2A23 V7 Rain Types

Aaron Funk and Courtney Schumacher

Department of Atmospheric Science, Texas A&M University

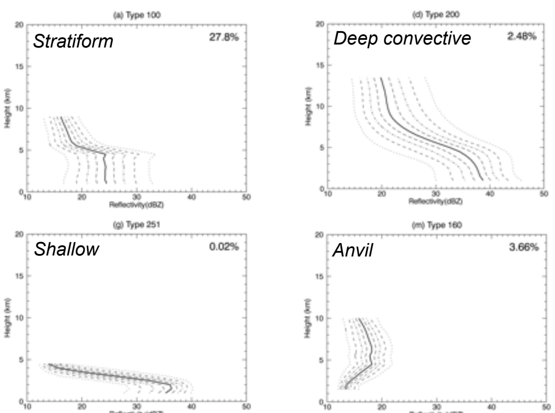
1. Introduction

The 2A23 algorithm's principle task is to classify TRMM PR pixels as one of three types: stratiform, convective, or other. This classification is done using reflectivity texture information in the horizontal and vertical. Version 7 of the 2A23 algorithm has introduced several new concepts resulting in new rain types and other modifications that have affected the overall v7 classifications. A type-by-type analysis of 2A23 v7 data was conducted using frequency-by-altitude diagrams, pixel statistics, PR vertical cross sections and rain and echo area maps to better understand the 2A23 algorithm evolution and how it impacts physical interpretations of convection.

2. New Concepts in 2A23 v7

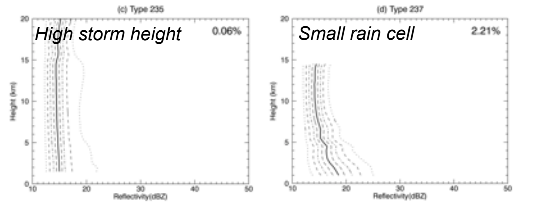
- Small rain cells
- "Randomly" appearing shallow non-isolated pixels
- High storm height

3. Frequency by Altitude Diagrams



- Stratiform FADs show tightly packed contours aloft (as do anvil FADs) representing homogeneous ice growth processes. Convective reflectivities are larger and more loosely grouped representing more heterogeneous growth processes. Shallow FADs represent warm rain processes.

4. New Types for 2A23 v7

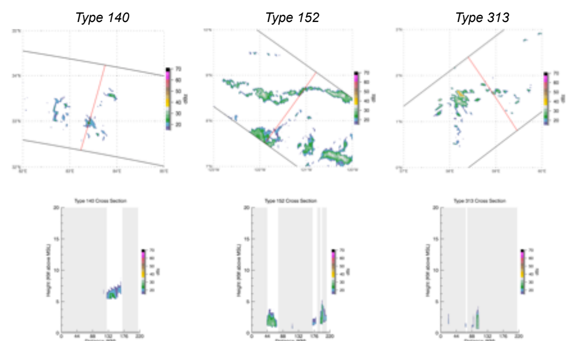


- High storm height types appear to be mostly noise while small rain cells appear to real at lower levels and mostly noise at upper levels.

5. V6 to V7 Per-Pixel Changes

- The overall trend from v6 to v7 was stratiform -> convective
  - ~48% pixels moved from v6 stratiform to v7 convective
  - ~5% pixels moved from v6 convective to v7 stratiform
  - Max movement was v6 type 152 to v7 type 292
- New 2A23 v7 stratiform types not highly populated

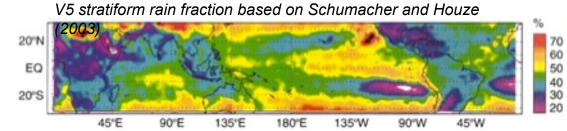
6. Convective Reclassification



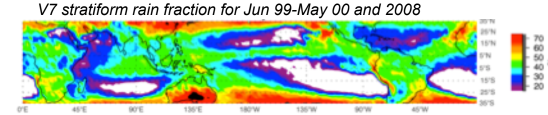
- Types 140, 152, and 313 are more likely convective due to their vertical structure. For example, type 140 appears as mountain convection over the Tibetan plateau and warm rain over the tropical oceans in PR cross-sections.

7. Stratiform Rain Fraction

V5 stratiform rain fraction based on Schumacher and Houze (2003)

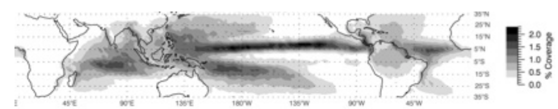


V7 stratiform rain fraction for Jun 99-May 00 and 2008



- V7 stratiform rain fractions are higher over land and lower over ocean.
- New tropics-wide (20N-20S) stratiform rain fraction near 35%
  - 2A23 default classifications: 37.5%
  - TAMU suggested convective reclassifications: 34.8%

8. Shallow Non-Isolated Pixels



- High relative occurrence in ITCZ regions (esp. the Pacific) suggests a distinct formation mechanism

9. Conclusions

- An overall migration of shallow pixels from stratiform to convective types between version 6 and 7 can be shown with a pixel-by-pixel analysis. We suggest even more migration in future algorithm versions.
- The tropics-wide stratiform rain fraction has been reduced since 2A23 version 5 partly due to shallow pixel movement between v6 and v7.
- Shallow, non-isolated pixels show a strong relative frequency of occurrence in the Pacific ITCZ.

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