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VORTICITY-BASED DETECTION OF TROPICAL CYCLOGENESIS

By

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TABLE OF CONTENTS

List of Figures	vii
Abstract	ix
1. INTRODUCTION	1
2. BACKGROUND	4
2.1 Principles of Scatterometry	4
2.2 The SeaWinds Scatterometer	5
3. DATA	8
3.1 Scatterometer Data	8
3.2 GOES Imagery	8
4. METHODOLOGY	10
4.1 Detection Technique	10
4.2 Threshold Determination	11
4.3 Track Assessment	12
5. RESULTS	14
5.1 Isabel (2003)	17
5.2 Debby (2000)	22
6. DISCUSSIONS	27
6.1 The Initial Stage	28
6.2 The Intermediate Stage	29
6.3 The Near-TC Stage	29
6.4 Pre-TC Track Transition	30
6.5 Future Improvements	30
7. CONCLUSIONS	32

REFERENCES	33
BIOGRAPHICAL SKETCH	36

LIST OF FIGURES

<p>Figure 1: The spacecraft and antenna geometries for SeaWinds. Outer beam is v-pol and inner beam is h-pol (adapted from Weissman et al. 2003)</p>	6
<p>Figure 2: Probability of Detection (POD) graph. Lower threshold values result in a higher probability of detection and increased false alarms. Higher threshold values result in detection of stronger systems (more misses) and, hence, less false alarms</p>	12
<p>Figure 3: Examples of the early stages of TCG that are identified by the vorticity-based detection technique. (a) Floyd, 46 hours before classification as a tropical depression. The vorticity signature shown is associated with the easterly wave that spawned Floyd. (b) Nicholas, 64 hours before classification as a tropical depression. The vorticity signature shown is associated with the easterly wave that produced Nicholas. (c) Michael, 38 hours before classification as a subtropical depression. The vorticity signature shown is associated with the upper-level cold low that interacted with a stationary front to create Michael. (d) Noel, 26 hours before classification as a subtropical storm. The vorticity signature shown is associated with the non-tropical occluded low that spawned Noel. Each example illustrates an apparent surface circulation</p>	16
<p>Figure 4: GOES infrared images associated with pre-TC Isabel (2003) for (a) 1 September at 1745 UTC, (b) 2 September at 845 UTC, (c) 3 September at 845 UTC, (d) 3 September at 2045 UTC, (e) 4 September at 2045 UTC, (f) 5 September at 845 UTC, and (g) 5 September at 2045 UTC (courtesy NOAA/NESDIS/CLASS: www.class.noaa.gov)</p>	18
<p>Figure 5: QuikSCAT vorticity images associated with pre-TC Isabel (2003) and the corresponding tracking times. (a) 1 September at 1856 UTC, 101 hours. (b) 2 September at 739 UTC, 88 hours. (c) 3 September at 714 UTC, 65 hours. (d) 3 September at 1944 UTC, 52 hours. (e) 4 September at 1918 UTC, 29 hours. (f) 5</p>	

September at 803 UTC, 16 hours. (g) 5 September at 2032 UTC, 3 hours	19
Figure 6: Track of the tropical disturbance associated with pre-TC Isabel (2003). Triangles represent the associated QuikSCAT images, and the number above or below each triangle signify the tracking time for that image. The number '0' represents when the NHC classified Isabel as a tropical depression	21
Figure 7: GOES infrared images associated with pre-TC Debby (2000) for (a) 15 August at 2045 UTC, (b) 16 August at 845 UTC, (c) 16 August at 2045 UTC, (d) 17 August at 2045 UTC, (e) 18 August at 845 UTC, (f) 18 August at 2045 UTC, and (g) 19 August at 845 UTC (courtesy NOAA/NESDIS/CLASS)	23
Figure 8: QuikSCAT vorticity images associated with pre-TC Debby (2000) and the corresponding tracking times. (a) 15 August at 1859 UTC, 95 hours. (b) 16 August at 742 UTC, 82 hours. (c) 16 August at 2014 UTC, 70 hours. (d) 17 August at 1950 UTC, 46 hours. (e) 18 August at 833 UTC, 33 hours. (f) 18 August at 2104 UTC, 21 hours. (g) 19 August at 808 UTC, 10 hours	24
Figure 9: Track of the tropical disturbance associated with pre-TC Debby (2000). Triangles represent the associated QuikSCAT images, and the number above each triangle signifies the tracking time for that image. The number '0' represents when the NHC classified Debby as a tropical depression	26

ABSTRACT

Ocean wind vectors from the SeaWinds scatterometer on QuikSCAT and GOES imagery are used to develop an objective technique that can detect and monitor tropical disturbances associated with the early stages of tropical cyclogenesis in the Atlantic basin. The technique is based on identification of surface vorticity and wind speed signatures that exceed certain threshold magnitudes, with vorticity averaged over an appropriate spatial scale. The threshold values applied herein are determined from the precursors of 15 tropical cyclones during the 1999-2004 Atlantic hurricane seasons using research-quality QuikSCAT data. Tropical disturbances are found for these cases within a range of 19 hours to 101 hours before classification as tropical cyclones by the National Hurricane Center (NHC).

The 15 cases are further subdivided based upon their origination source (i.e., easterly wave, upper-level cut-off low, stagnant frontal zone, etc). Primary focus centers on the cases associated with tropical waves, since these waves account for approximately 63% of all Atlantic tropical cyclones. The detection technique illustrates the ability to track these tropical disturbances from near the coast of Africa. Analysis of the pre-tropical cyclone (TC) tracks for these cases depict stages, related to wind speed and precipitation, in the evolution of an easterly wave to tropical cyclone.