MARINE BOUNDARY LAYER CLOUD PROPERTIES FROM AMF
POINT REYES SATELLITE OBSERVATIONS

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1. OBJECTIVES

- Use satellite observations to place the AMF surface-based and aircraft observations into a larger-scale context relevant to GCM-sized grids (e.g. 300 x 300 km)
- Quantify the macro- and microphysical properties of California region marine boundary layer clouds.
- Quantify the diurnal cycle of MBL cloud properties from satellite observations

2. CLOUD SCREENING

- Identify GCM-sized boxes containing mainly MBL clouds (cloud fraction > 20%)
- Automated cloud identification algorithm screens to remove scenes containing overlying cirrus and other cloud types
- Compute scene-mean cloud macro- and microphysical properties

3. MACROPHYSICAL PROPERTIES

- Mesoscale cloud structure is quantified using the effective cloud diameter:

\[ C_D = \frac{4 \sum A_i}{\sum P_i} \]

\[ C_D = \frac{4 \times 0.75}{3} = 1 \]

\[ C_D = \frac{4 \times 1.5}{3} = 2 \]

- \( A_i \) = Area of a single cloud element, \( P_i \) = Perimeter of a single cloud element, \( N \) = number of cloud elements

4. CLOUD PROPERTIES

- Large values of \( C_D \) for solid cloud decks. Smaller values for scattered cloud scenes
- Large \( C_D \) generally accompanied by largest optical depth and liquid water path

5. DIURNAL CYCLE

- Max optical depth, LWP and \( R_e \) occur in the morning decreasing through the daytime
- Diurnal cycle of \( C_D \) is consistent with more solid clouds in the morning becoming more scattered in the afternoon.

6. TIME SERIES

- July shows 4-6 day cycle from larger \( C_D \) (more solid) to smaller \( C_D \) (more scattered)
- Large \( C_D \) tends to correlate with large optical depth, large liquid water path

SUMMARY

- \( C_D \) offers a simple measure of MBL cloud organization
- The diurnal cycle of cloud macro-physical properties and \( C_D \) at Pt Reyes are consistent with previous work.
- The time series of \( C_D \) can be used to identify distinct mesoscale organization regimes within the Pt. Reyes observation period

Movie of \( C_D \)