Investigating Relationships Between Cirrus Cloud Properties and Large-Scale Dynamics Using A-Train Data and Cluster Analysis

Betsy Dupont and Jay Mace, University of Utah

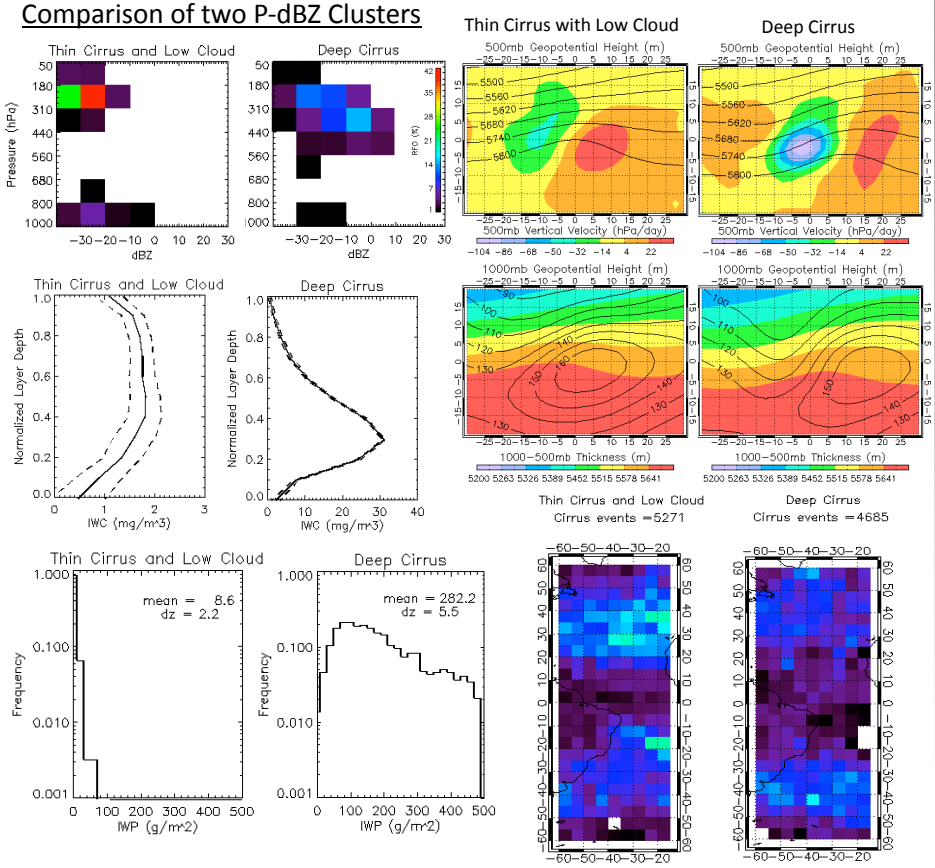
Main Questions

Are there identifiable relationships between cirrus cloud properties and the large scale dynamics? If so, we may be able to use these relationships to help parameterize cirrus in models.

Given the cloud vertical structure, what are the large-scale dynamics?

Given the large-scale state, what are the cirrus cloud properties?

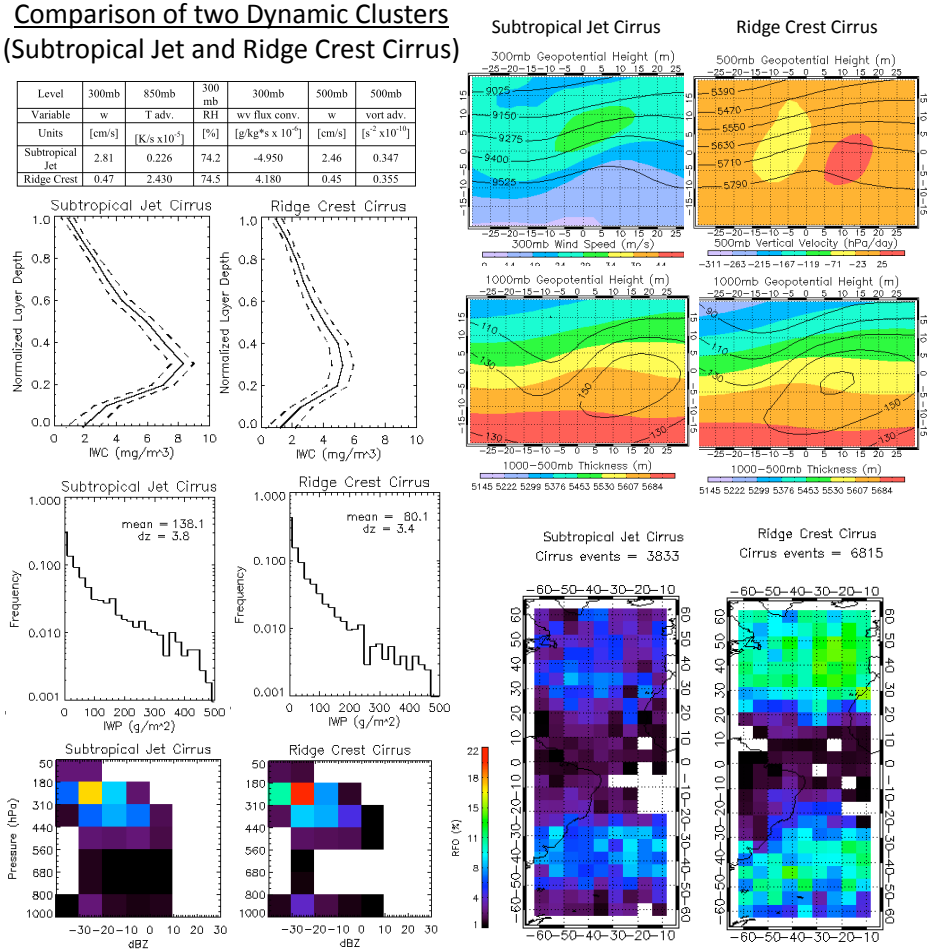
Comparison of two P-dBZ Clusters



Thin Cirrus and Low Cloud is characterized by a surface high pressure and the vertical profile of IWC is weighted towards cloud top. Deep Cirrus is associated with a surface trough and the IWC is weighted towards cloud base. Deep Cirrus has a larger cloud depth and much larger IWP compared to Thin Cirrus and Low Cloud.

Comparison of two Dynamic Clusters (Subtropical Jet and Ridge Crest Cirrus)

Level	300mb	850mb	300 mb	300mb	500mb	500mb
Variable	w	T adv.	RH	wv flux conv.	w	vort adv.
Units	[cm/s]	[K/s x10^{-5}]	[%]	[g/kg*s x 10^{-6}]	[cm/s]	[s^{-2} x10^{-10}]
Subtropical Jet	2.81	0.226	74.2	-4.950	2.46	0.347
Ridge Crest	0.47	2.430	74.5	4.180	0.45	0.355



Subtropical Jet Cirrus is located along 30° latitude in jet stream and is characterized by strong rising motion at upper levels. Ridge Crest Cirrus if found primarily in the midlatitudes and is characterized by weak rising motion at upper levels. Subtropical Jet and Ridge Crest Cirrus have a similar average layer thickness, however the mean IWP for Subtropical Jet Cirrus is almost double that of Ridge Crest Cirrus.