Aspects of convection at prospective TWP sites in the Tropical Western and Eastern Pacific regions

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Climatological considerations for TWP science objectives

1. Frequency of deep convection within range of aircraft
2. Frequency of high-level and thin cirrus
3. Tropopause temperatures
4. Lower stratospheric water vapor
5. Interannual variability of convection - ENSO
6. Intraseasonal variations - Madden-Julian oscillation (MJO)

Site-specific meteorological considerations

1. Local weather variations - e.g. diurnal cycle at San Jose
2. Amplitude and phase of diurnal cycle over region of interest - Night operations required/desirable?
3. The tropical cyclone threat
Outline

• January and July frequency of Highly Reflective Cloud (HRC) - *atlas by Garcia*
• Interannual variability of HRC
• Diurnal amplitude and phase over oceanic cumulonimbus from shipboard observations - *Warren atlas*
• Animation of GOES-8 IR from July 1997 for the American tropics
January - West Pacific HRC - July

green: 3 HRC-days/month  blue: 4 or 5 HRC-days/month  red: 6 or more HRC-days/month
January East Pacific HRC July

green: 3 HRC-days/month  blue: 4 or 5 HRC-days/month  red: 6 or more HRC-days/month
January - West Pacific HRC variability - July

Coefficients of Variation = Standard deviation/mean x 100
CV < 50% < CV < 75% < CV < 100% < CV
Cumulonimbus Diurnal Cycle

Cumulonimbus Amplitude of Diurnal Cycle (0.1 % Cloud Amount)

December, January, February (1952-1981)

Ocean Areas Only

Global Average (Ocean) 0.7%

Jun-Aug

Dec-Feb

Cumulonimbus Phase of Diurnal Cycle (Local Time of Maximum Cloud Amount)

December, January, February (1952-1981)

Ocean Areas Only

Map 130a

Map 130b

Cumulonimbus Amplitude of Diurnal Cycle (0.1 % Cloud Amount)

June, July, August (1952-1981)

Ocean Areas Only

Global Average (Ocean) 0.9%

Map 131a

Map 131b
QuickTime™ and a PNG decompressor are needed to see this picture.
**Summary**

1. **Costa Rica winter** - some activity in Panama warm pool
2. **Costa Rica summer**
   - Copious and reliable maritime convection over the Panama warm pool, offshore waters and Pacific ITCZ hurricane breeding region breeding during northern summer
   - Complex interactions between synoptic disturbances and topographic and diurnal forcing - both locally at San Jose and in the Panama warm pool (Colombian coast)
   - Interannual variability <50%
   - Some diurnal variability over warm pool - early morning peak?
   - MJO weak in this season and at these longitudes

3. **Guam winter** -
   - main action south of Equator (SPC)
   - Strong ENSO and MJO variability

4. **Guam summer** -
   - Within W. Pac ITCZ but location of individual target systems NOT as predictable as in Panama
   - ENSO and MJO less a factor
   - Some evidence of mid-day peak of Cb frequency
Unanswered questions - Ongoing work

1. **Costa Rica summer**
   - Nature of the diurnal window for flight ops at San Jose
   - Characterization of diurnal cycle over Panama warm pool, in particular interactions with diurnal systems on Pacific coast of Colombia
   - Magnitude of tropical cyclone threat - e.g. July vs. Sept?

2. **Guam summer**
   - Characterization of diurnal cycle
   - Tropical cyclone threat