NOTES AND CORRESPONDENCE

Reply

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1. Introduction

In Gruskin (2010, hereinafter G10) a tropical disturbance that made landfall near Morehead City, North Carolina, on 27 June 2006 is described. G10 argues that the disturbance likely had maximum 1-min winds $>18 \text{ m s}^{-1}$, a closed surface wind circulation (CSWC) around a well-defined center, a warm core, was nonfrontal, and derived most of its energy from latent heat of condensation, and therefore likely met the National Hurricane Center's (NHC's) criteria for a tropical storm [Office of the Federal Coordinator for Meteorology (OFCM) 2010]. G10 suggested that the disturbance be reviewed by the Best Track Change Committee (BTCC) to be potentially added to the Hurricane Database for the Atlantic and eastern North Pacific basins (HURDAT) as a tropical storm. The BTCC reviewed the evidence presented in G10 and ultimately decided not to add the disturbance to HURDAT as described in Beven et al. (2010, hereafter B10). The specific difference between B10 and G10 is their conclusions on whether the disturbance had a CSWC. The following reply will discuss B10's argument that there is not enough evidence that the disturbance had a CSWC prior to landfall.

2. Specific concerns in B10 about the presence of a CSWC

B10 discusses the complexities associated with Air Force reconnaissance investigations of the disturbance, specifically traverses at 1732 and 1800 UTC. In real time, data from neither traverse suggests a CSWC, but postanalysis of the 1800 UTC reconnaissance data combined with Weather Surveillance Radar-1988 Doppler (WSR-88D) data in G10 suggests that a CSWC was present. The author believes that the postanalysis of reconnaissance data in G10 provides a more thorough depiction of the kinematic structure than the coarser real-time analysis.

The next point in B10 that raises doubt on the presence of a CSWC is the simple kinematics of the disturbance. The strongest winds in the disturbance were $20 \text{ m s}^{-1}$ and the forward motion of the disturbance was $11 \text{ m s}^{-1}$ before landfall, implying that the rotational velocity of the disturbance was $9 \text{ m s}^{-1}$, assuming that the vortex is symmetric relative to the mean flow. However, the assumption that the vortex is symmetric relative to the mean flow is not accurate in this case. WSR-88D, Air Force reconnaissance, and surface data support that the disturbance had northerly winds in the western semicircle, implying that the disturbance was asymmetric relative to the mean flow, since the rotational velocity must be higher in the western semicircle for northerly winds to exist there. A pressure gradient calculation assuming cyclostrophic balance (Fig. 10 of G10) further supports this notion, since the pressure gradient in the western semicircle was greater than the eastern semicircle. Thus, the author believes that the data presented in G10 provide a much clearer depiction of the actual structure of the circulation than the idealized kinematical calculation in B10.

The final argument of B10 raising doubt on the presence of a CSWC is that the northerly winds observed at station C2542 were less than $3 \text{ m s}^{-1}$, too weak to detect the wind direction by visual examination of the sea surface or the stepped frequency microwave radiometer (SMFR) and therefore too weak to close off the circulation by
typical NHC conventions. First, the SFMR cannot detect wind direction, so that point is not valid. Second, the author believes that whether the wind direction can be visually estimated does not matter in light of WSR-88D, reconnaissance, and surface data that all support northerly winds and therefore a CSWC. It would be inconsistent with the official NHC definition of a CSWC to say the circulation is open just because winds on one side are light, especially in a case like this where there is substantial evidence to the contrary.

3. Conclusions

In this reply, the author analyzed each argument presented in B10 that raised doubt on the presence of a CSWC in the June 2006 disturbance described in G10. It was concluded that these arguments were inconsistent with the observational evidence from Air Force reconnaissance, WSR-88D, and surface stations. Therefore, the disturbance likely had a CSWC and likely met the criteria to be considered a tropical storm as originally stated in G10. The author believes that not adding the disturbance to HURDAT as a tropical storm creates an inconsistency in the historical record.

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REFERENCES

