Supplement of

A Numerical reassessment of the Gulf of Mexico carbon system in connection with the Mississippi River and global ocean

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Figure S1: Direct comparison between cruise underway $pCO_2$ data (Obs) and model result (Model), the spatial distribution over twelve months.

| Month  | Obs  | Model | Obs  | Model |
|--------|------|-------|------|-------|
| Jan    | (a)  | (b)   | (c)  | (d)   |
| Feb    | (e)  | (f)   | (g)  | (h)   |
| Mar    | (i)  | (j)   | (k)  | (l)   |
| Apr    | (m)  | (n)   | (o)  | (p)   |
| May    | (q)  | (r)   | (s)  | (t)   |
| Jun    | (u)  | (v)   | (w)  | (x)   |

$pCO_2$ ($\mu$atm)
Figure S2: Direct comparison between cruise underway \( pCO_2 \) data (data downloaded from https://www.ncei.noaa.gov/access/oads/) and model-simulated spatial means (daily mean with 1 \( \sigma \)) over NGoM and Open GoM. Cruise data is monthly averaged, and its mean and one standard deviation are shown in the plot as black dots and grey bars, respectively.