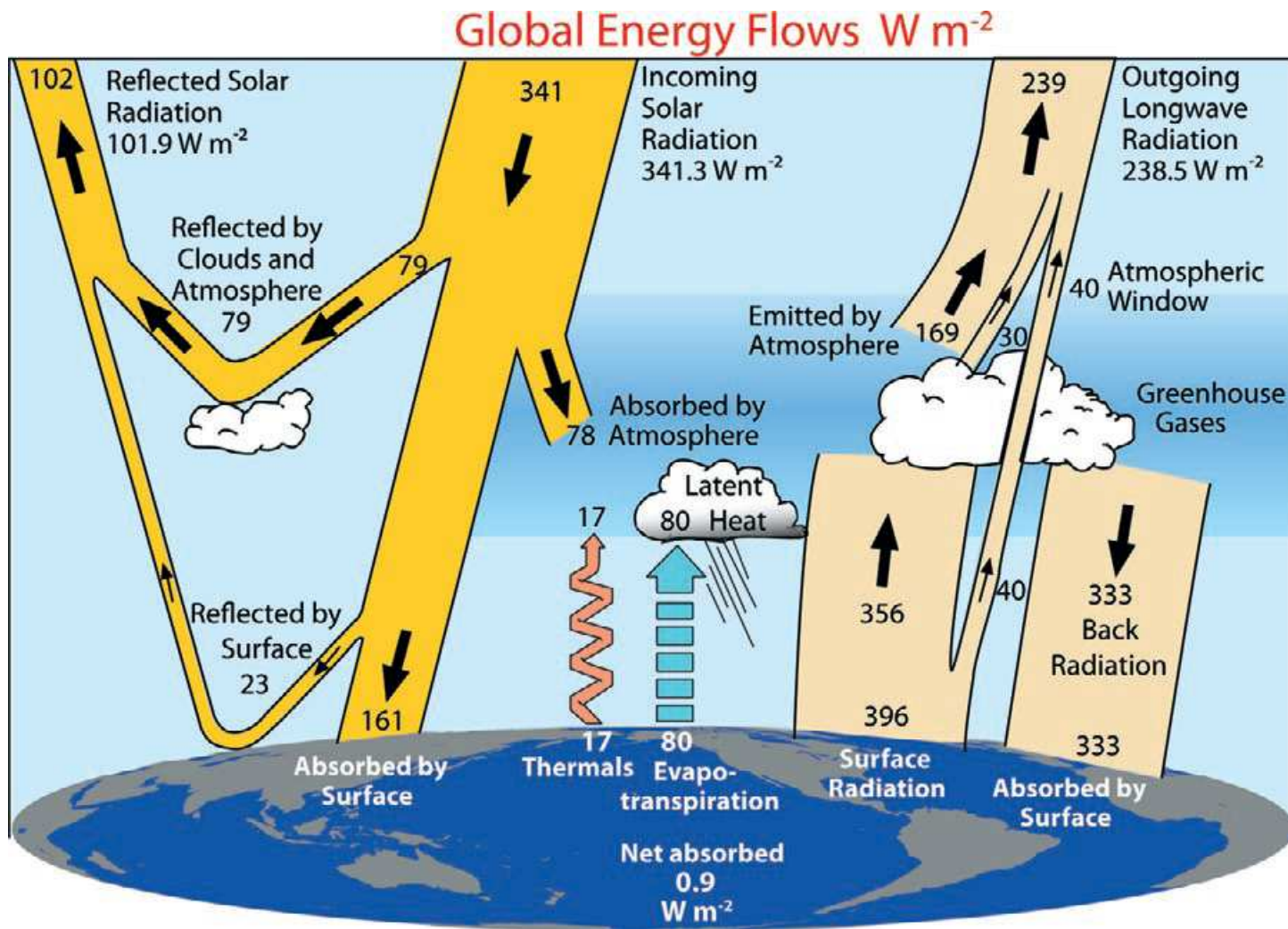


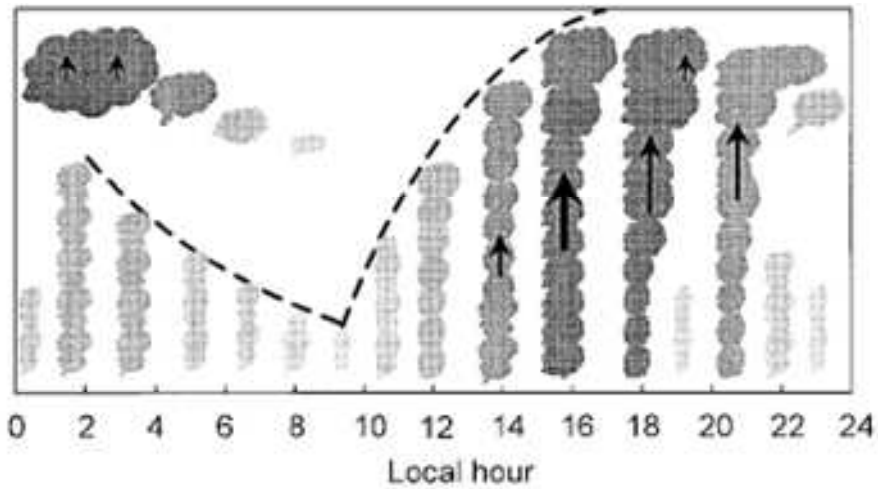
Tropical Diurnal Cycle Using CERES Synoptic Data

Patrick Taylor and Norman Loeb
NASA Langley Research Center
Climate Sciences Branch
Ecole Normale Superieure
15 September 2010

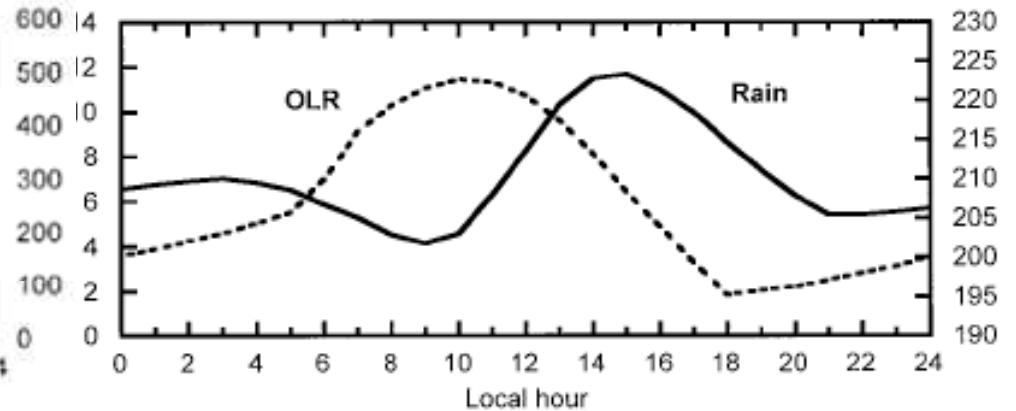
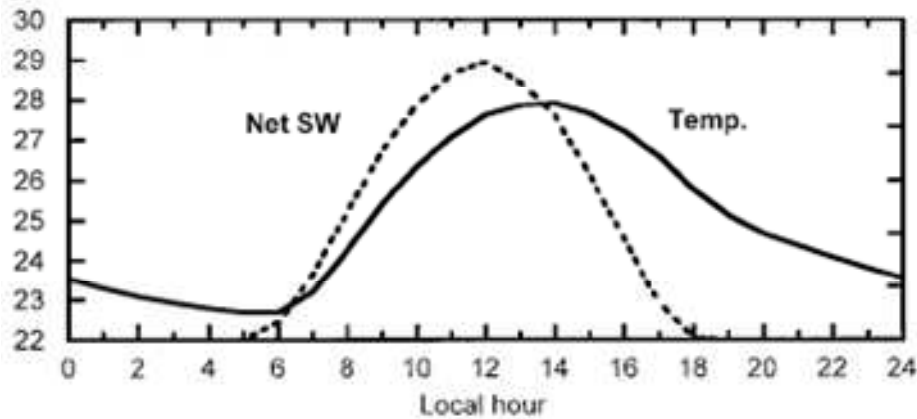


Trenberth et al. 2007

Diurnal Cycle Schematic



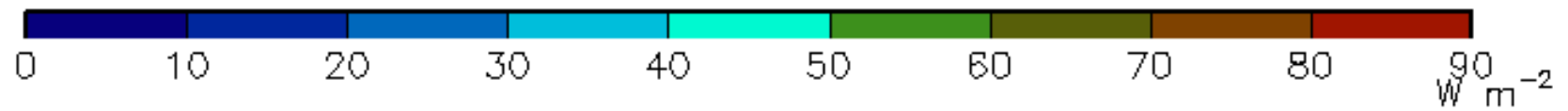
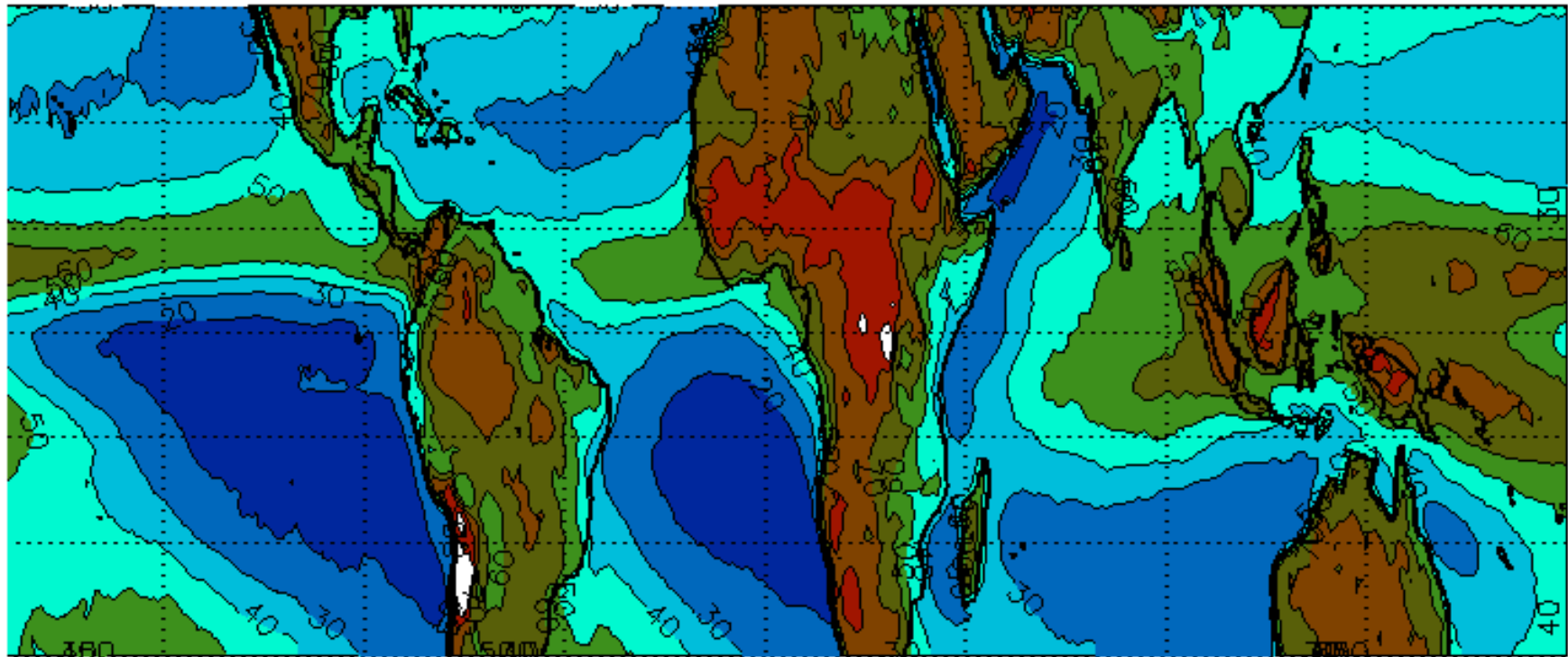
Lin et al. 2000



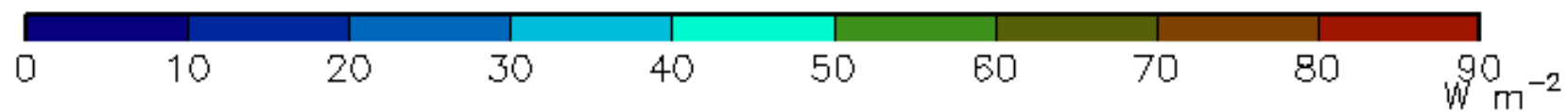
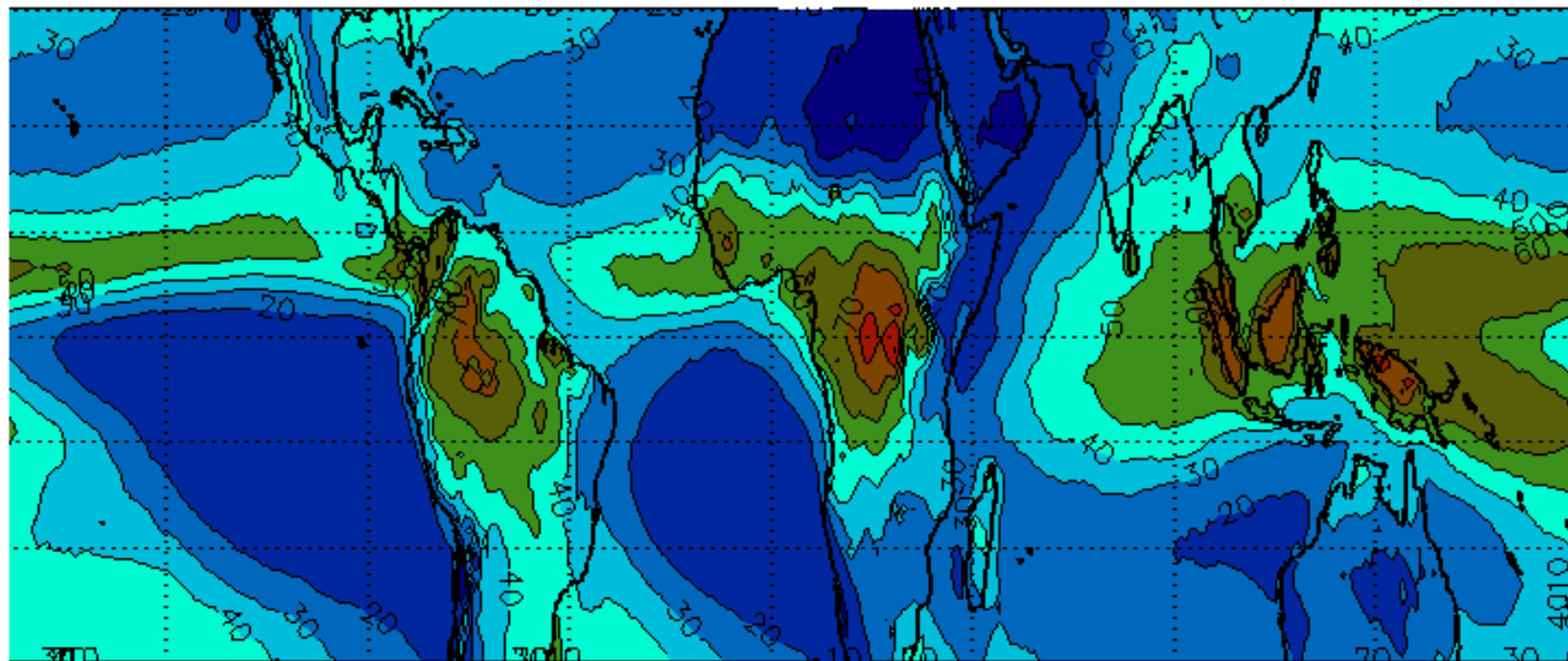
CERES Synoptic Data Product

- 1°x1° regional 3-hourly mean fluxes
- Synergistically combines CERES and Geostationary (GEO) satellite observations to resolve the diurnal cycle.
- GEO radiances are converted to broadband fluxes and normalized to place on same scale as CERES.

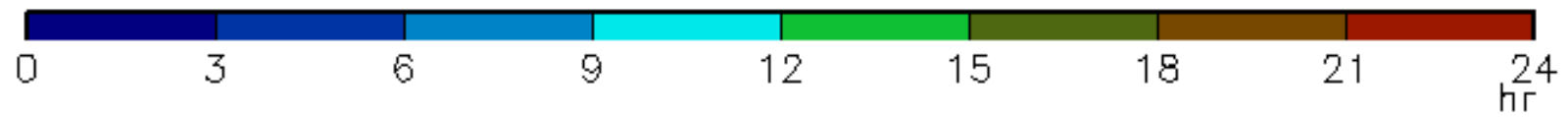
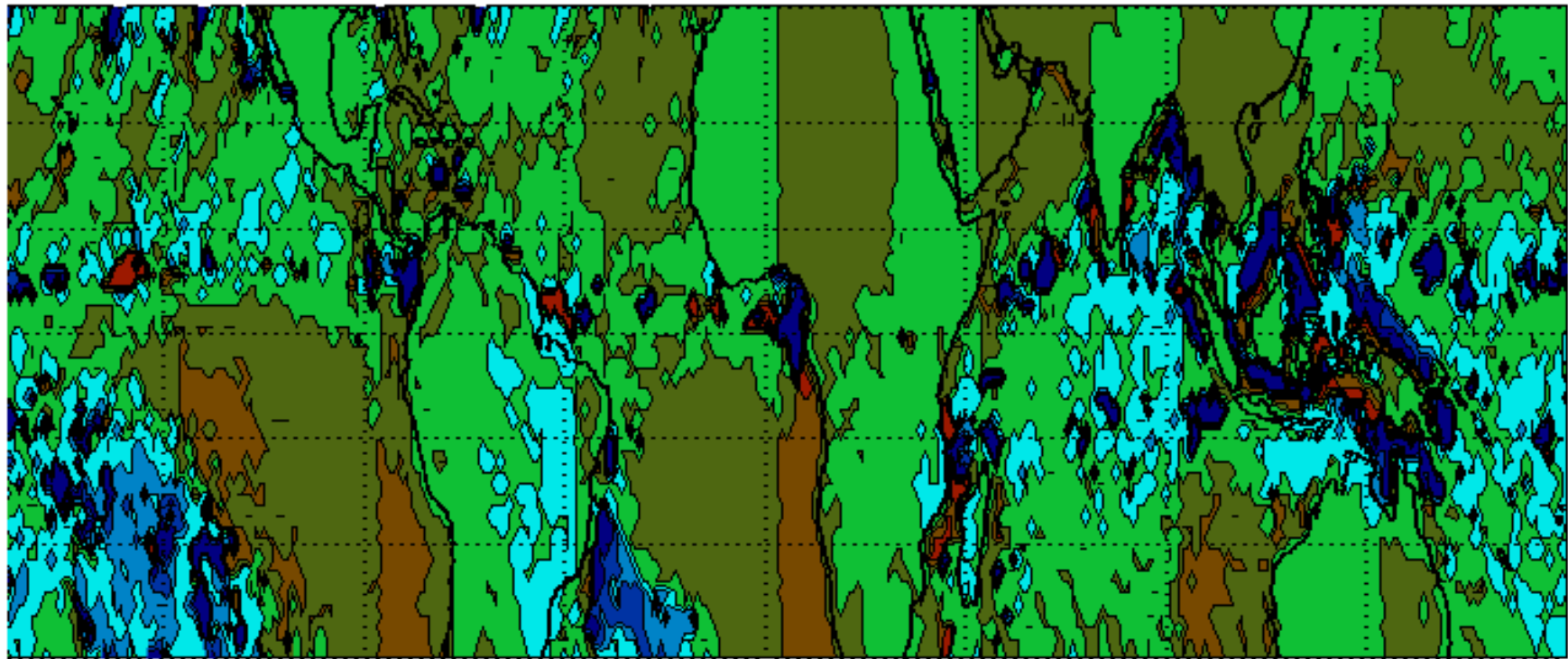
Mean Diurnal Range OLR—Annual Mean



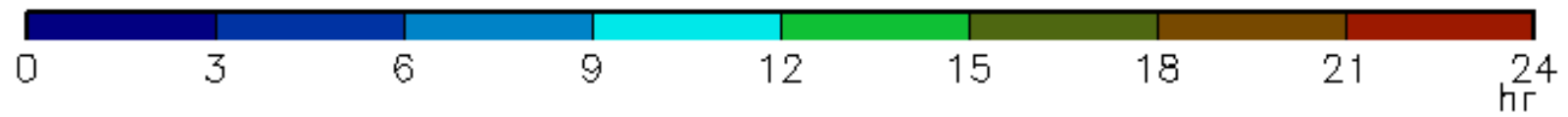
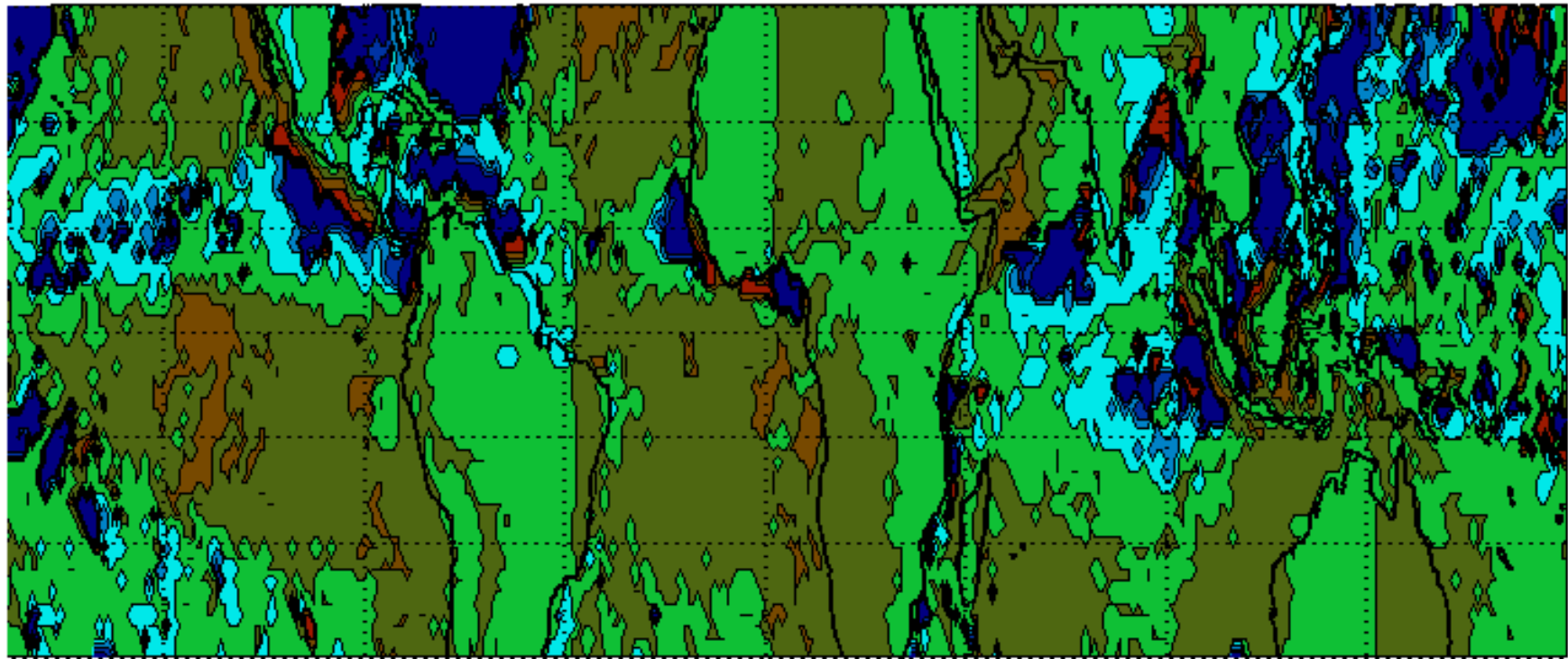
Mean Diurnal Range LW CRF—Annual Mean



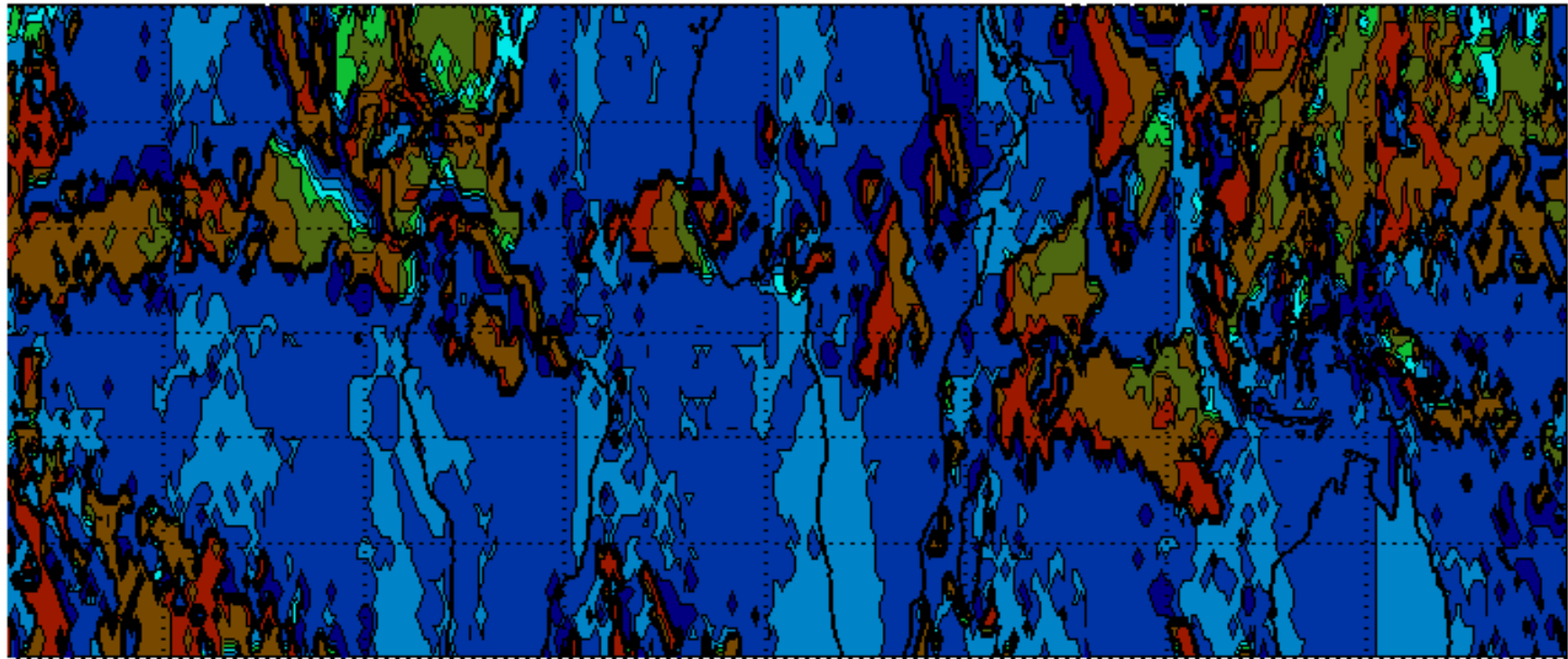
Time of Maximum OLR--January



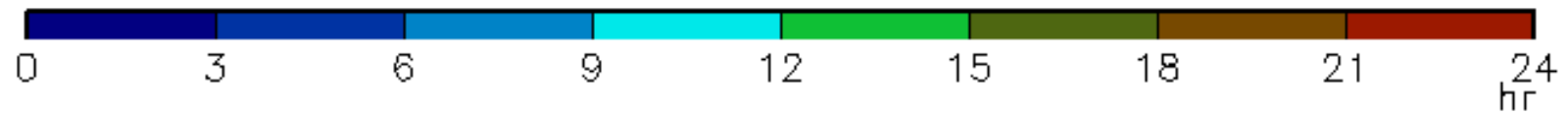
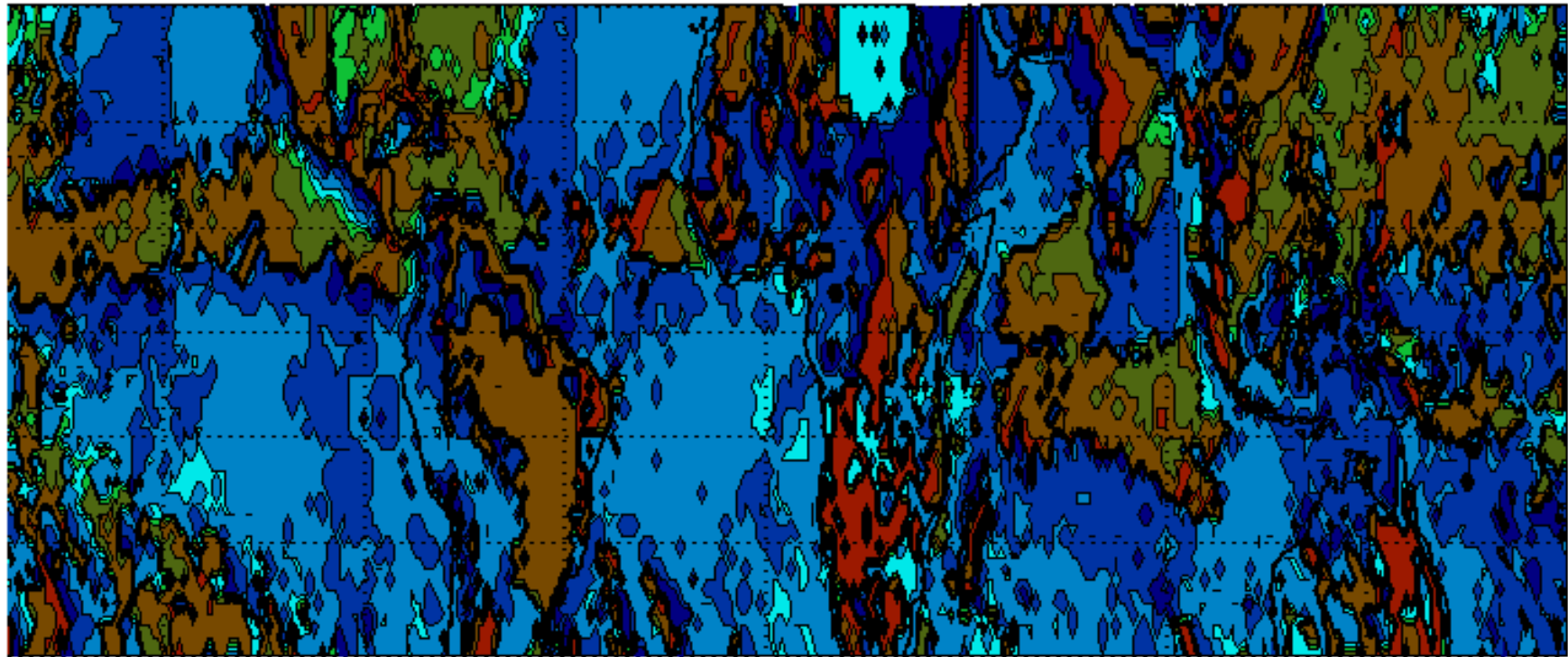
Time of Maximum OLR--July



Time of Minimum OLR--July



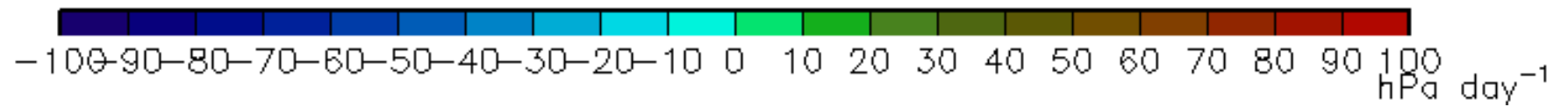
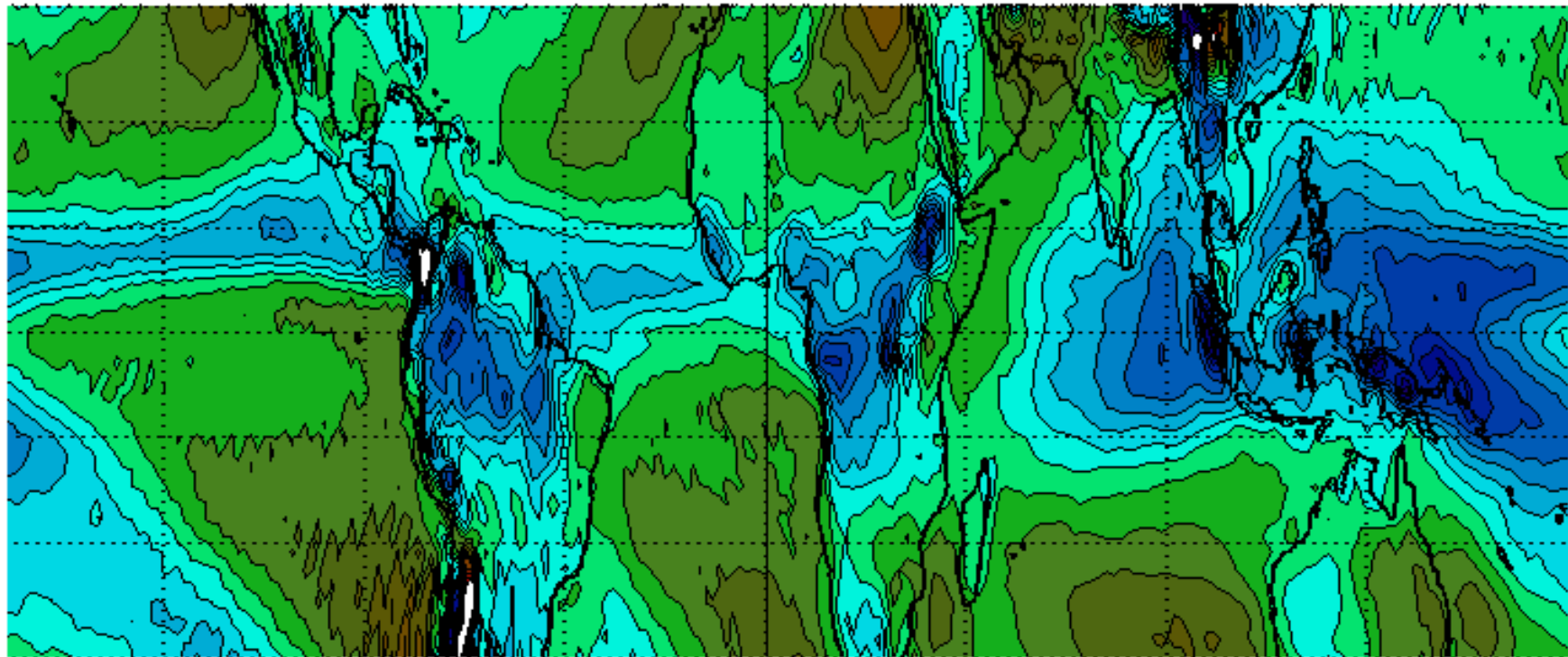
Time of Maximum LW CRF--July



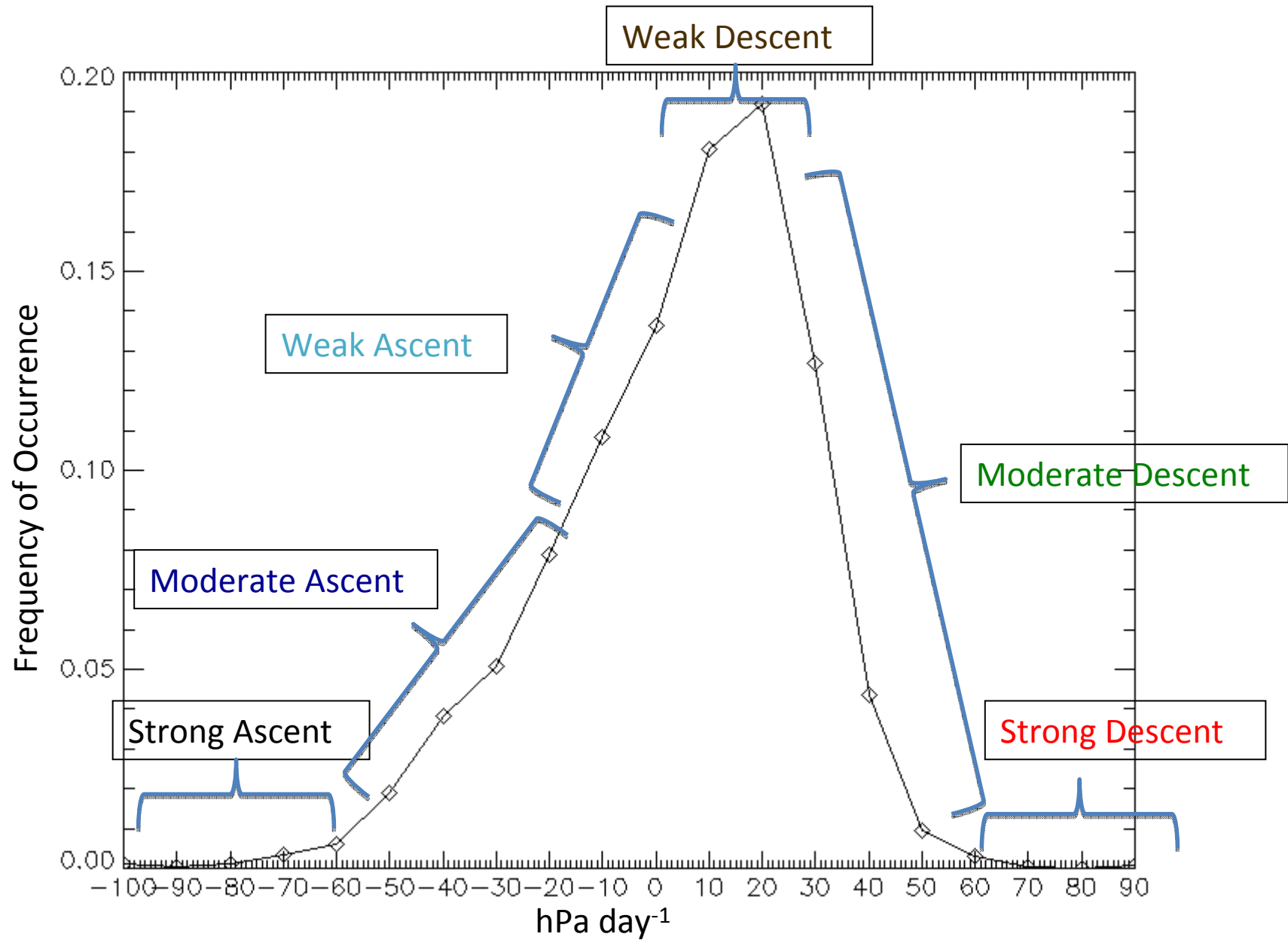
Approach

- Define Tropics as 30 N to 30 S
- Define dynamical regime using ERA-interim 500-hPa vertical velocity
- Analyze characteristics of the diurnal cycle within this framework.

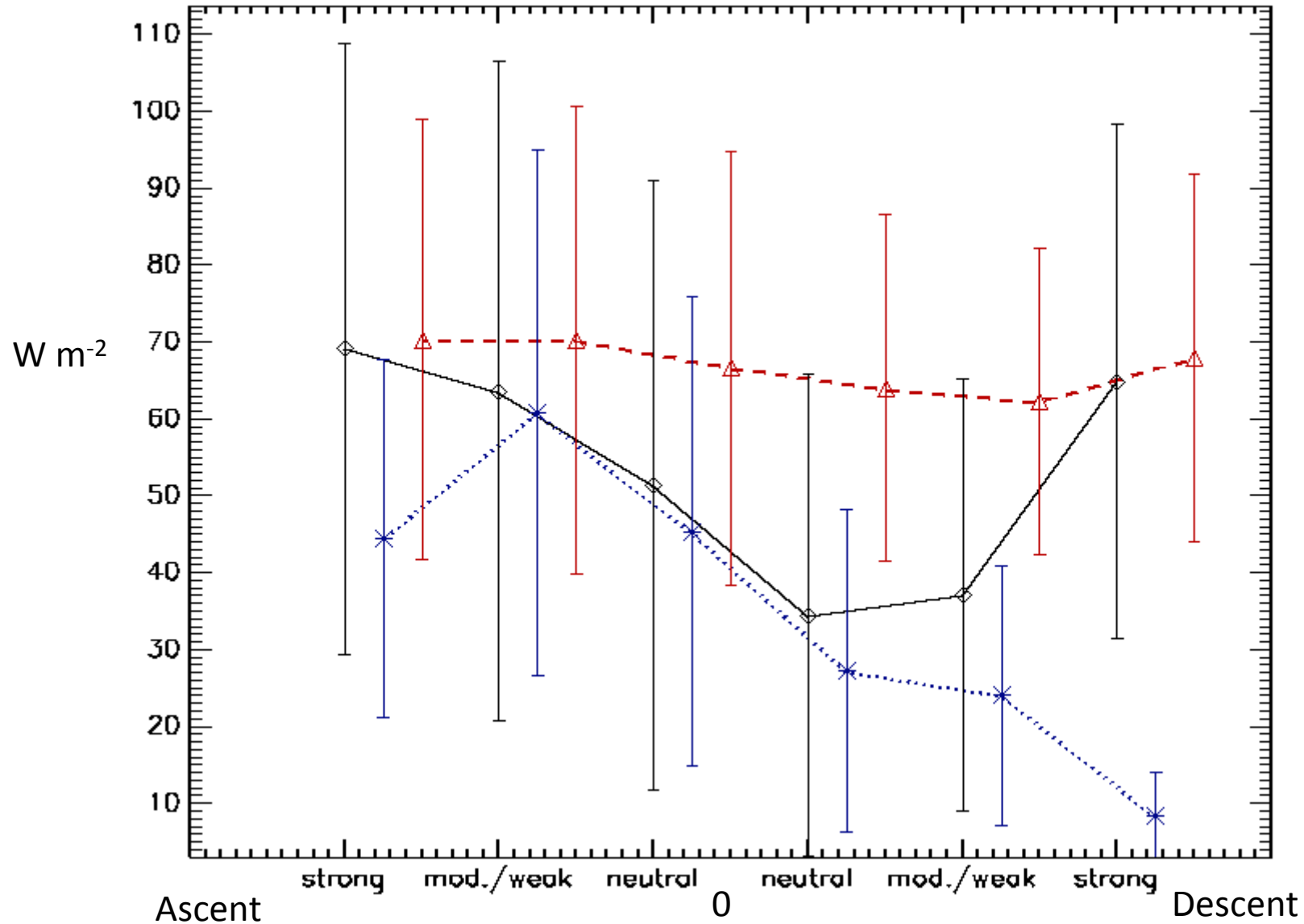
ERA Interim 500 hPa omega—Annual Mean



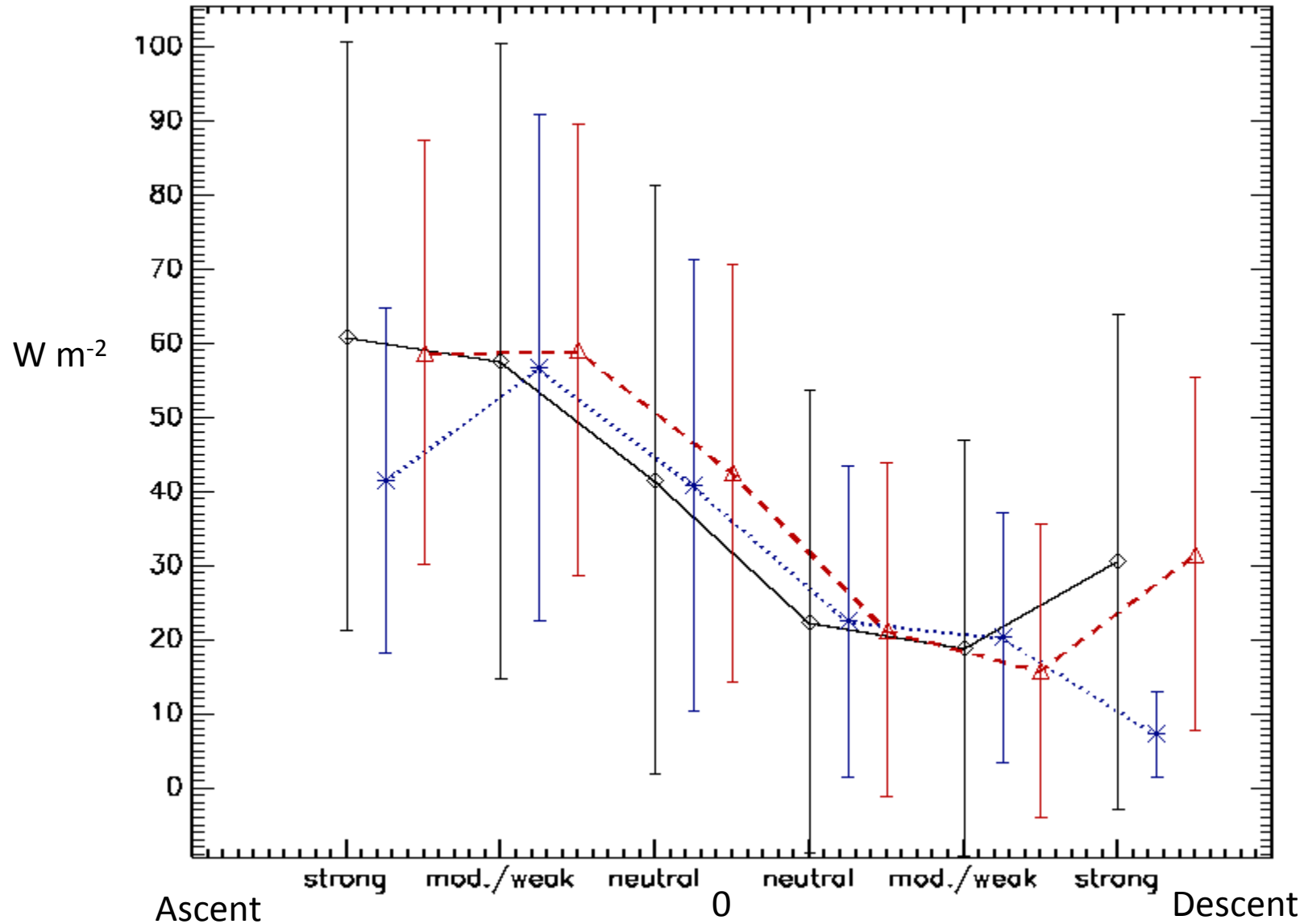
ERA Interim 500 hPa omega—Annual Mean



Diurnal Amplitude—OLR

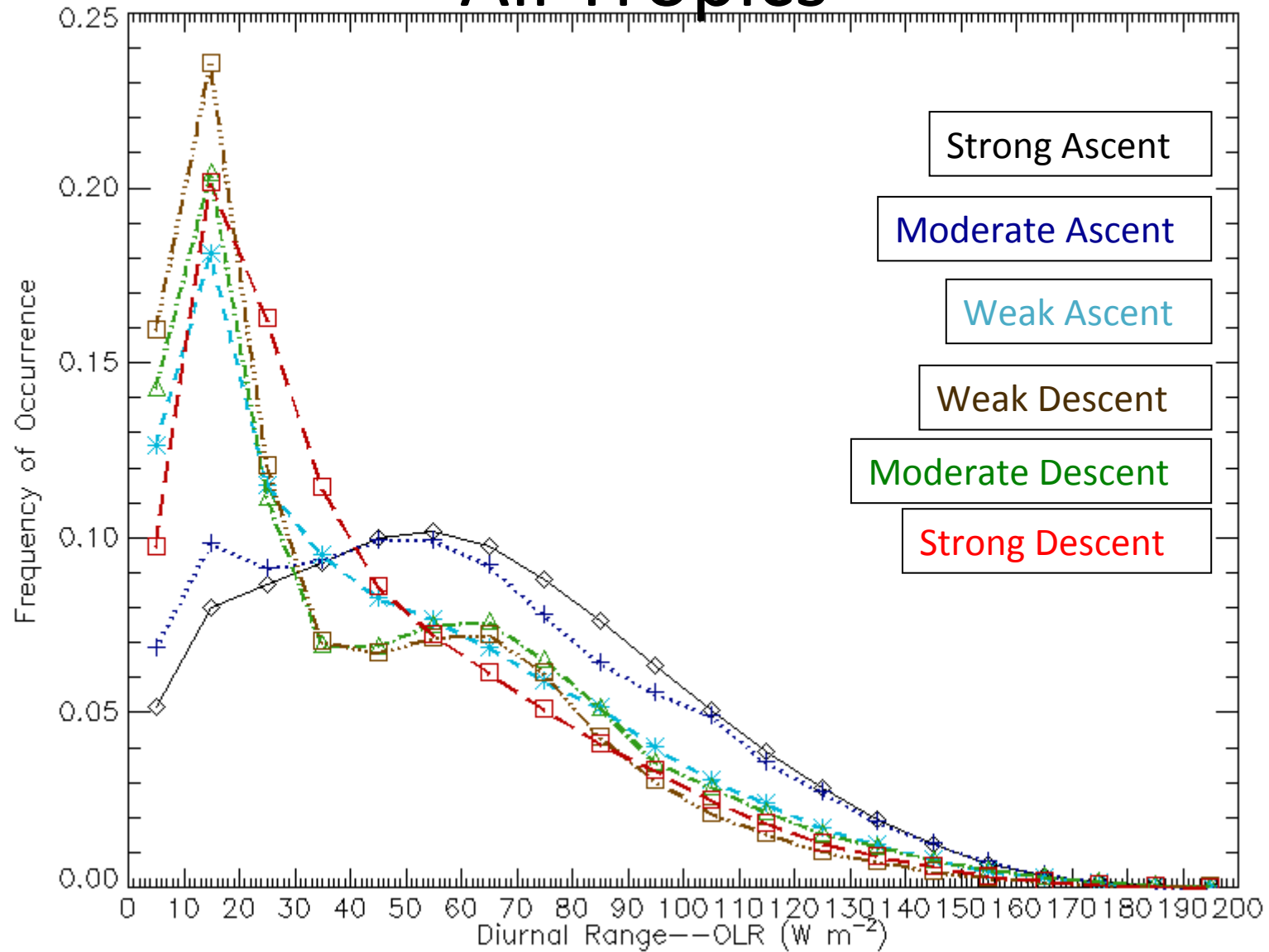


Diurnal Amplitude—LW CRF



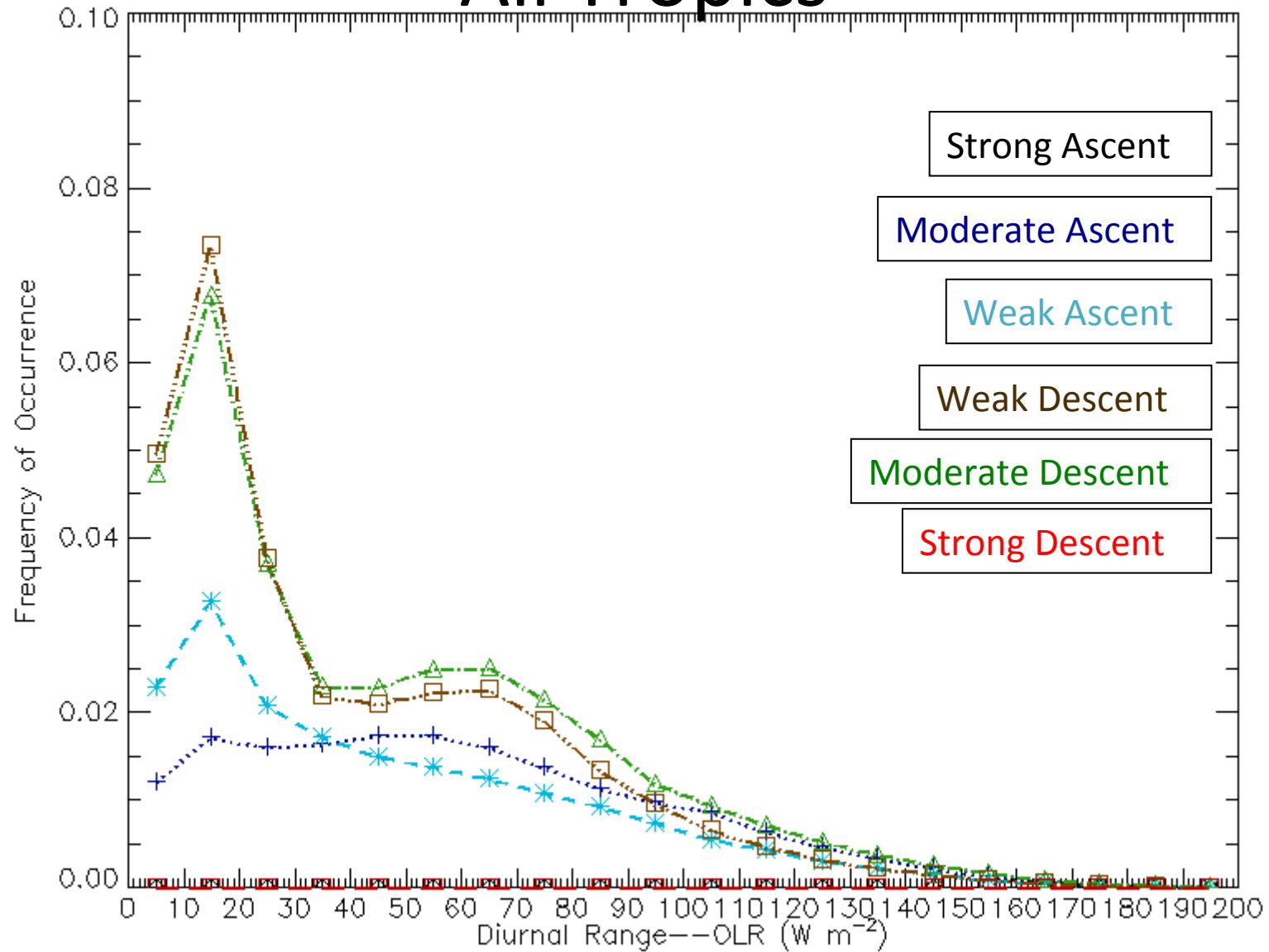
Diurnal Amplitude—OLR

All Tropics



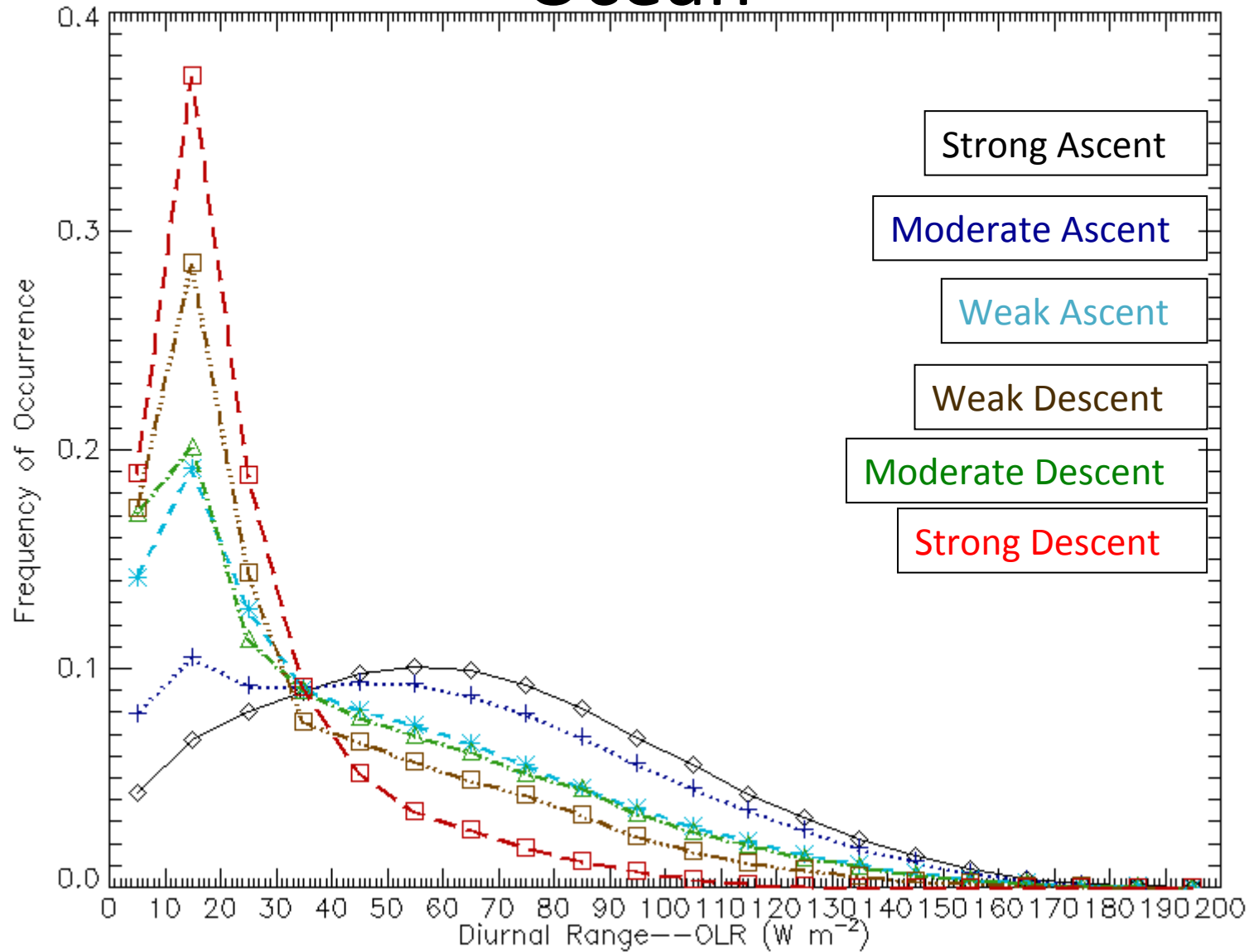
Diurnal Amplitude—OLR

All Tropics



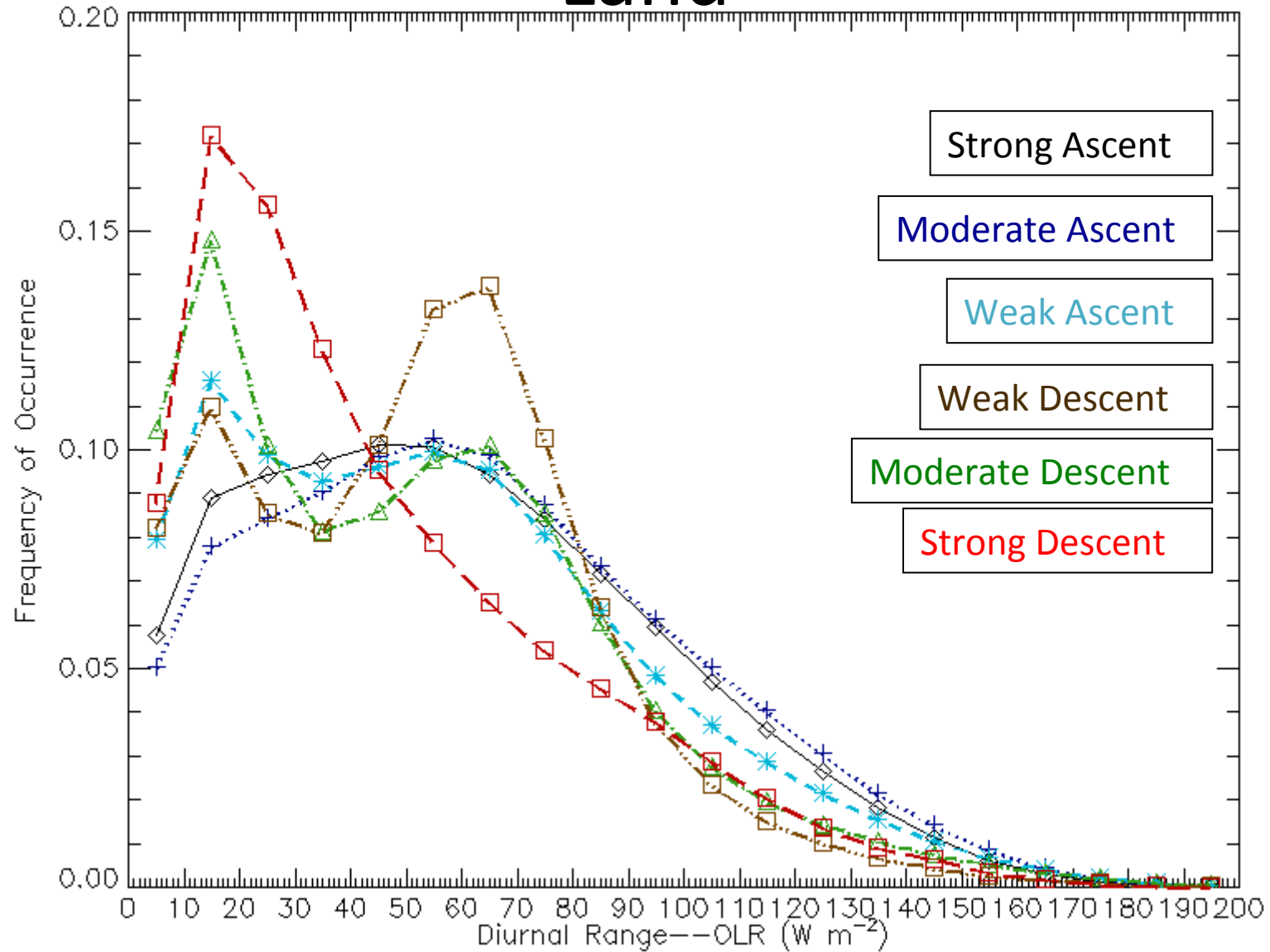
Diurnal Amplitude—OLR

Ocean



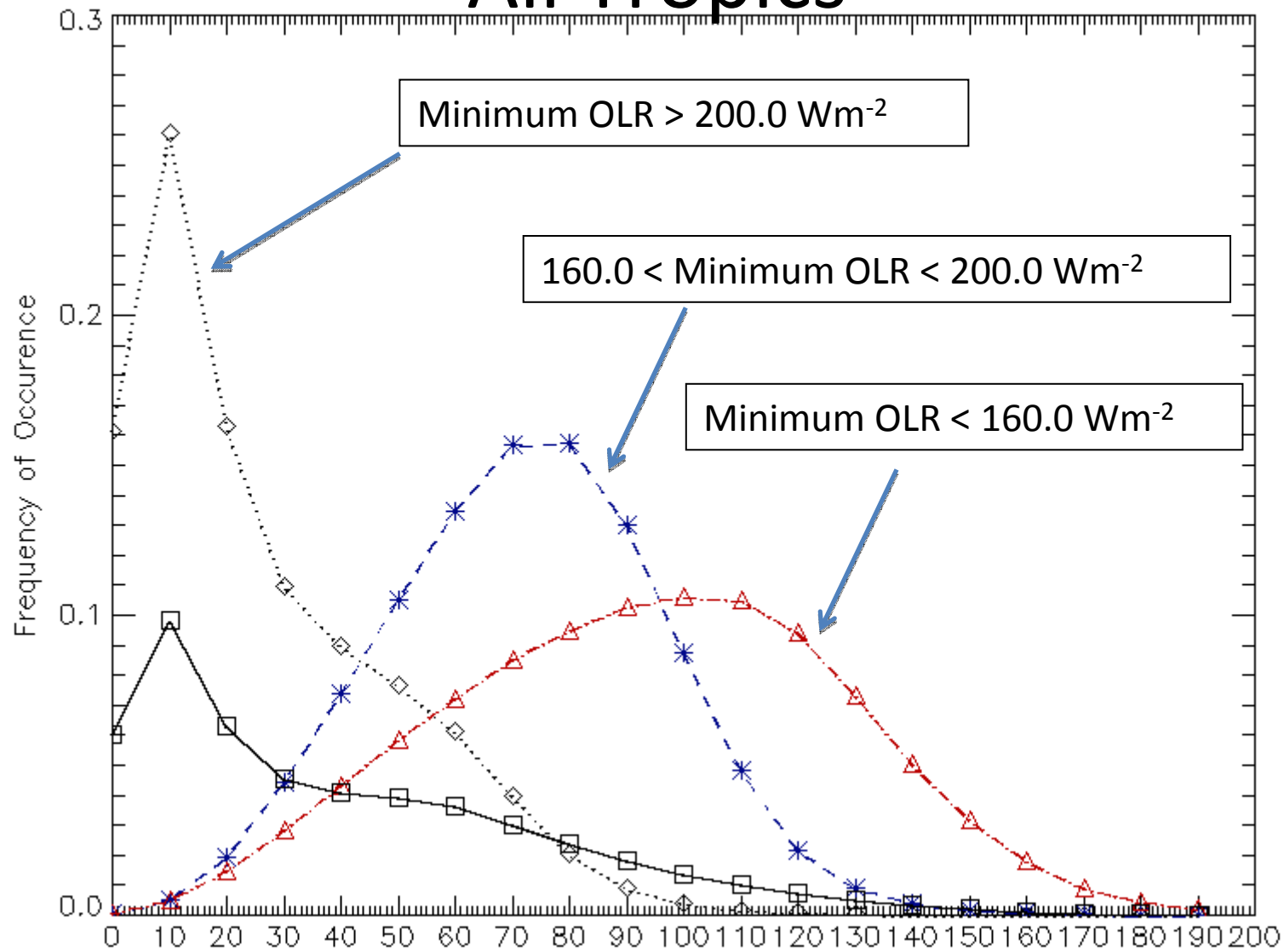
Diurnal Amplitude—OLR

Land

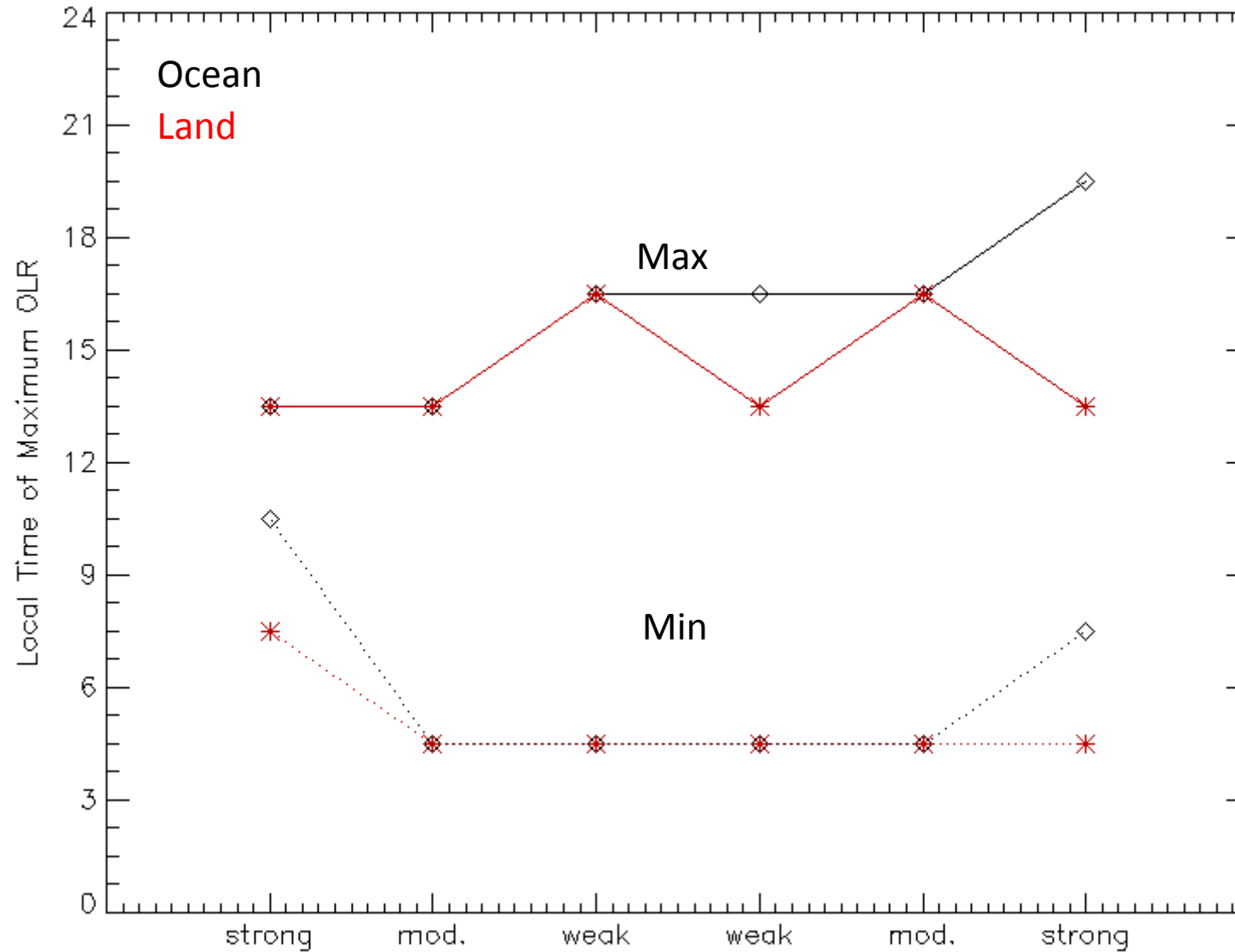


Diurnal Amplitude—OLR

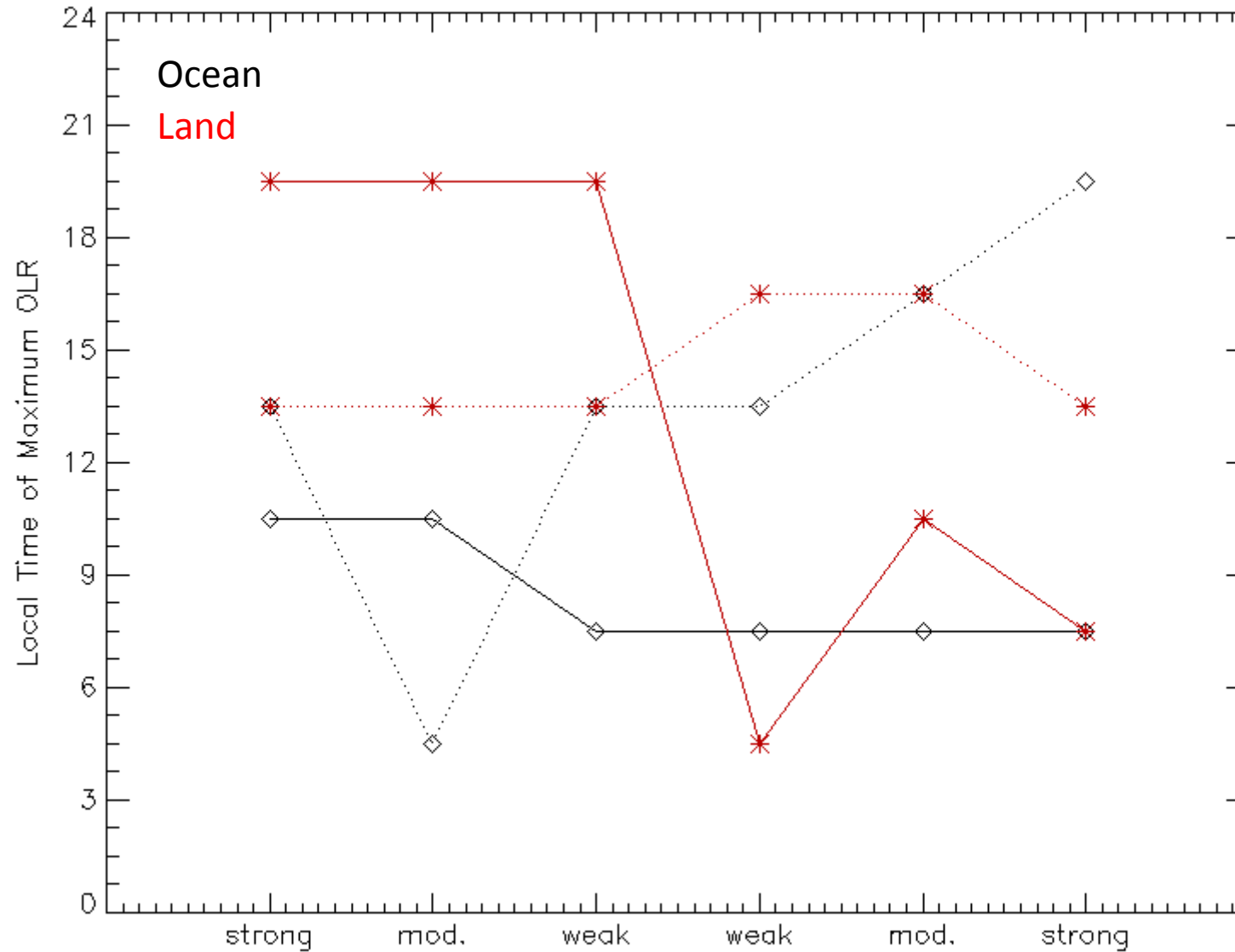
All Tropics



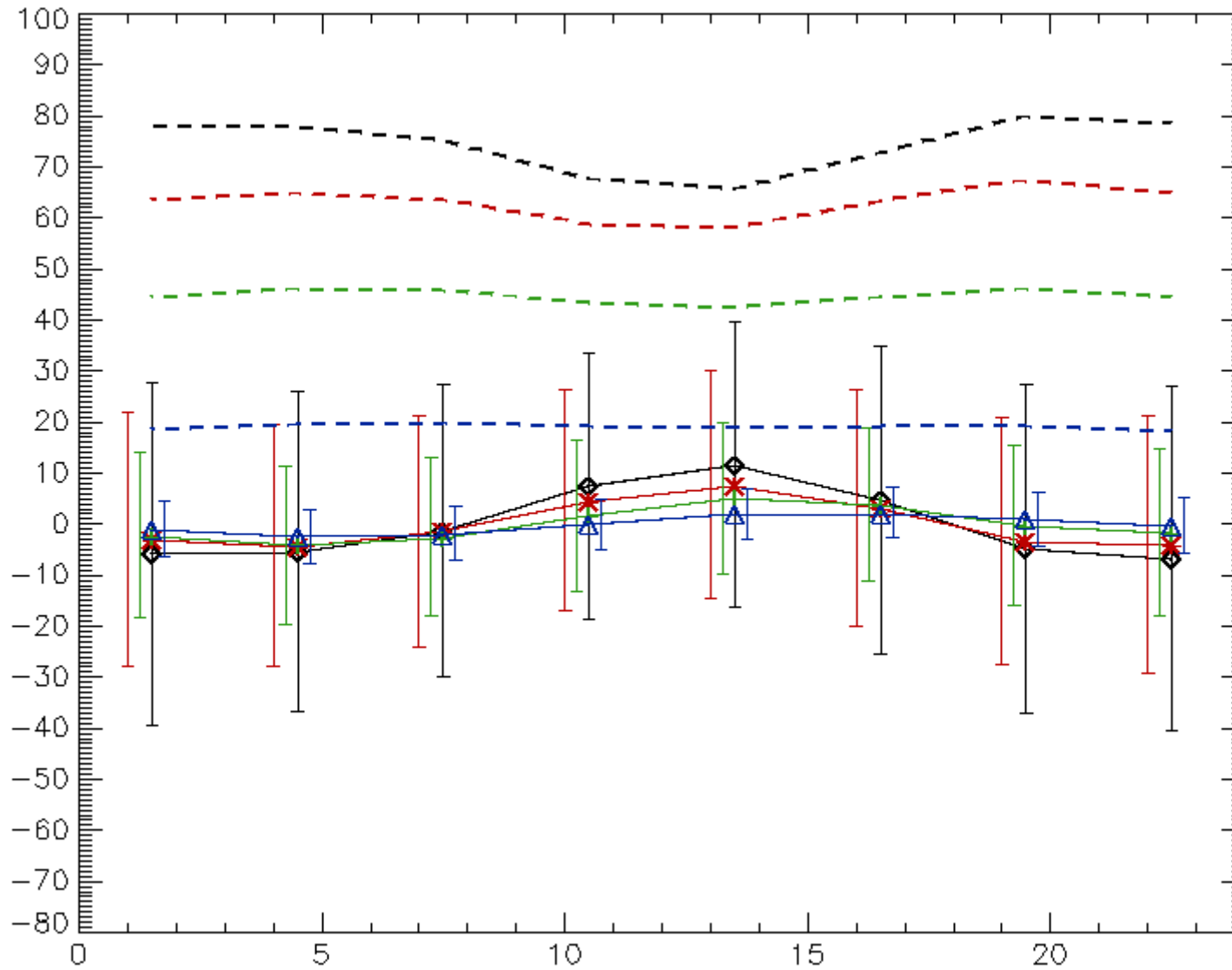
Diurnal Phase—OLR



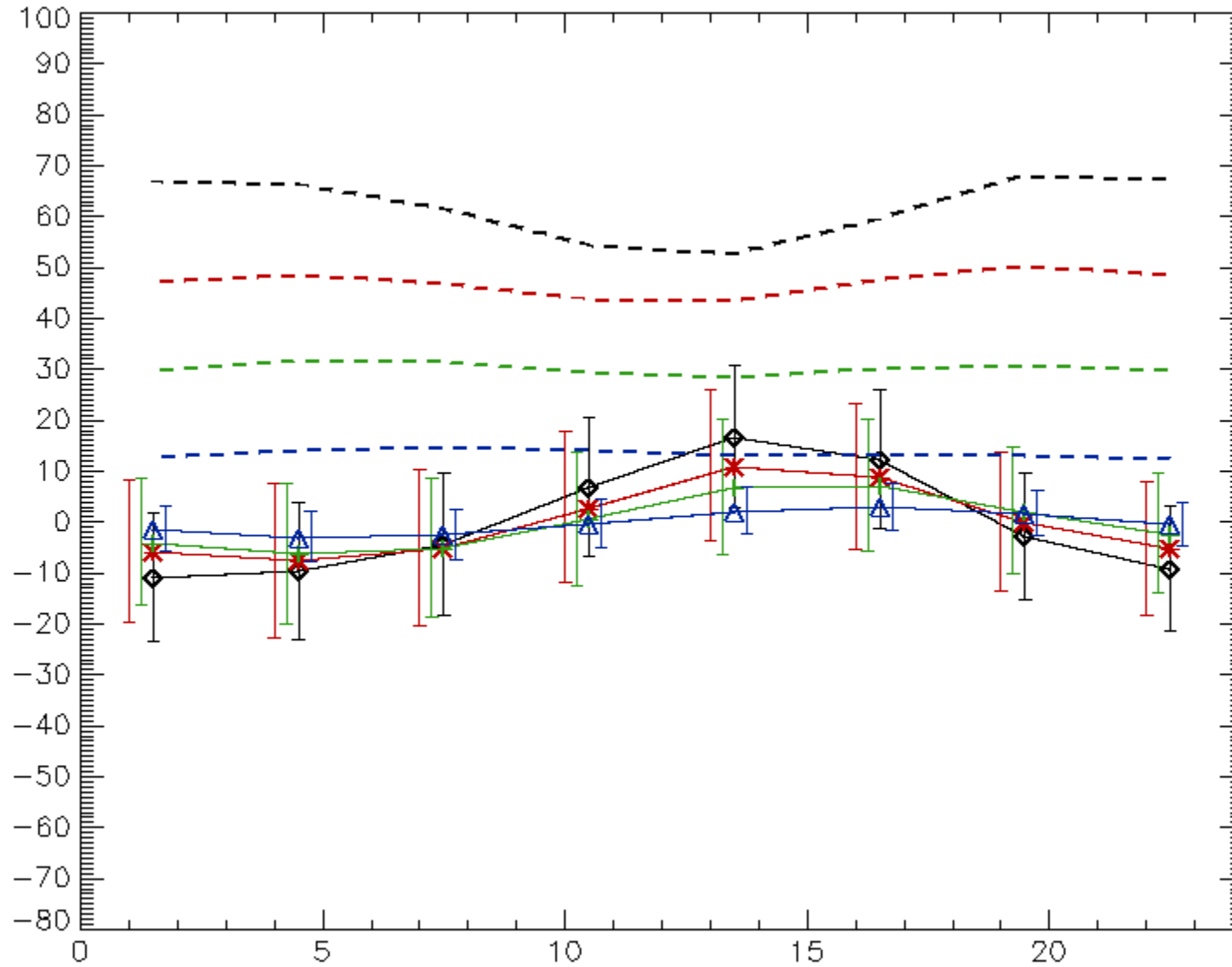
Diurnal Phase—LW CRF



Moderate Ascent



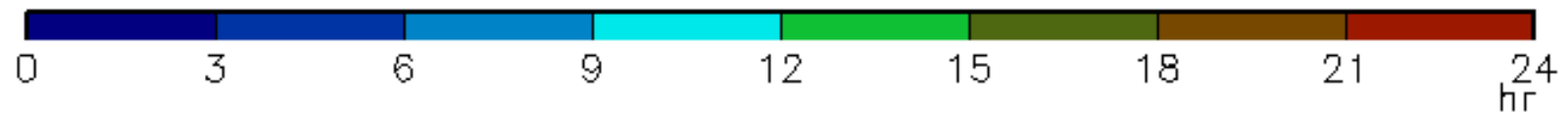
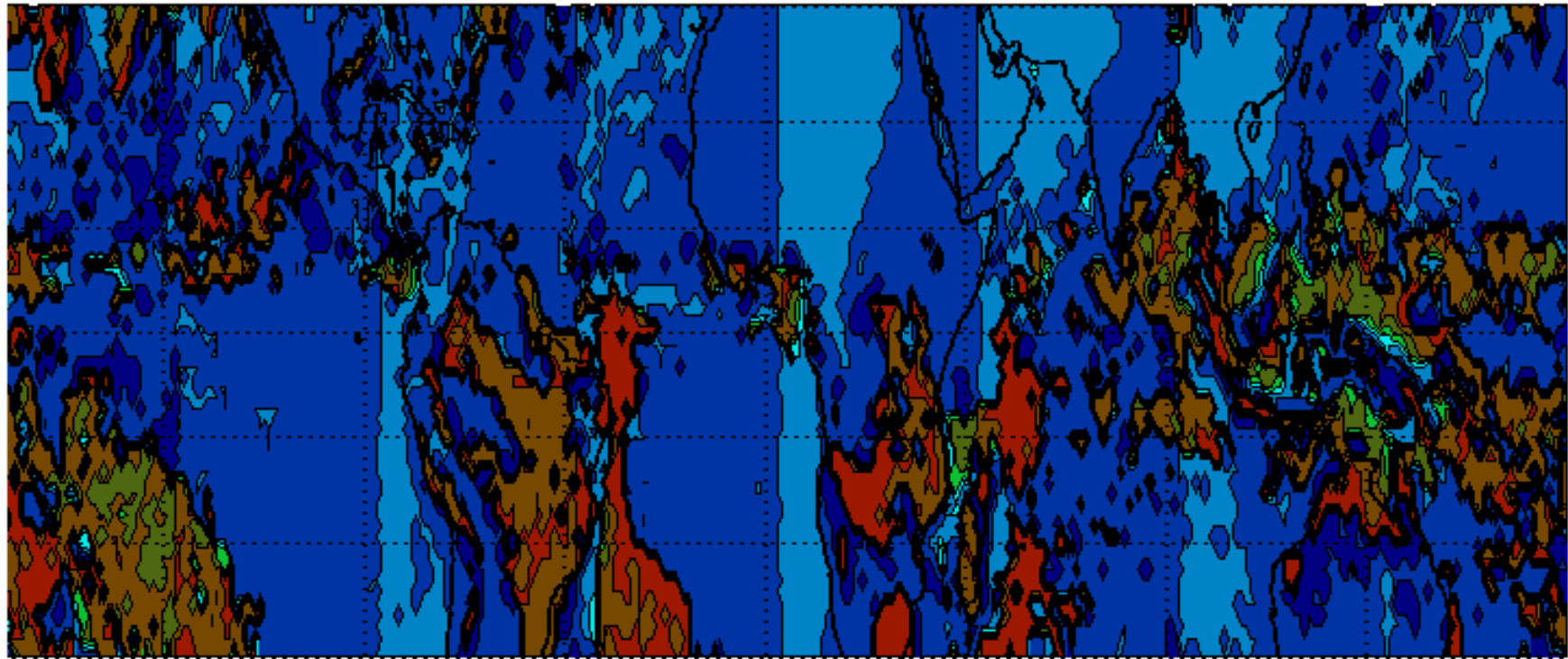
Moderate Descent



Conclusions and Future Work

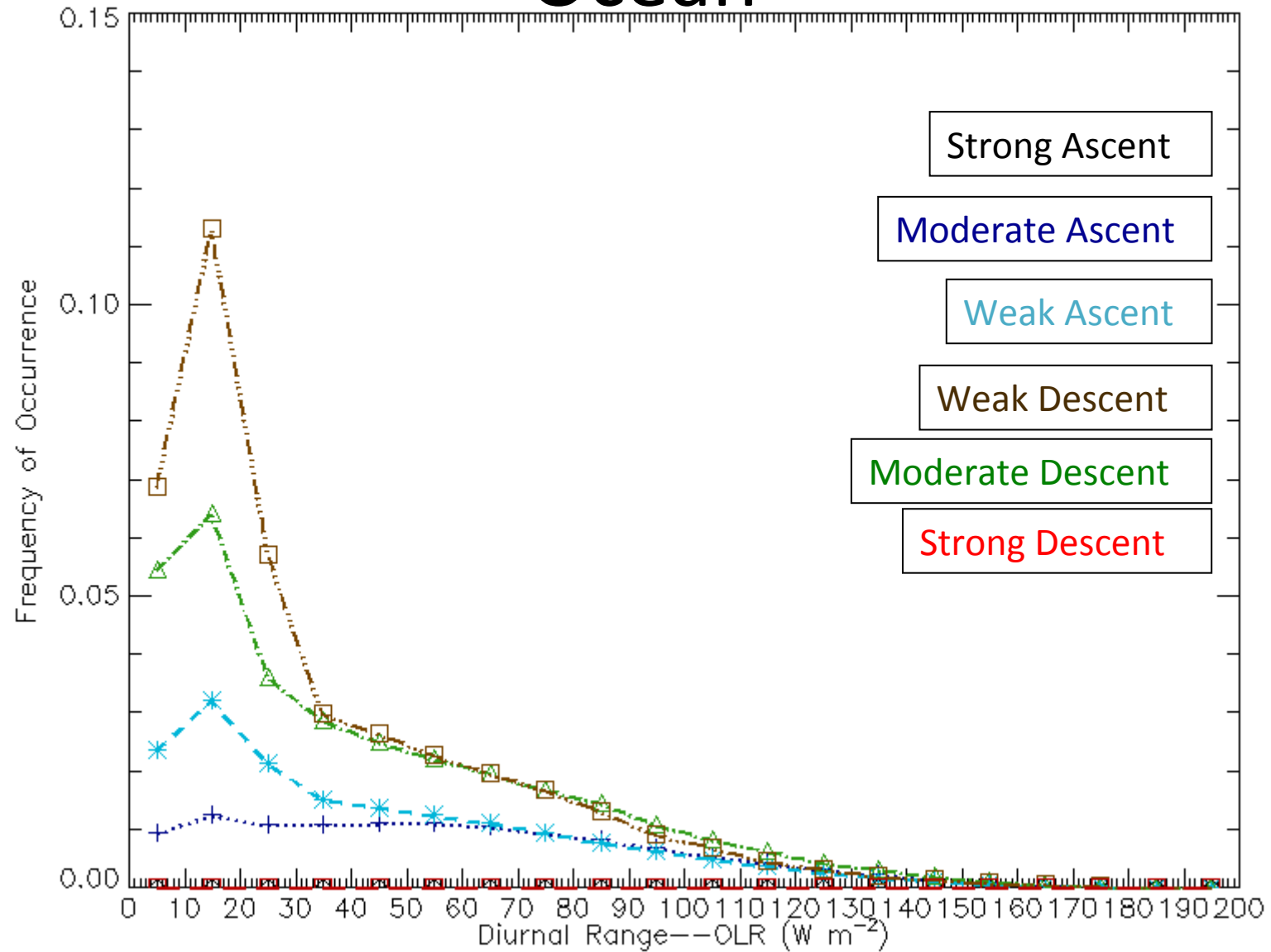
- CERES SYN data allow for a comprehensive view of the tropical diurnal cycle.
- The dynamical regime framework separates the amplitude and phase characteristics well.
- Large amplitude diurnal cycles have a strong CRF throughout.
- Future plan is to compare with GCMs.

Time of Minimum OLR--January



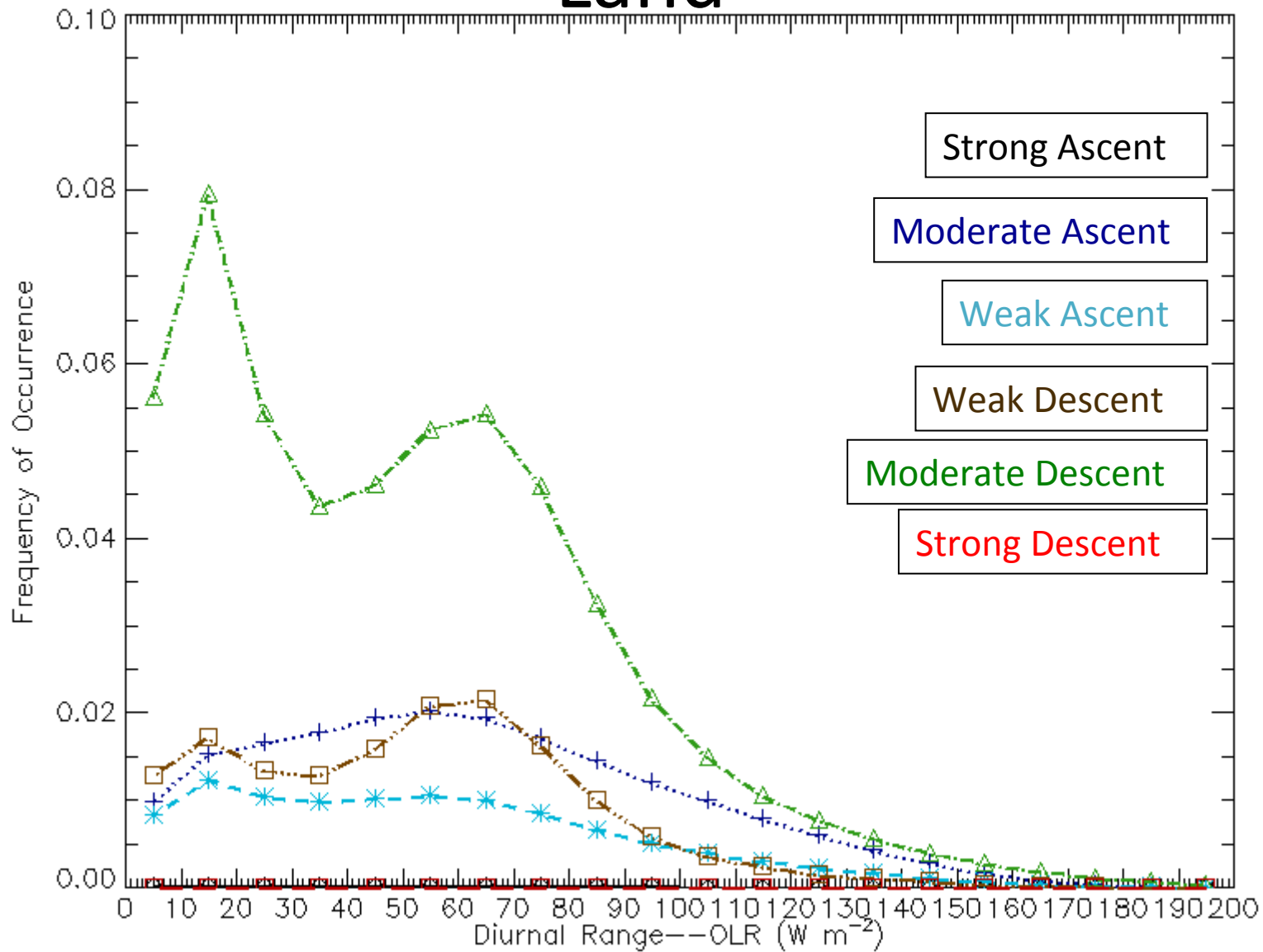
Diurnal Amplitude—OLR

Ocean

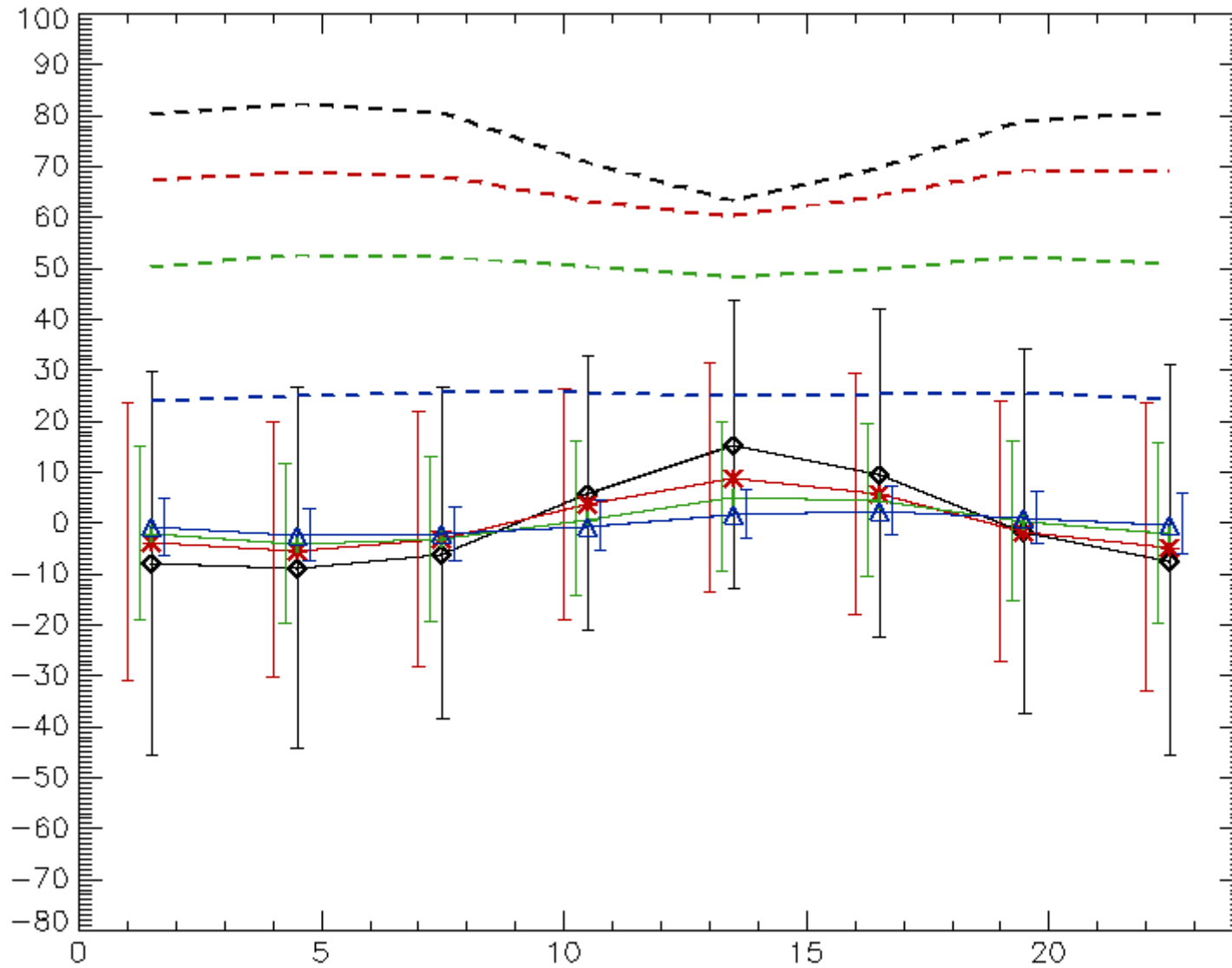


Diurnal Amplitude—OLR

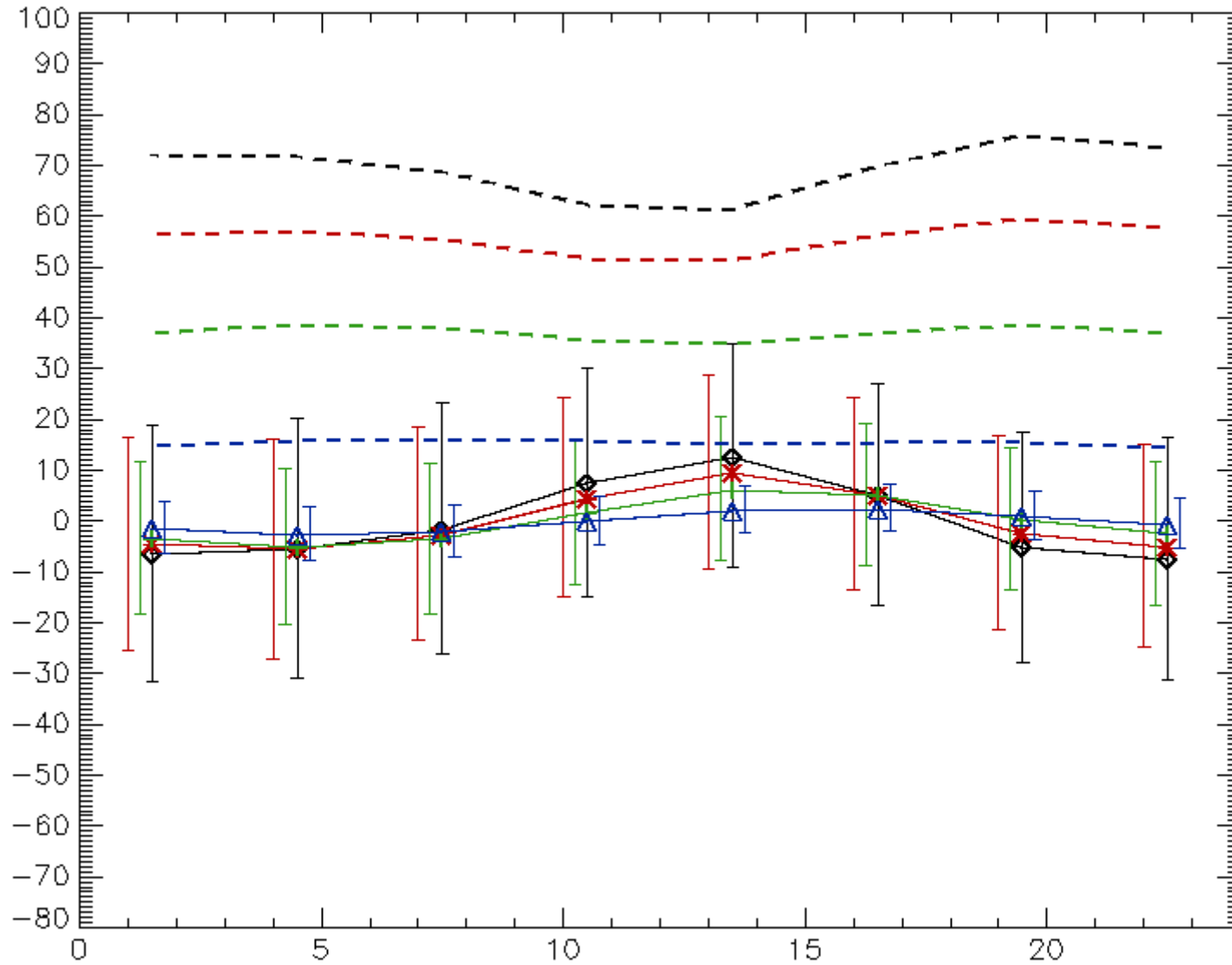
Land



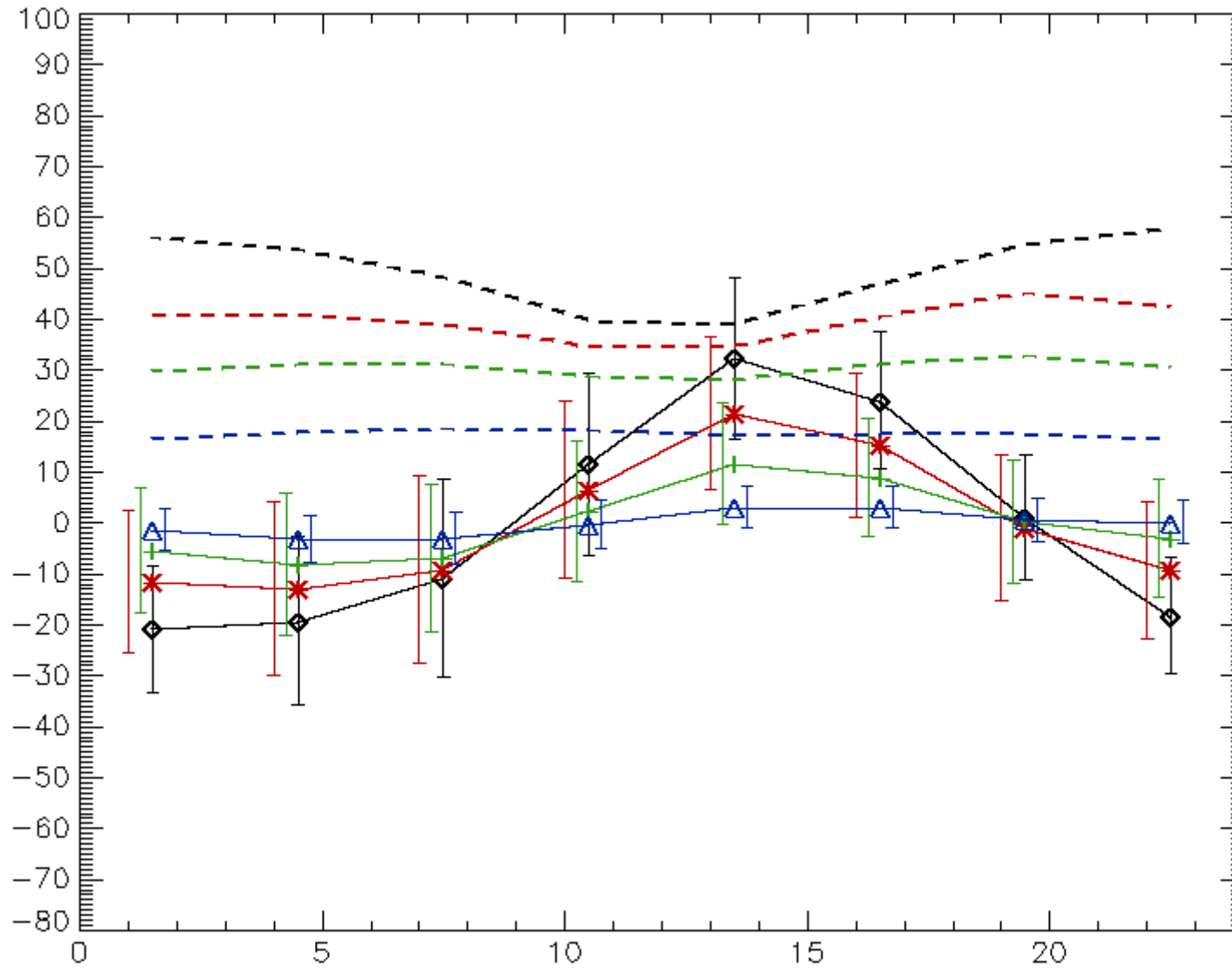
Strong Ascent



Weak Ascent

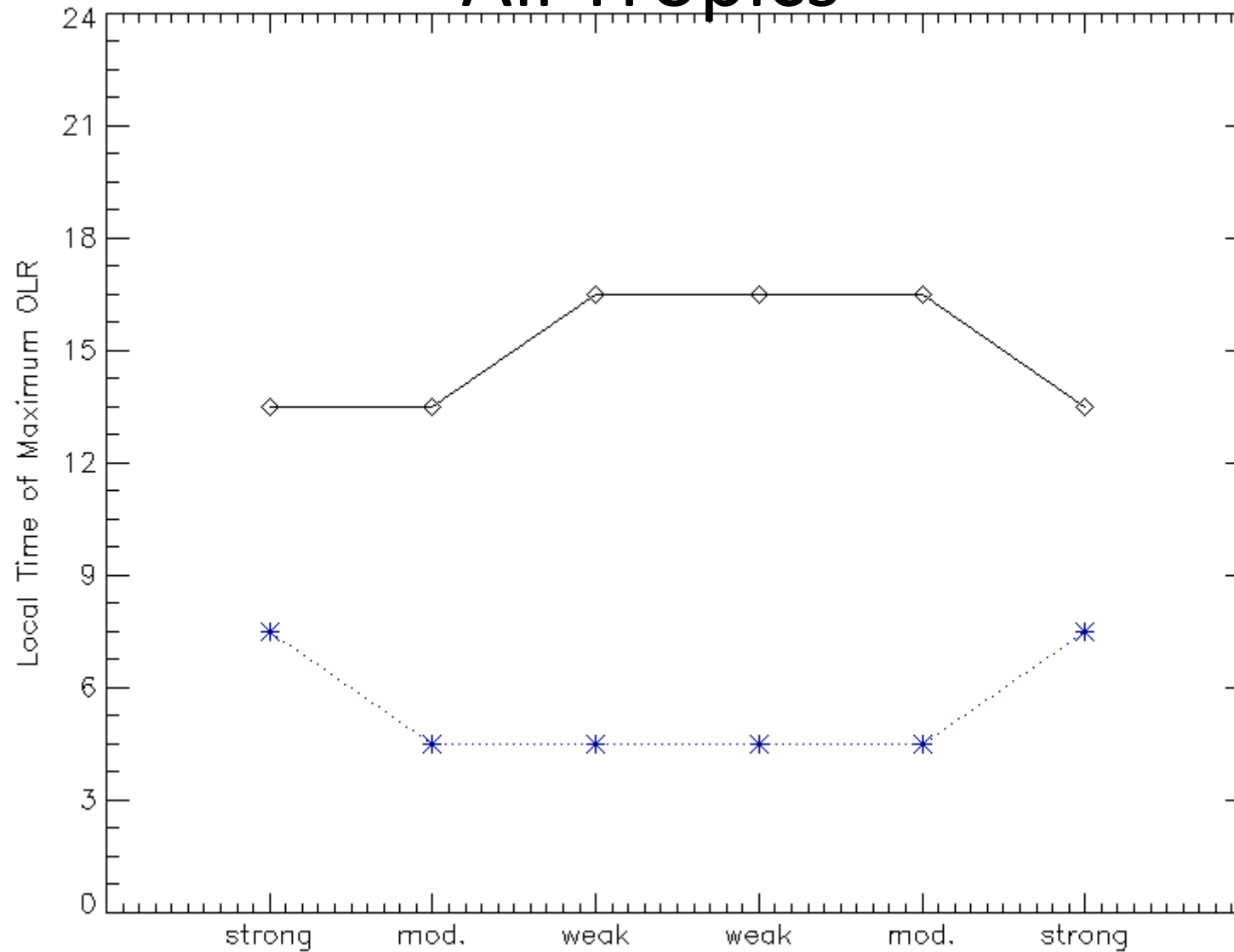


Strong Descent



Diurnal Phase—OLR

All Tropics



Diurnal Phase—LW CRF

All Tropics

