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
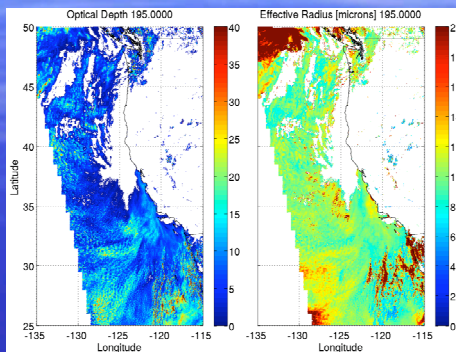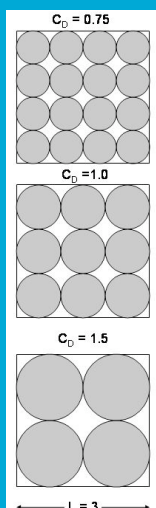
2. CLOUD SCREENING

- 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 _-physical properties

- For details see: Jensen et al, 2007: Investigation of regional and seasonal variations in MBL cloud properties from MODIS observations, *J. Climate*, (submitted).

3. MACROPHYSICAL PROPERTIES

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

$$C_D = \frac{4 \sum_i^N A_i}{\sum_i^N P_i}$$

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

$C_D = 0.75$
$C_D = 1.0$
$C_D = 1.5$
L = 3

Optical Depth 195.0000   Effective Radius [microns] 195.0000
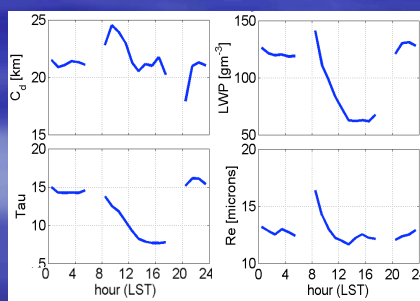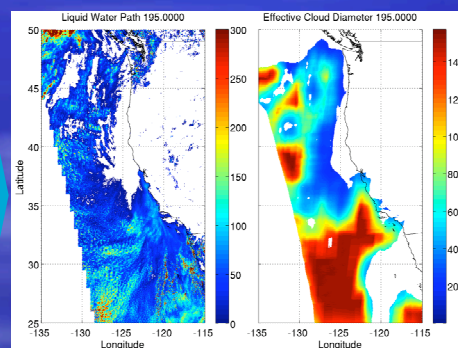
4. CLOUD PROPERTIES

- 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

Liquid Water Path 195.0000   Effective Cloud Diameter 195.0000

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 _-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
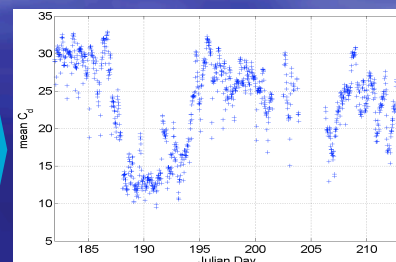
5. DIURNAL CYCLE

- 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.

Movie of C_D