Interpretation of cloud structure anomalies over the tropical Pacific during the 1997/98 El Niño

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$N = \frac{-\text{SW CRF}}{\text{LW CRF}}$

English Index 3 (°C)

Month

Western Region

Eastern Region

JFMA means

1997

1998
Western Region

Eastern Region

Cloud-top altitude (km)

Month

LW CRF (W/m²)

SW CRF (W/m²)

R = 0.99

R = 0.99

Eastern Region

Western Region

Cloud-top altitude (km)

Month

LW CRF (W/m²)

SW CRF (W/m²)

R = 0.99

R = 0.99
LW CRF (W/m²)

Cloud-top altitude (km)

R = 0.97

Eastern Region

LW CRF (W/m²)

Cloud-top altitude (km)

R = 0.98

SW CRF (W/m²)

Cloud-top altitude (km)

R = 0.95

Eastern Region

SW CRF (W/m²)

Cloud-top altitude (km)

R = 0.95

Western Region

LW CRF (W/m²)

Cloud-top altitude (km)

R = 0.97

SW CRF (W/m²)

Cloud-top altitude (km)

R = 0.95

Western Region
CCM Column Radiation Model

\[ \Delta = \text{JFM} - \text{JJA} \]

\( I = \text{Change in cloud-top altitude} \)

\( II = \text{Change in cloud fraction} \)

\[
\begin{align*}
&\Delta\text{ LW CRF (W/m}^2) \\
&\Delta\text{ SW CRF (W/m}^2)
\end{align*}
\]
Cloud fraction

Cloud-top altitude (km)

R = 0.87

Cloud optical depth

Cloud-top altitude (km)

R = 0.94

Eastern Region

Western Region

R = 0.87

R = 0.94

R = 0.94

R = 0.96
Eastern Region

![Graph showing cloud-top altitude (km) vs. El Nino index 3 (°C) for the Eastern Region. The graph includes data points for both altitude and index 3, with a correlation coefficient R = 0.99.]

Western Region

![Graph showing cloud-top altitude (km) vs. El Nino index 3 (°C) for the Western Region. The graph includes data points for both altitude and index 3, with a correlation coefficient R = 0.86.]

Month

R = 0.99

R = 0.86