Identification of GOES-R Storm Top Features

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Severe storms impose substantial risk on human lives and property and influence the economic activity of human society greatly. This projects aims at finding visible and IR features seen in satellite storm imageries that can be used as indicators for severe storm nowcasting and forecasting. Many visible and infrared features at the top of thunderstorms as observed by meteorological satellites are intimately related to the physics and dynamics in the most active part of the storm. By identifying these features and investigating the physical processes responsible for generating these features, much information about the current state of the storm can be retrieved from satellite images which can then be used for the purpose of storm forecasting/nowcasting purpose. In this project, we utilize a physics-based cloud resolving model to simulate thunderstorm processes so as to see if the simulated storm exhibits the same visible and IR features as observed. If the simulating is successful, then we use the model physics to explain the physical processes responsible for producing these features. The characteristics of the features so identified and physically interpreted can used to form quantitative relations between them and physical variables of the storm (e.g., winds, updraft, humidity, turbulence, etc.). Such relations will serve as the basis for quantitative retrieval of storm properties. We propose to continue examining existing and identifying new storm top features and studying the physics and dynamics responsible for producing them.