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Plain Language Summary: Detecting tropical cyclone (TC) centers is a challenge in understanding TC inner-core dynamics. Four frequently used center detecting methods are evaluated in a high-resolution simulation of Hurricane Wilma (2005). The vertical tilt the minimum pressure variance center (MVC) and the potential vorticity centroid center (PVC) are generally smooth, while the relative tracks of the maximum tangential wind center (MTC) and the pressure centroid center (PCC) contain abrupt changes. The MVC also leads to the strongest symmetric structure in the tangential wind, PV, and radial PV gradient in the eyewall region. This study suggests that the MVC should be selected in the study of inner-core processes.

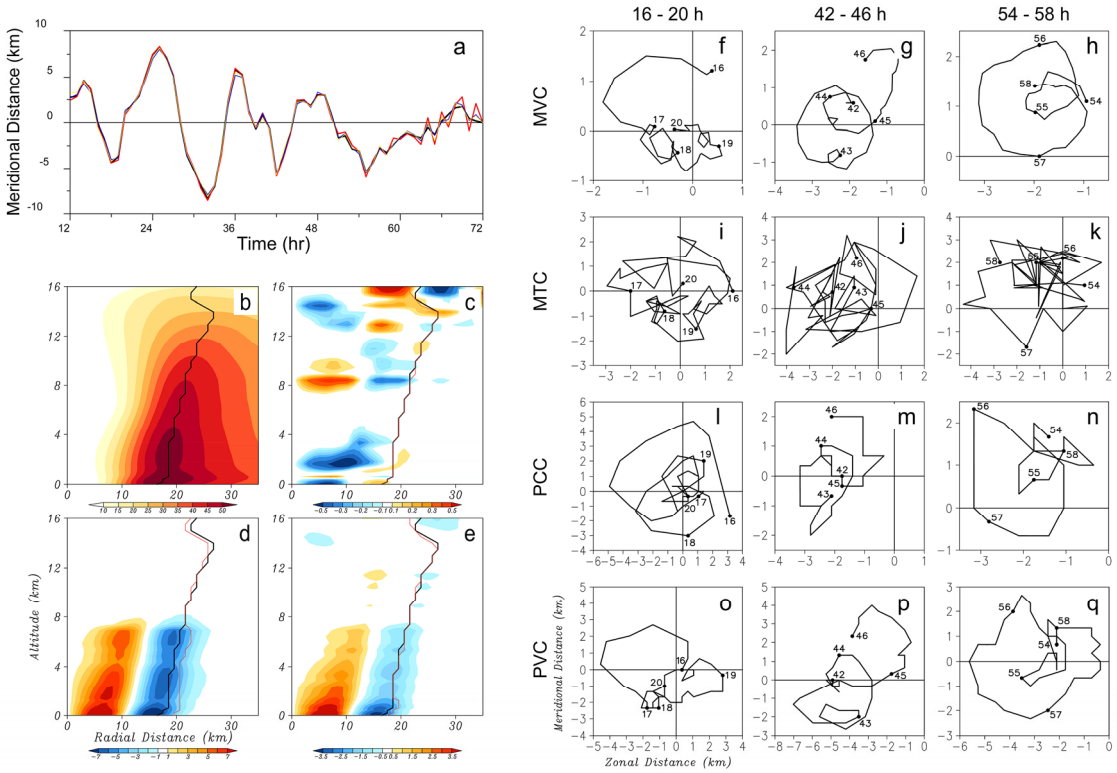

Figure 1. Meridional track oscillations of the four center methods at z = 3 km derived by removing the 9-hour running mean (a). The cross section of the azimuthal mean tangential wind (shading) for the MVC (b) and differences (shading) based on the MTC (c), PCC (d) and PVC (e). The vertical tilts in different period, derived from the MVC (f-h), MTC (i-k), PCC(l-n) and PVC (o-q), respectively.

- By using a high-temporal-spatial-resolution simulated hurricane, four TC center detecting methods are evaluated.
- The differences in the detected center position and vertical tilt are generally small due to the strong TC intensity, with similar small-scale track oscillations that rotate cyclonically around the mean track.
- The MVC shows the smoothest track and vertical tilt, also leads to the strongest symmetric structure in the tangential wind, PV, and radial PV gradient in the eyewall region, therefore it is recommended in the study of inner-core processes.