**Using TRMM Measurements in a Dynamically Constrained Framework to Better Understand Tropical Cyclone Rapid Intensification**

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1. Overview and specific objectives of this proposal

1.1 Questions to address

1.1.1 What is importance of inner-core precipitation structure in RI?

1.1.2 How does inner-core precipitation structure vary when considered in dynamical radius,

i.e., defined relative to the RMW?

1.1.3 How does inner-core precipitation structure relate to inner-core symmetric kinematic

structure in RI?

1.2 Specific objectives

1.2.1 Develop algorithms for plotting TCPF fields in dynamical radius

- *working hypothesis*: extended best track data can be used normalize radius in TCPF

fields based on RMW

1.2.2 Calculate statistical properties of inner-core precipitation for RI vs. SS cases using TCPF

- *working hypothesis*: deepest, most intense convection, as measured by parameters such

as counts of CBs, height of 20 dBZ echo, 85 GHz scattering, has a preferred

radius for RI cases

1.2.3 Relate TCPF statistics to inner-core kinematic structure

- *working hypothesis*: there is a direct relationship between inner-core precipitation

structure, inner-core kinematic structure, and likelihood of RI

2. Relevance to NASA’s research objectives

3. Accomplishments resulting in whole or in part from recent NASA support

3.1 TC inner-core kinematic and convective structure and RI

3.1.1 TC inner-core structure from airborne Doppler radar composites

3.1.2 Convective-scale structure and evolution during RI

3.2 Development and dissemination of the TRMM Tropical Cyclone Precipitation Feature (TCPF) database

3.2.1 Hot towers and TC rapid intensification (RI)

3.2.2 Rainfall properties in the inner core and their relation to TC intensity change

3.3 Publications resulting in whole or in part from past 3 years of NASA support

4. Preliminary studies

4.1 Composite study of intensifying vs. steady-state TC’s using airborne Doppler

5. Detailed work plan

Year 1: Plot TCPF fields in dynamical radius based on RMW from EBT and/or airborne

Doppler data; quantify errors in RMW from EBT for select cases based on flight-level, radar data;

develop radar-based convective burst definition using Doppler radar data

Year 2: Apply convective burst definition and extended best track RMW to TRMM TCPF

database for composites of rapidly intensifying (RI) vs. steady-state (SS) TCs; analyze statistical

properties (e.g, convective burst counts, reflectivity profiles, height of 20 dBZ echo, 85 GHz

scattering as f(normalized radius)) for RI vs. SS TCs (Questions 1.1.1, 1.1.2)

Year 3: Find 1 or 2 good cases with both P3 and TRMM overpasses to study all the available

parameters, such as vertical velocity, vorticity, radial flow, 85/37 Tb's, dBZ profiles, IR channel

Tb's, lightning flashes, etc. within context of kinematic fields derived from airborne Doppler

(Questions 1.1.1, 1.1.3)

6. Management Plan and Timetable

7. References (excluding those already cited)

8. Budget Details and Justification

Biographical Sketch for PI (Rogers) and Co-I (Jiang)

Current and Pending Support for PI (Rogers) and Co-I (Jiang)