

Supporting Information for

# **Argo Trajectories Reveal Changing Core-Peripheral Partitioning of Gulf Stream Transport**

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## **Introduction**

This supplementary material contains the sensitivity test results and stream axis position analyses mentioned in the main text. We examine the robustness of the core band identification and transport trends with respect to bandwidth selection and gradient

threshold selection. The core band centerline position and width are also analyzed to rule out geometric changes as the cause of the distinct core-peripheral interannual evolution.

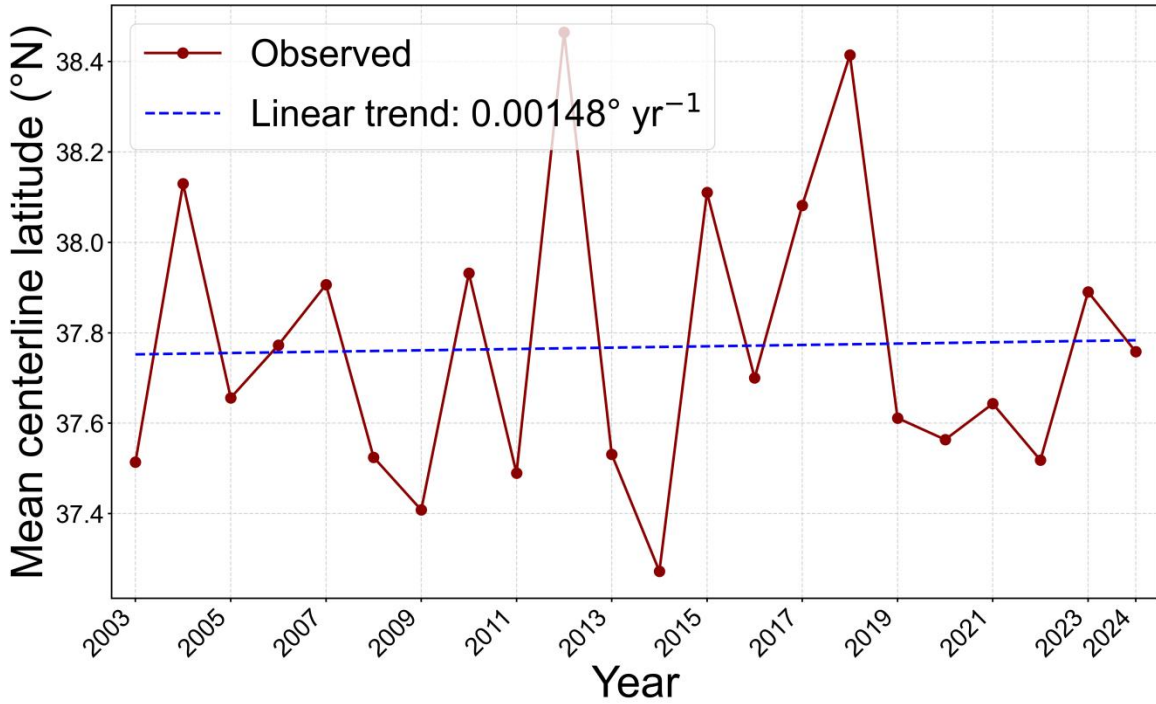


**Figure S1.** Interannual position of the core band centerline (2003–2024). Horizontal axis: year; vertical axis: mean latitude of the stream axis (°N). Scatter points denote annual mean latitudes; the solid line is the linear fit. The interannual variability has a standard deviation of  $\sim 0.3^{\circ}$ – $0.4^{\circ}$  latitude, but the linear trend is only  $+0.00148^{\circ} \text{ yr}^{-1}$  (standard error  $\pm 0.0045^{\circ} \text{ yr}^{-1}$ ,  $p=0.893$ ), far smaller than the Gulf Stream width ( $\sim 1.3^{\circ}$  latitude), indicating no significant shift in the mean stream axis position over the study period.

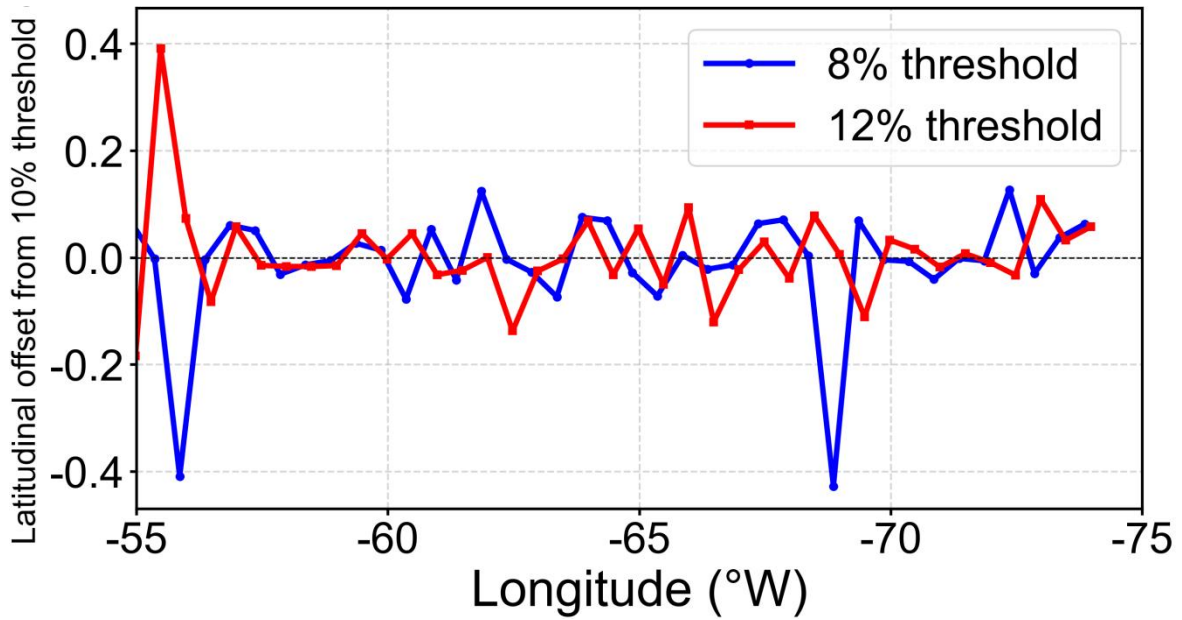


**Figure S2.** Gradient threshold offset as a function of longitude. Horizontal axis: longitude (°W, from -75 to -55); vertical axis: latitudinal offset (degrees). Two curves are shown: blue circles for the 8% threshold and red squares for the 12% threshold, with a horizontal dashed line at  $Y = 0$ . The mean absolute offsets for the 8% and 12% thresholds are  $0.084^\circ$  and  $0.056^\circ$ , respectively, both far smaller than the core band width ( $\sim 1.3^\circ$  latitude). Core band identification is therefore insensitive to the choice of gradient threshold. The offset fluctuations at individual longitudes reflect spatial inhomogeneity in Gulf Stream meandering and do not affect the overall core band identification.

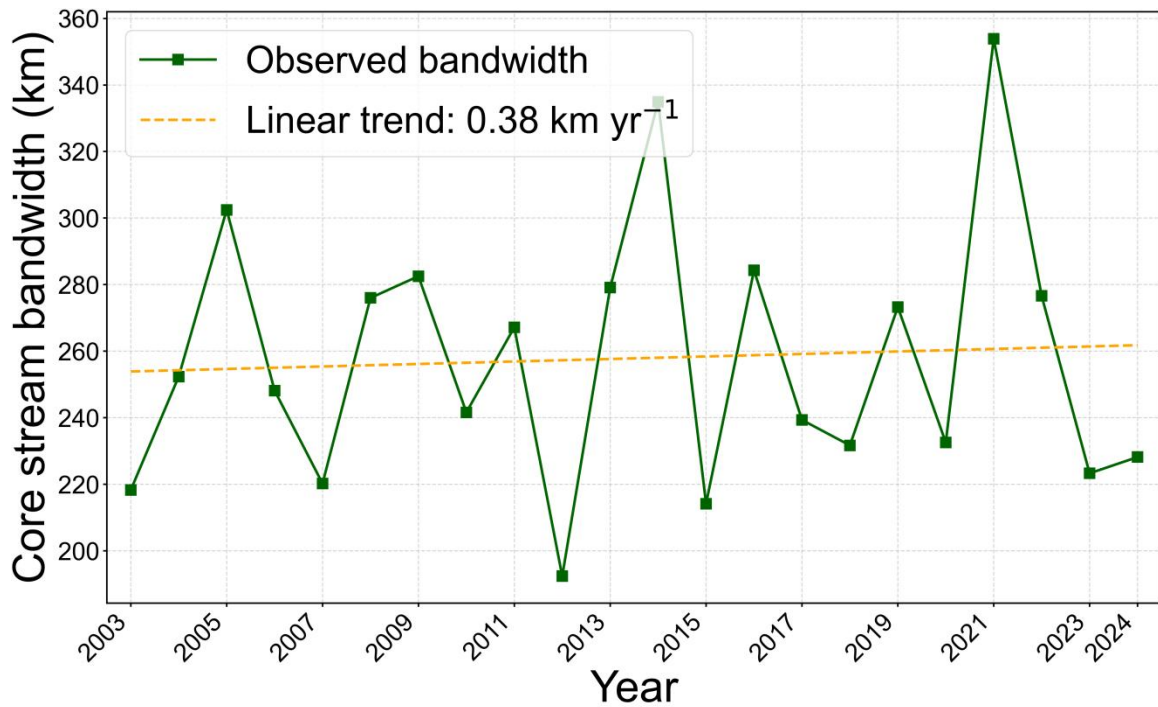


**Figure S3.** Interannual variability of core band width (2003–2024). Square markers denote annual mean width; the orange dashed line is the linear trend. The linear trend is  $+0.38 \text{ km yr}^{-1}$  ( $p = 0.786$ , Mann-Kendall tau =  $-0.0043$ ,  $p = 1$ ), suggesting no statistically significant change in bandwidth over the study period. This further supports the absence of a trend in the core band structure over the study period.

**Table S1.** Bandwidth sensitivity test results.

| Bandwidth<br>(km) | Gradient<br>threshold | Pre-2017 ( $\text{Sv yr}^{-1}$ ) | Post-2017( $\text{Sv yr}^{-1}$ )  |
|-------------------|-----------------------|----------------------------------|-----------------------------------|
|                   |                       |                                  |                                   |
| 121.1             | 8%                    | $-5.07 \pm 1.54$ ( $p = 0.006$ ) | $+21.89 \pm 7.75$ ( $p = 0.037$ ) |
| 142.6             | 10%                   | $-4.99 \pm 1.46$ ( $p = 0.005$ ) | $+20.01 \pm 7.31$ ( $p = 0.041$ ) |
| 167.6             | 12%                   | $-4.99 \pm 1.38$ ( $p = 0.003$ ) | $+18.52 \pm 6.68$ ( $p = 0.039$ ) |

**Table S2.** Gradient threshold sensitivity test results.

| Gradient<br>threshold | Mean absolute offset relative<br>to 10% threshold | Signed<br>offset | Longitude-dependent<br>offset range | Standard<br>deviation |
|-----------------------|---------------------------------------------------|------------------|-------------------------------------|-----------------------|
| 8%                    | 0.084°                                            | +0.018°          | -0.427° to 0.424°                   | 0.142°                |
| 12%                   | 0.056°                                            | -0.006°          | -0.183° to 0.391°                   | 0.088°                |