Supplemental Material

Supplemental Material: Examples and discussion of observed large RMW TC cases

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The distribution of RMW values as a function of maximum wind speed revealed a very large variability for moderate (<category 3) TCs, notably with cases with very large RMW (up to 100 km). We thus further illustrate here some of these. Fig. S1 shows that they are usually associated with highly asymmetrical TCs for which high winds are mostly confined to one sector of the TC vortex. It is interesting to note that such cases typically show disagreement between BT and SAR RMW estimates, with differences of more than 30 km. BT RMW falls inside the TC eye (see dark-blue circles), far from the maximum wind area, whereas SAR-extracted RMW (yellow circle) seems to characterize more faithfully the asymmetrical high wind area. We thus assume that BT estimation is in such cases inaccurate, possibly attributing a too low RMW, precisely because BTs use RMW indirect estimation based on the usual RMW–V_{MAX} relation, which in such cases no longer holds. The case of Sergio shows a different behavior, with SAR and BT RMW estimates being in relatively good agreement, although with a large value of RMW (90 km). This case features a ring of high winds, more distributed around its vortex, that may favor the good agreement between both datasets.

The case of TC Joaninha (Fig. S1f), which is the most intense case with large RMW that we observed, may, however, be biased. It indeed shows a large discrepancy between SAR-extracted V_{MAX} and BT V_{MAX} ($\sim$20 m s^{-1} difference). In this case, we assume that the $Vmax_{SAR}$ estimate may be erroneous because the SAR wind field features a very strange “line” of intense winds in the southwest quadrant of the TC, which may be associated with a localized rain event. Indeed, the heterogeneity mask shows a little area of heterogeneity just north of this intense wind “line”, which may indicate the presence of strong rain in the area (which is, however, not detected as heterogeneity and masked over the whole area and which would here cause anomalously high winds). This example shows that rain issues are not easy to detect and may still impact our wind field retrievals (such cases are, however, rare and are assumed to not significantly impact our statistical estimates). On the other hand, the SAR RMW estimate seems not to be strongly impacted by this potential rain issue. The BT RMW estimate, in contrast, seems unrealistic, falling inside the TC eye, where no high wind is observed.

Overall, this overview of specific cases shows that large RMW can be observed for moderate TCs and is mostly associated with very asymmetrical TCs.

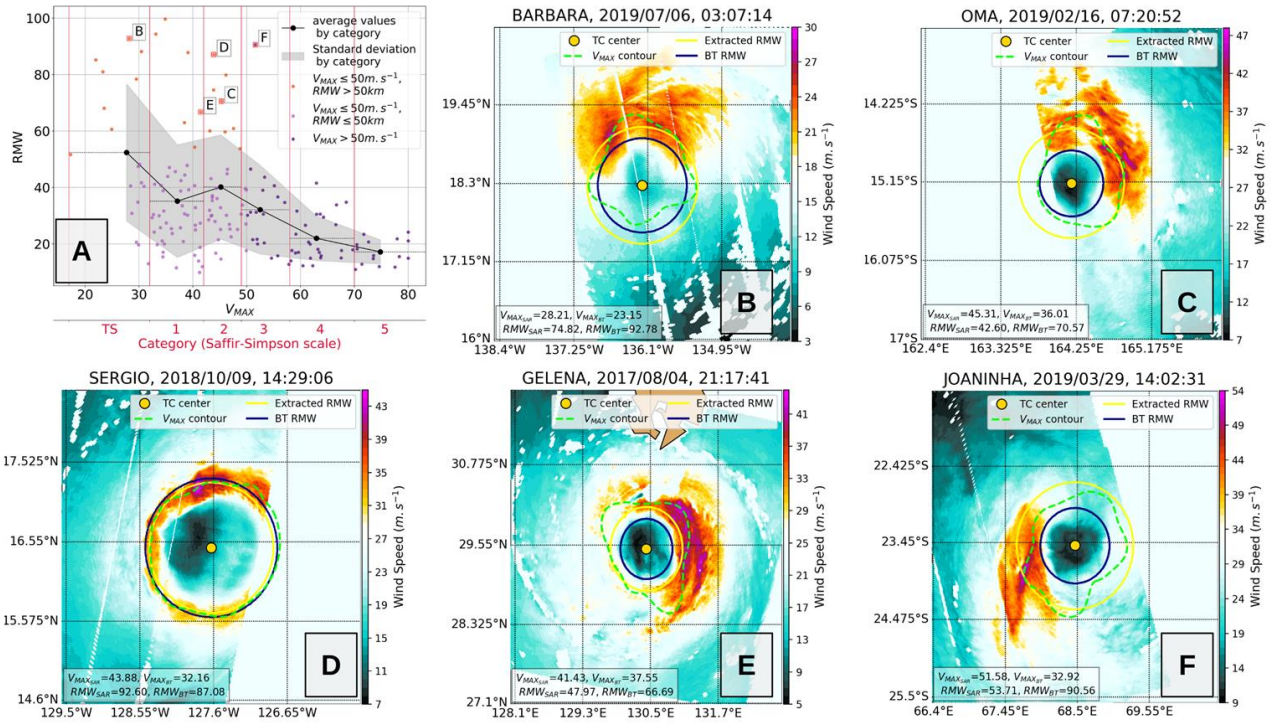

Fig. S1. Comparison of SAR and BT RMW estimates for five SAR acquisitions featuring particularly large RMWs. (a) Reproduction of Fig. 5 in which the five cases are labeled; TC (b) BARBARA, (c) OMA, (d) SERGIO, (e) GELENA, and (f) JOANHINA. The SAR- retrieved wind field is shaded. The yellow dot locates the SAR TC center position, the green dotted line is the extracted $Vmax_{AZ}$ contour, the yellow circle represents the SAR azimuthally averaged RMW, and the dark-blue circle is the BT RMW.