

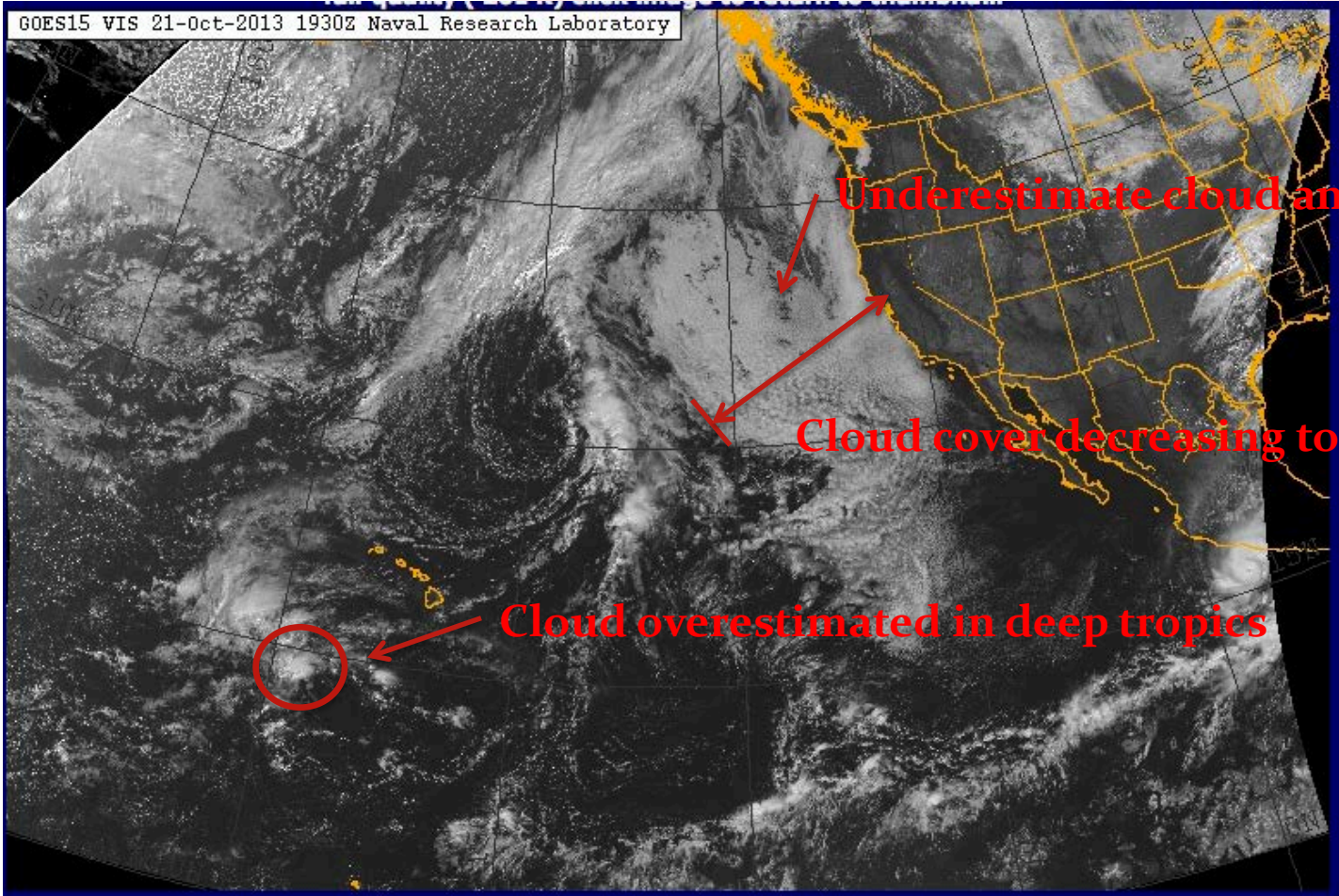
Clouds, Precipitation and Marine Boundary Layer Structure during MAGIC

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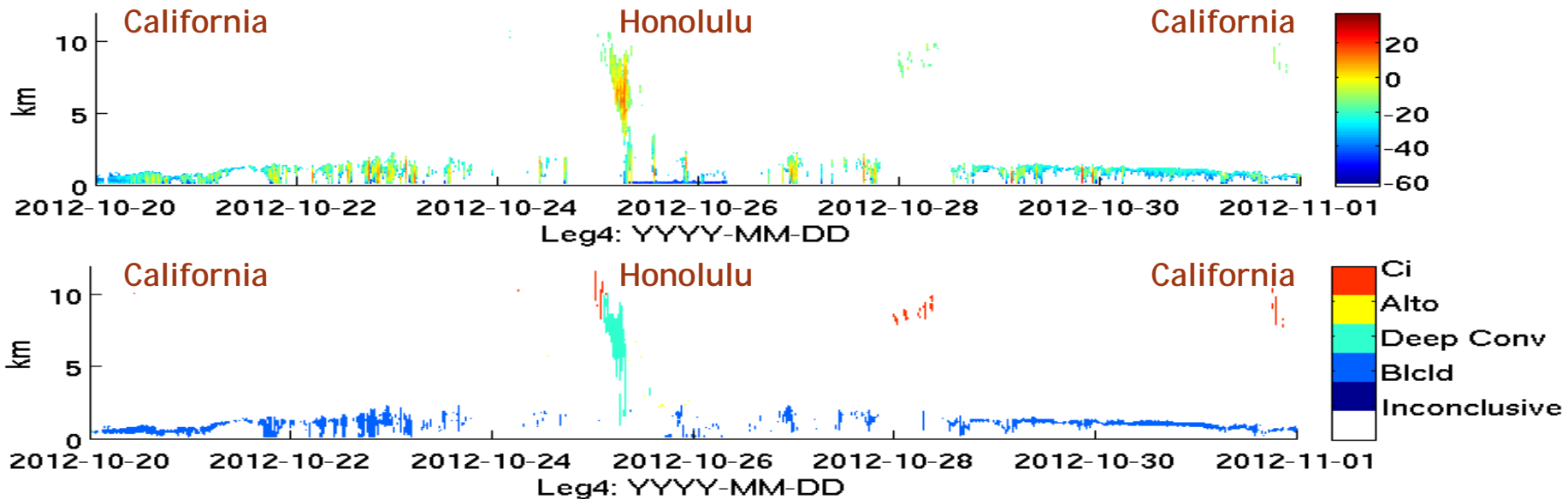


Motivation



J. Teixeira et al. 2011

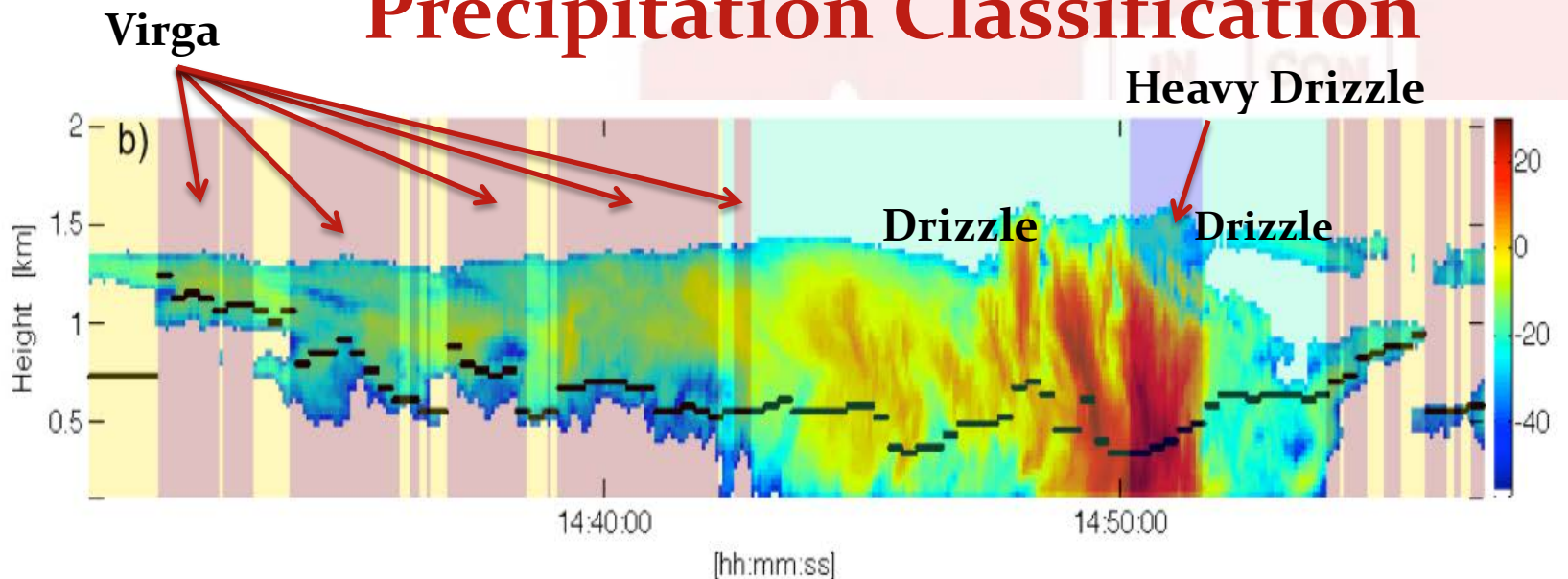
Cloud Classification



Cloud Type

				MBL cld			
		Cirrus	Alto	Cu	Sc	Ind	Deep Conv.
cloud base		≥ 6 km	[2 km, 6 km]	< 3 km	< 3 km	< 2 km	< 2 km
cloud top		—	—	< 3 km	< 3 km	< 3 km	≥ 3 km
Duration		—	—	< 20 min	≥ 20 min	≥ 20 min	—
CT variability	[20 min, 2 hr]	—	—	—	< 100 m	≥ 100 m	—
based on	(2 hr, 10hr)	—	—	—	< 160 m	≥ 160 m	—
cloud		—	—	—	< 200 m	≥ 200 m	—
duration	> 10 hr	—	—	—	< 200 m	≥ 200 m	—

Precipitation Classification

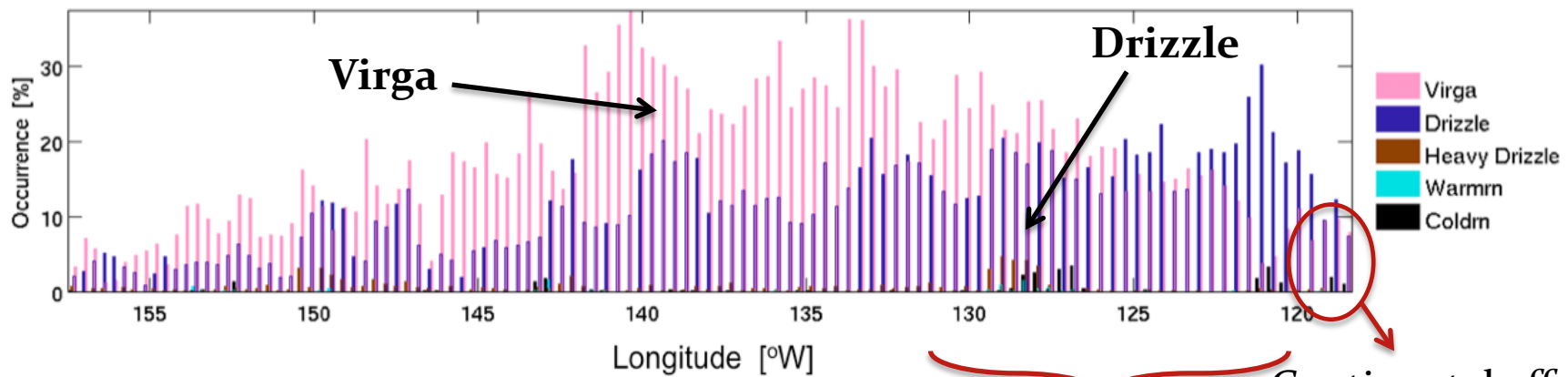
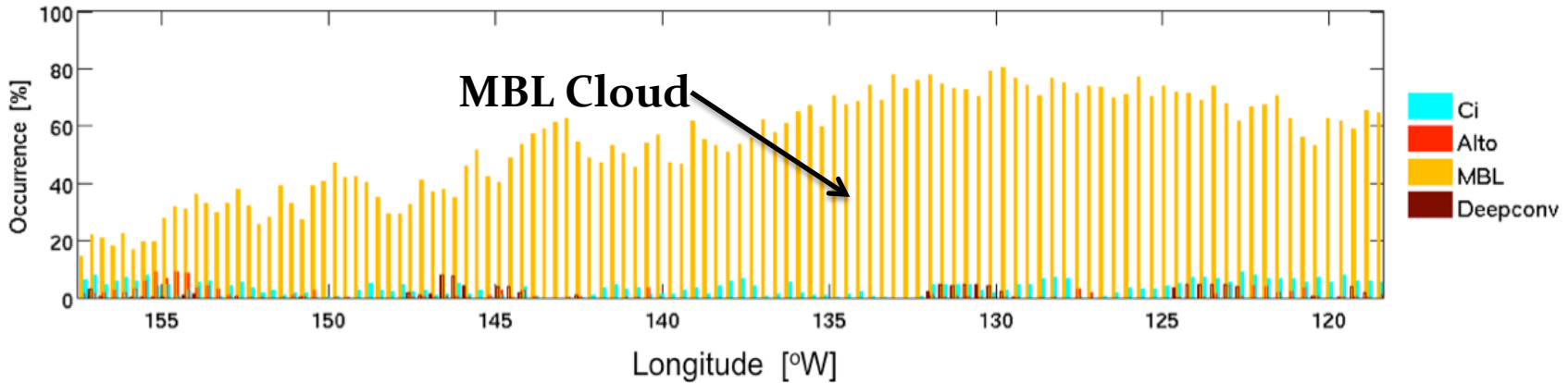


	Precipitation Type				
	Virga	Drizzle	Warm Rain (Heavy Drizzle)	Cold Rain	Conv. Rain
Echo base	> First gate	≤ First gate	≤ First gate	≤ First gate	≤ First gate
Base reflectivity	—	<0dBZ	>0dBZ	>0dBZ	>0dBZ > First Top reflectivity
Surface Rain	No	No	Yes	Yes	Yes
First cloud top	< Freezing level	< Freezing level	< Freezing level	>Freezing level	—
Echo below cloud base	Yes (50 m lower)	Yes (50 m lower)	Possible	Possible	Possible

Cloud and Precipitation Distribution along the transect

Honolulu, Hawaii

California Coast



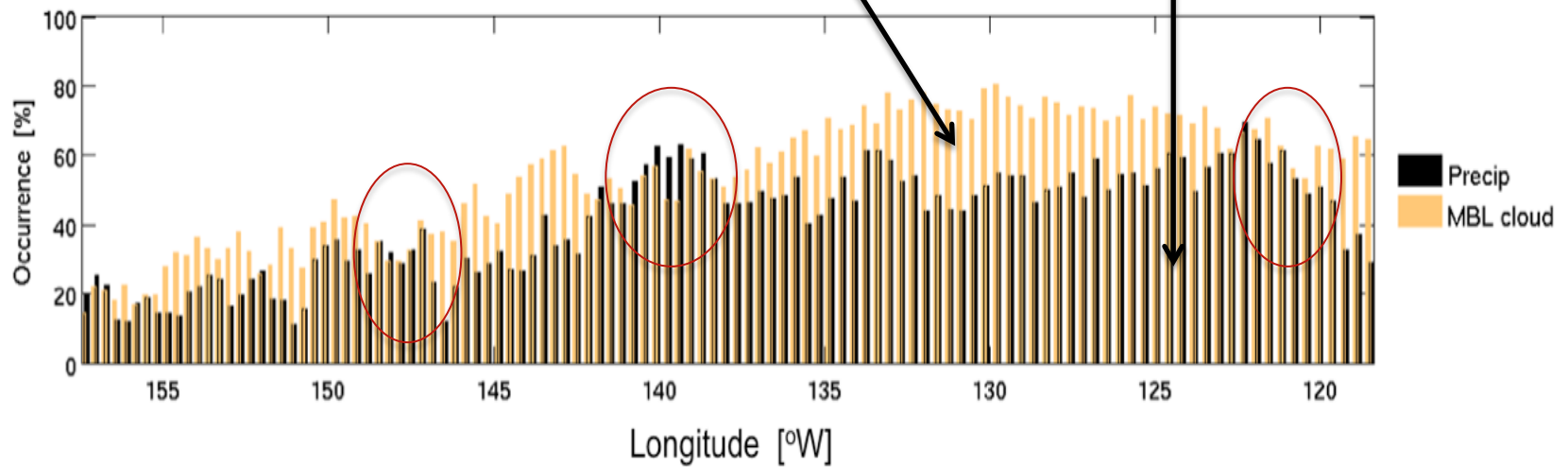
Increase of the cloud base height further away from the coast

Continental effect

MBL Cloud and MBL-cloud precipitation along the transect

MBL Cloud

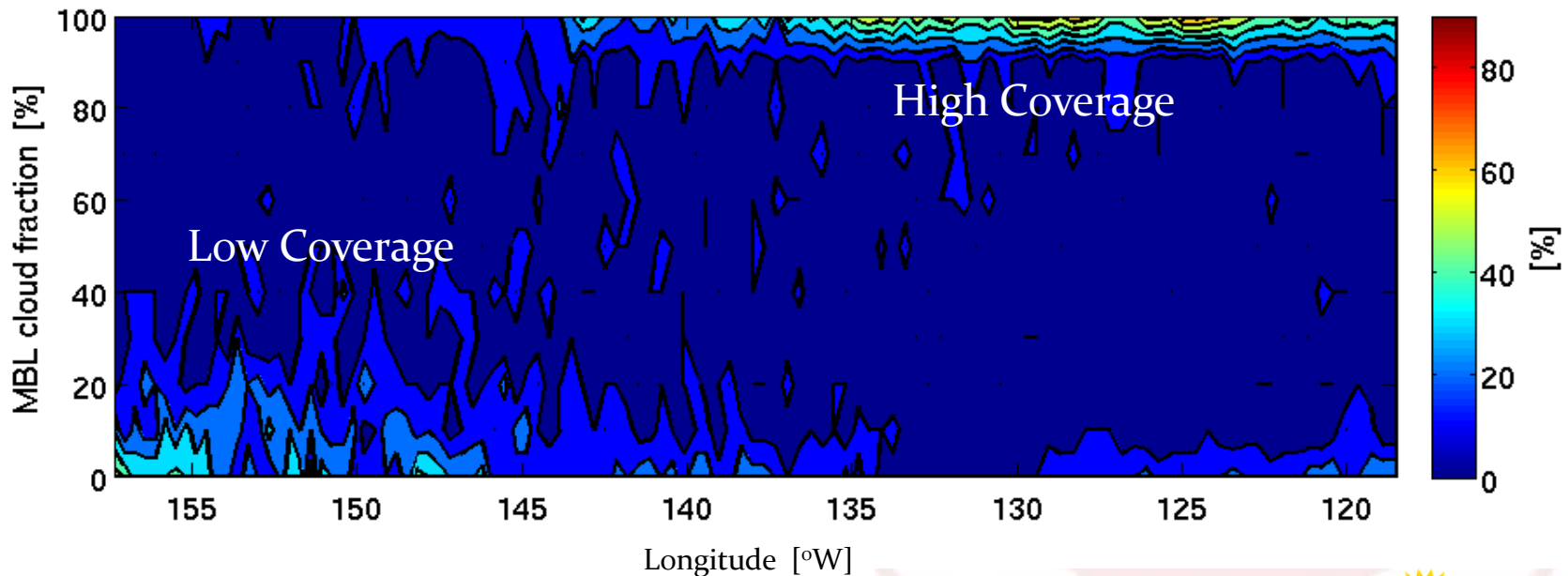
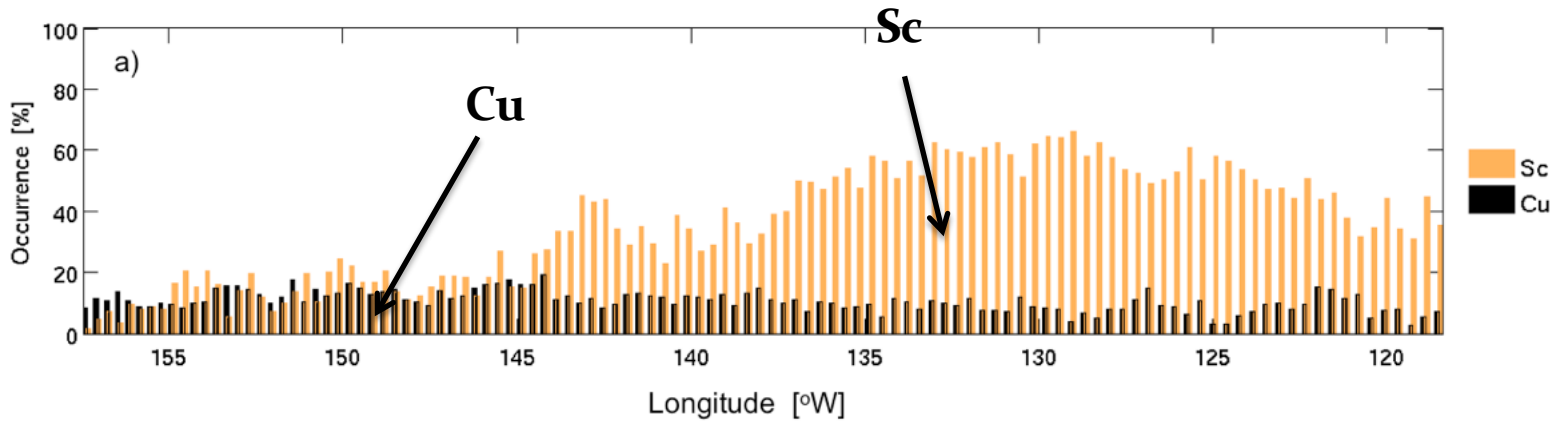
MBL-cloud Precipitation



Honolulu, Hawaii

California Coast

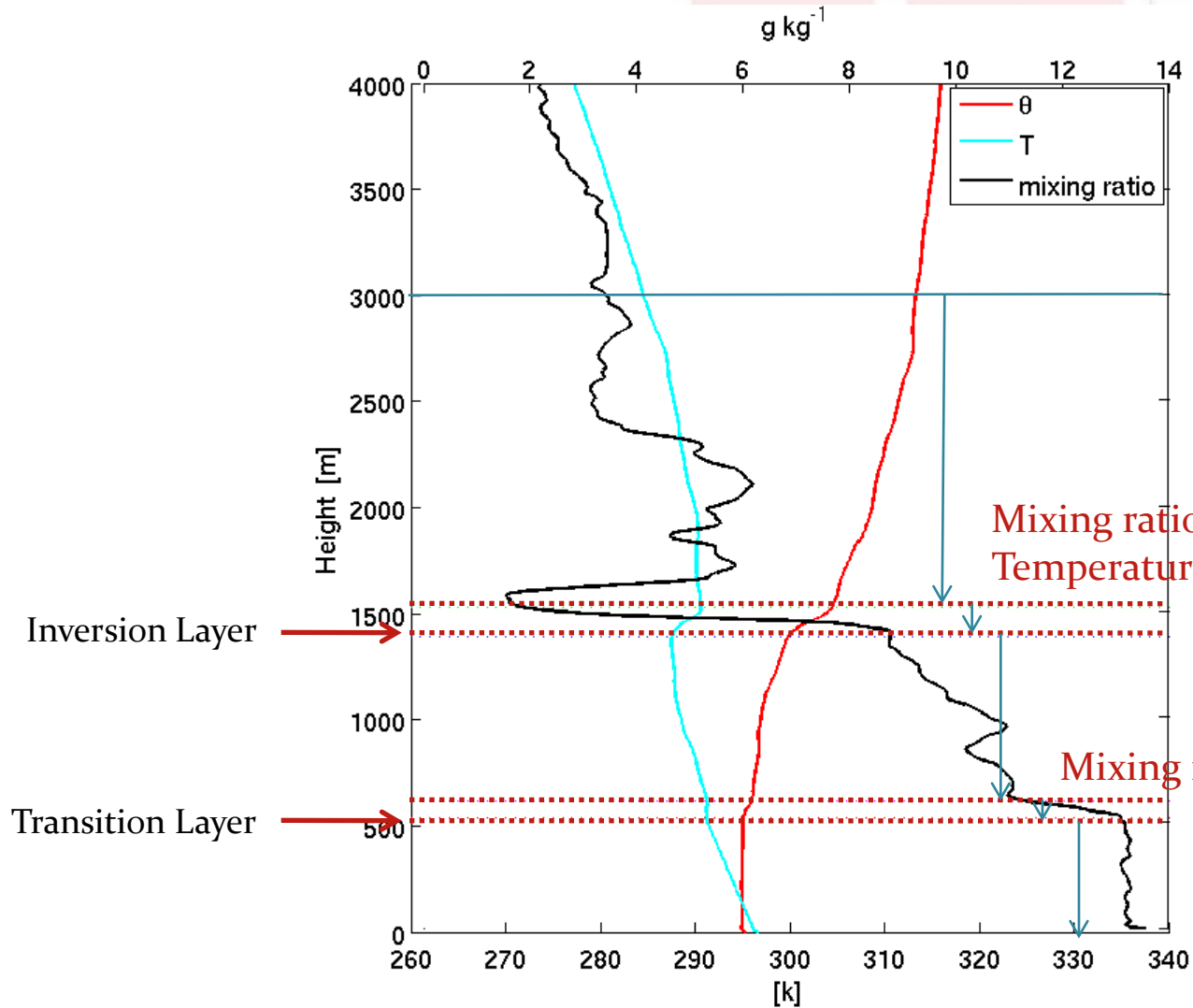
MBL cloud fraction along the transect



Honolulu, Hawaii

California Coast

Radiosonde Analysis



Mixing ratio decrease with height
Temperature strongly increase with height

Jasmine Remillard et al. 2010

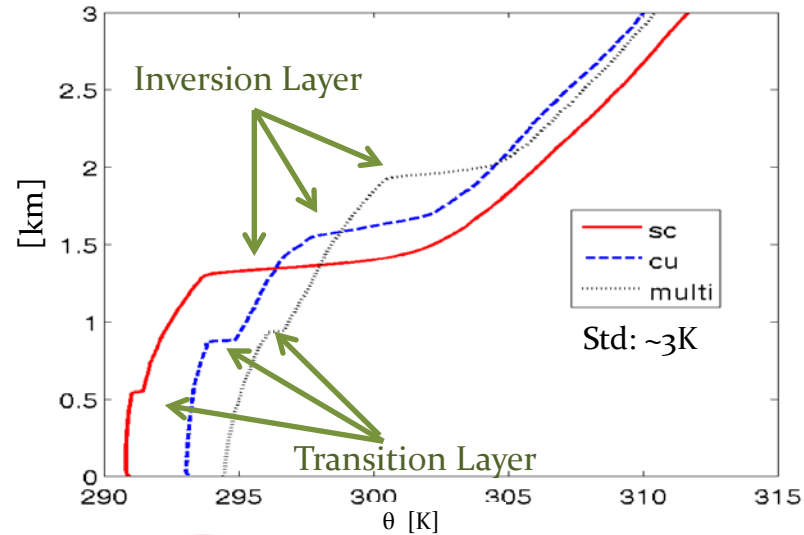
Mixing ratio decrease with height

$$\mu = -\left(\frac{\partial \theta}{\partial p}\right) - \frac{0.608\theta}{1+0.608r} \frac{\partial r}{\partial p}$$

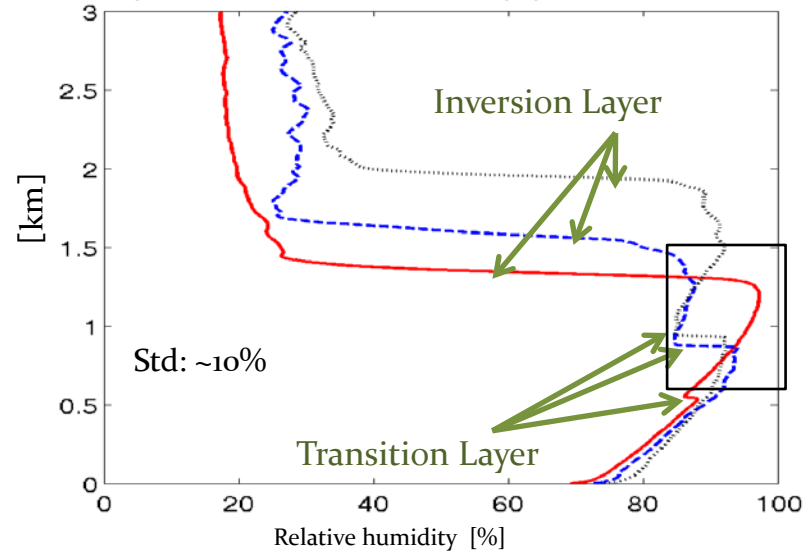
Yin and Albrecht 1999

The thermodynamic properties of Sc and Cu

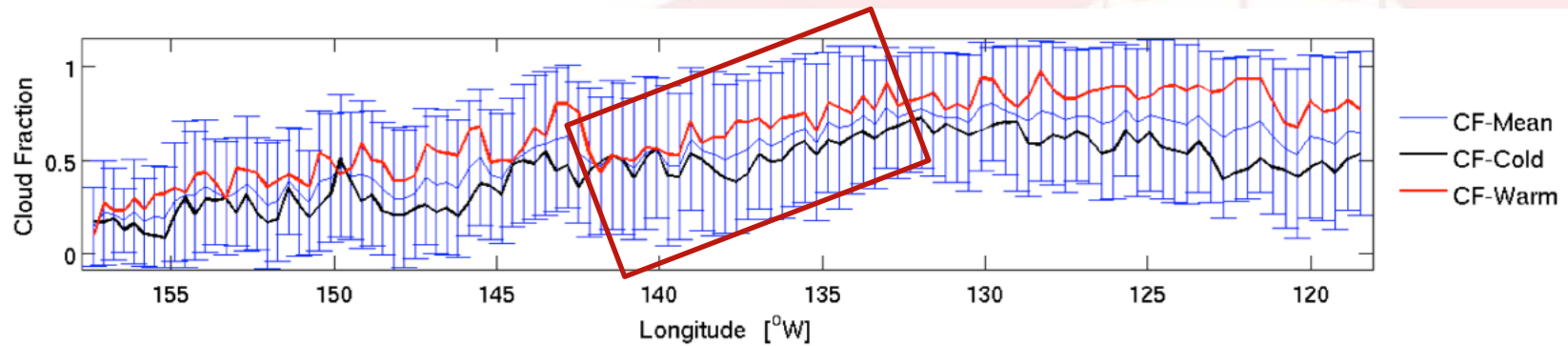
Composite potential temperature profile for MAGIC



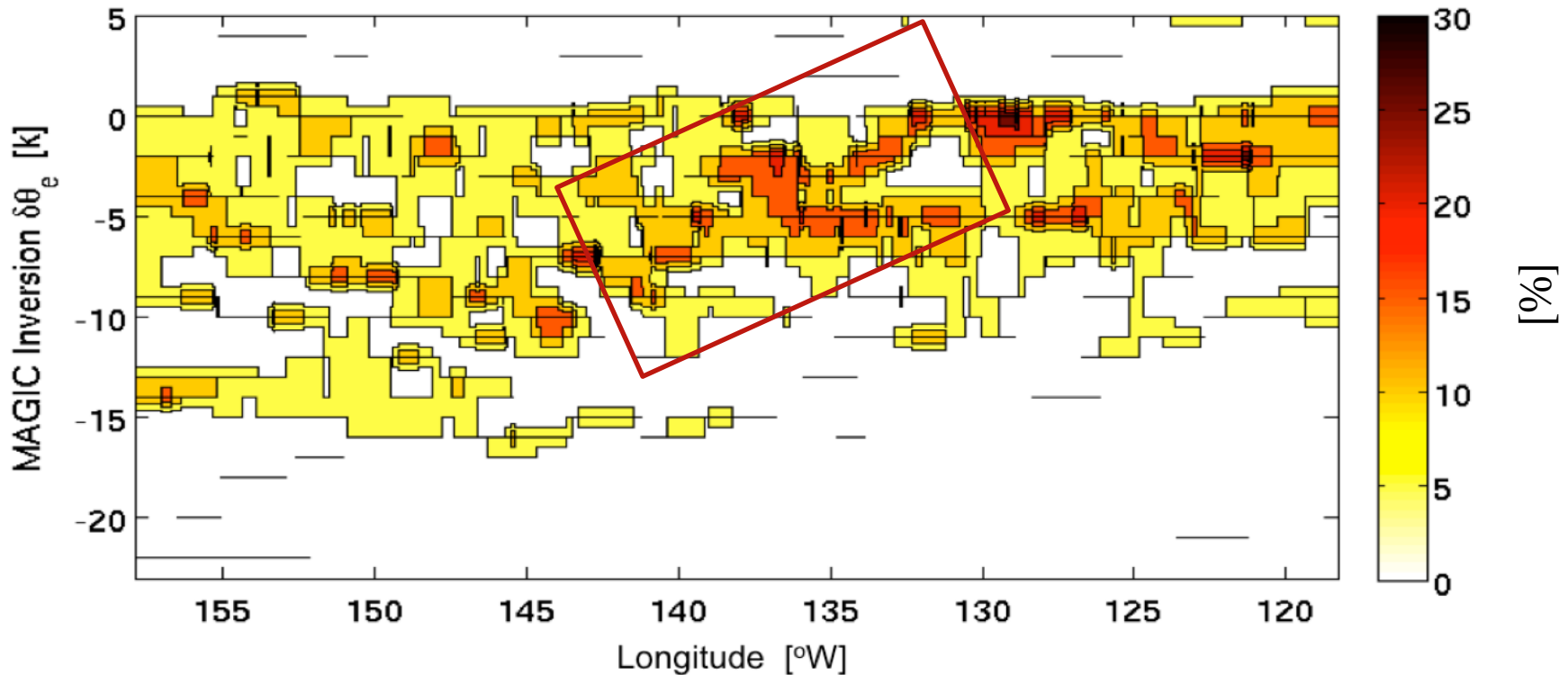
Composite relative humidity profile for MAGIC



Evolution of MBL cloud fraction and the inversion stability



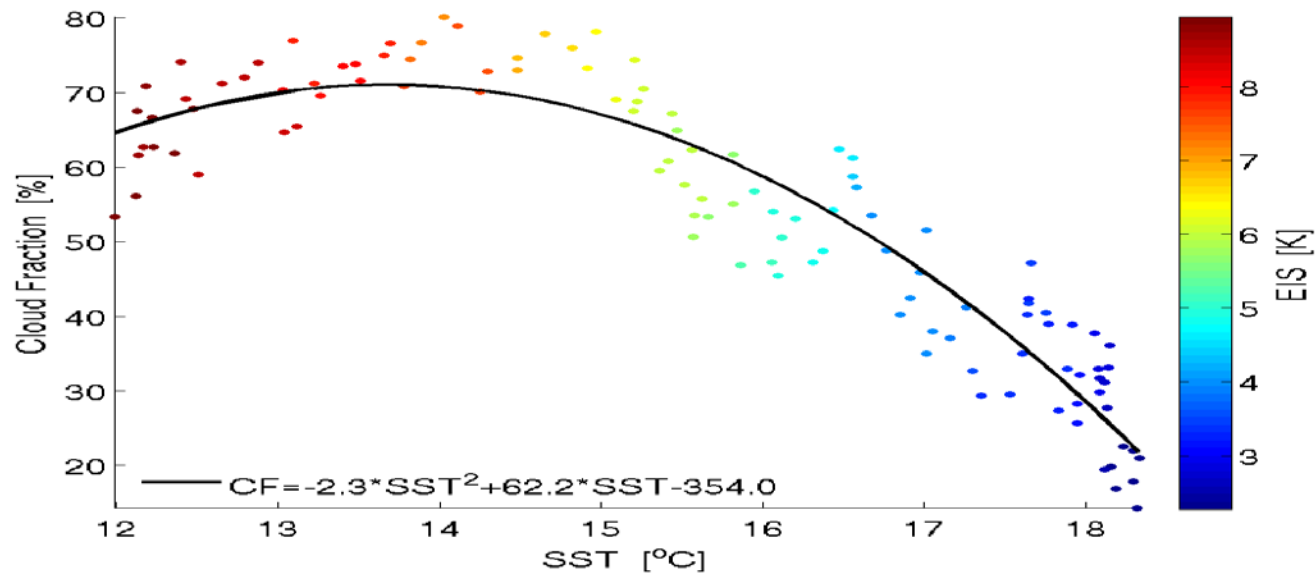
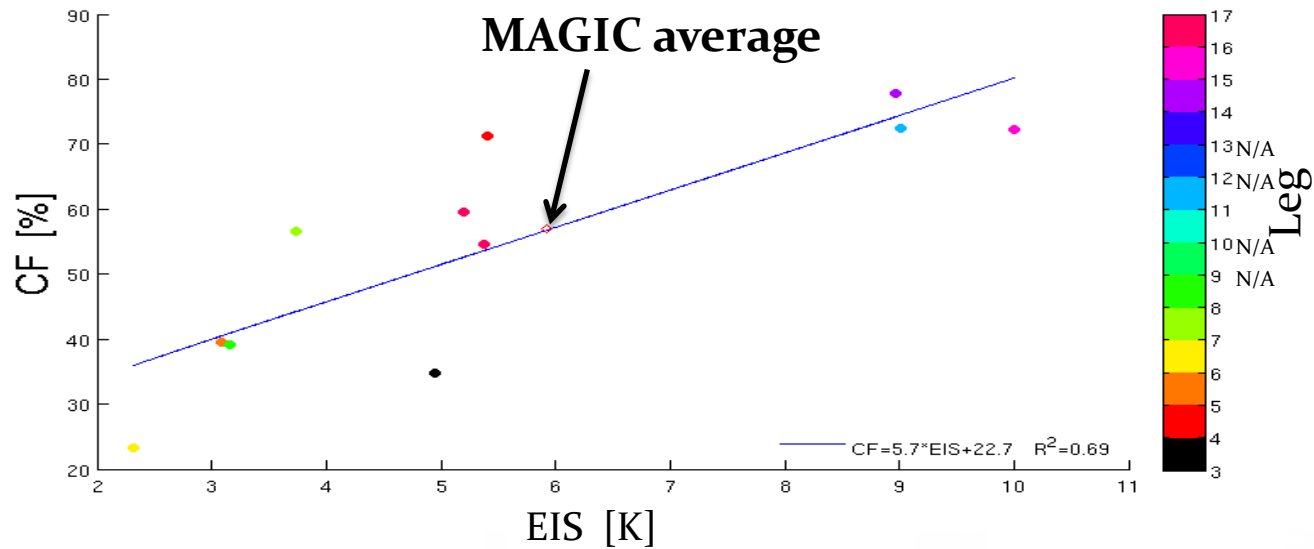
Histograms of MAGIC Inversion $\delta\theta_e$ (%)



Honolulu, Hawaii

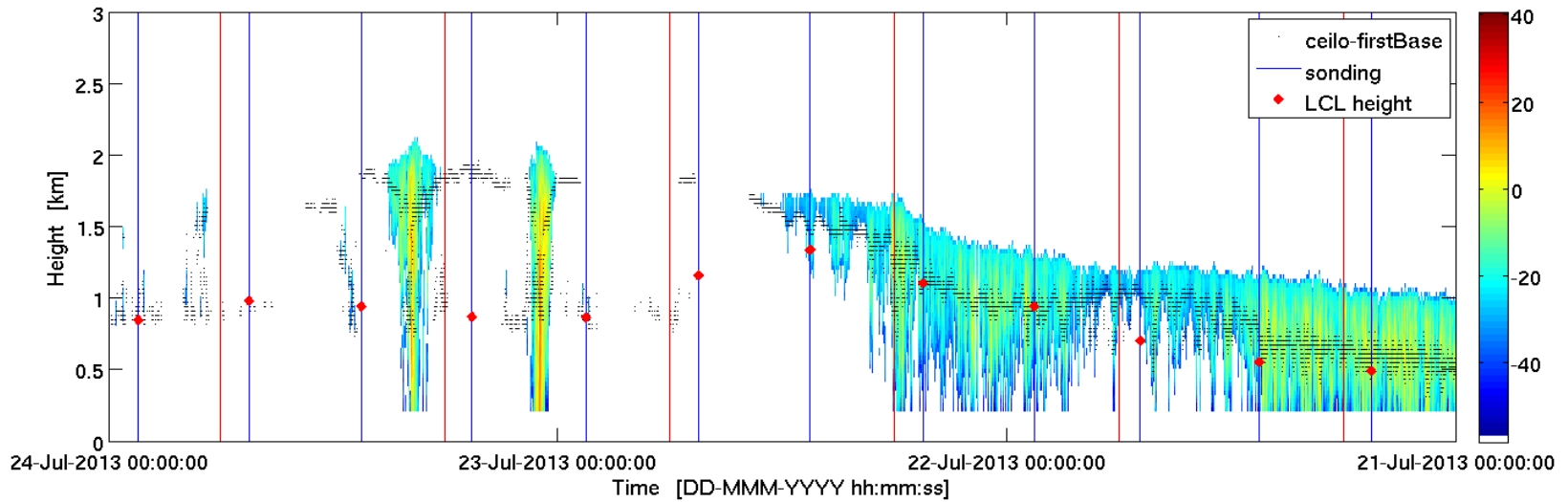
California Coast

The relationship between EIS/SST and MBL cloud fraction



Future Work

Honolulu, Hawaii



California Coast

