GPM DPR Small Cell Size Rain

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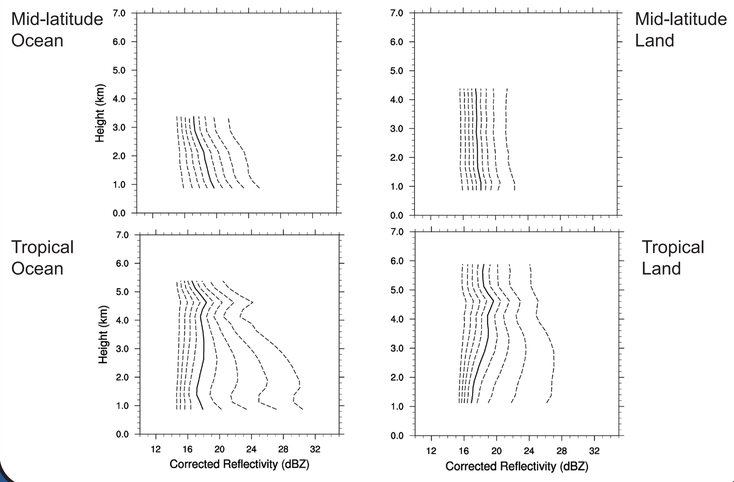
Introduction

The GPM radar rain classification identifies small cell size (i.e., a single or two adjacent pixels), which causes the algorithm to change the retrieval's rain type to convective. Shallow, isolated is a subset of small cells but the shallow classification requires that the identified storm top occur at least 1 km below the melting layer, limiting shallow rain to warmer climates. Small rain cells are identified globally irrespective of bright band height and thus irrespective of latitude. The small rain cell method identifies convective rain whose characteristic very greatly with latitude and season.

Reflectivity Profiles

DJF non-shallow small cell reflectivity profiles for NH mid-latitude (top) show that small cells are still relatively shallow and that the ocean profiles increase toward the surface, potentially because of lower cloud bases and/or more moisture availability, while the land profiles don't change with height. The small cell reflectivity profiles for the tropics (bottom) are also relatively shallow, likely representative of congestus. The higher reflectivity profiles over ocean increase toward the surface while the lower reflectivity profiles decrease toward the surface. All of the tropical land profiles decrease toward the surface, likely because of higher cloud bases and evaporation.

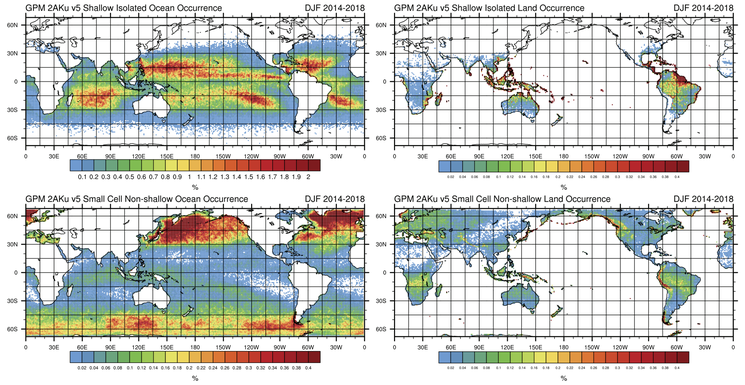


Rain Type Coercion

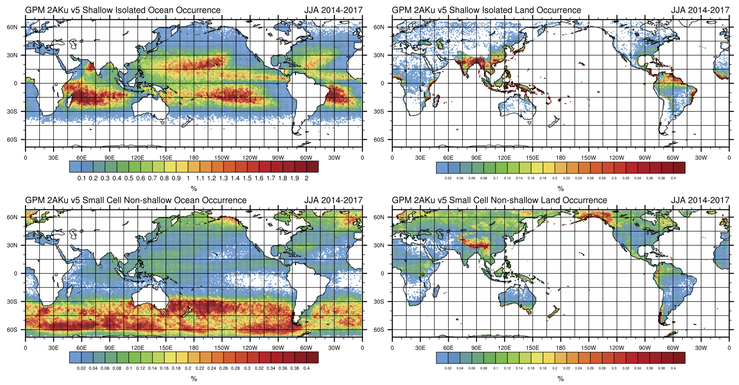
Vertical/Horizontal	Stratiform	Convective	Other
Stratiform	0.00%	0.00%	0.00%
Convective	0.04%	0.08%	0.01%
Other	99.68%	0.18%	0.00%

Analysis of the independent vertical and horizontal classifications shows the majority of non-shallow small cell size pixels were coerced from a stratiform rain type.

Small Cell Frequency

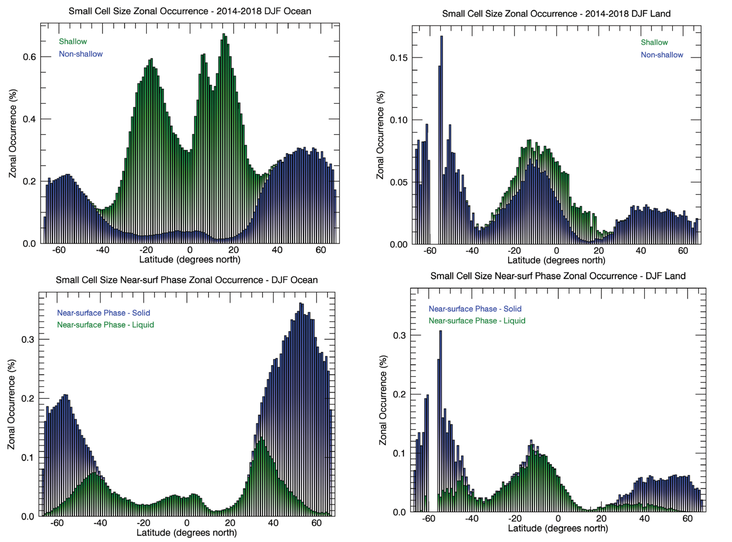


In DJF, non-shallow small cells account for most of the convection in the North Pacific and Atlantic Oceans. There are also Southern Ocean enhancements in small cell occurrence south of Australia (with possible links to the Socrates field campaign) and westward off the tip of South America. Non-shallow small cell enhancements over land occur over Europe, South Africa, and Japan and along the Rockies and Andes.



In JJA, the highest occurrence of non-shallow small cells are in the Southern Pacific Ocean. High values of occurrence are also seen over land near the Himalayan Plateau, along the Alaska/Canadian Pacific coast, and over the Andes.

Boreal Winter Zonal Statistics



Small cell size is primarily an oceanic phenomenon and occurs most in the tropical latitudes with high contributions from the shallow isolated rain type. Over tropical land, most of the small cells are non-shallow. During boreal winter, small cells are exclusively non-shallow poleward of 40°N over both land and ocean.

During boreal winter, liquid phase still exists in small cells at high oceanic latitudes. Solid phase in small cells occurs at tropical latitudes over higher terrain.

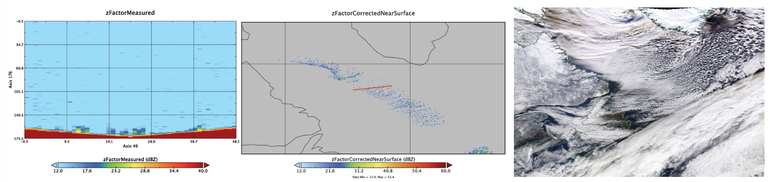
Convective Fractions

The majority of convective pixels at higher latitudes are small cell size rain during the cold season and the percentages remain high during the higher latitude warm seasons as well. Non-shallow small size rain makes up a small percentage of convective pixels at tropical latitudes.

DJF	68S-40S	25S-25N	40N-68N
Land	35.9%	3.5%	69.9%
Ocean	54.2%	1.1%	52.8%

JJA	68S-40S	25S-25N	40N-68N
Land	53.7%	2.9%	15.4%
Ocean	60.2%	1.1%	22.7%

North Atlantic



The largest DJF small cell occurrence is found in the Labrador Sea. The 2AKu near-surface reflectivity field on 12/5/2014 shows organization of convection into rows, similar in structure to the MODIS Terra visible image from the same day.

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