



*Supplement of*

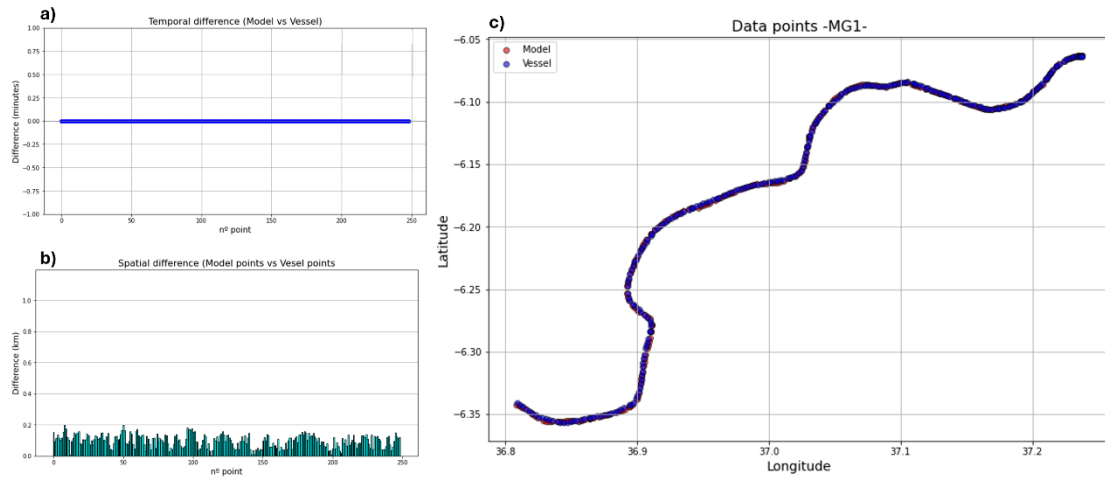
## **Anthropogenic pressures driving the salinity intrusion in the Guadalquivir estuary: insights from 1D numerical simulations**

**Sara Sirviente et al.**

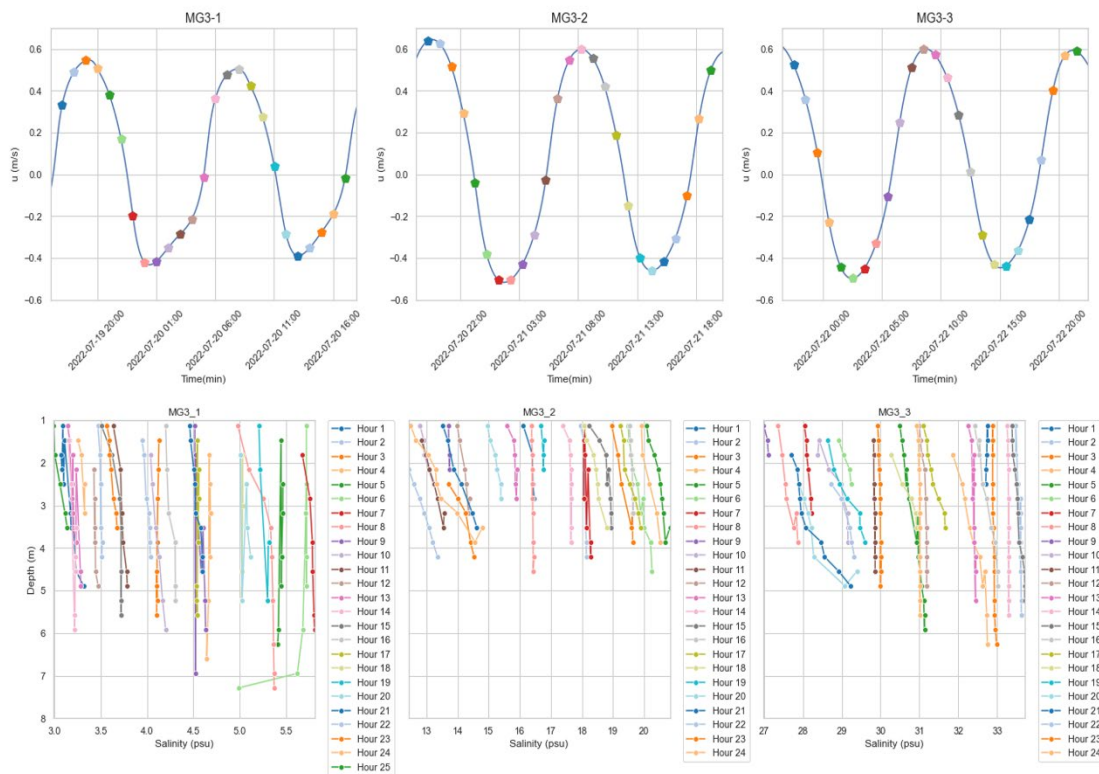
*Correspondence to:* Sara Sirviente (sara.sirviente@uca.es)

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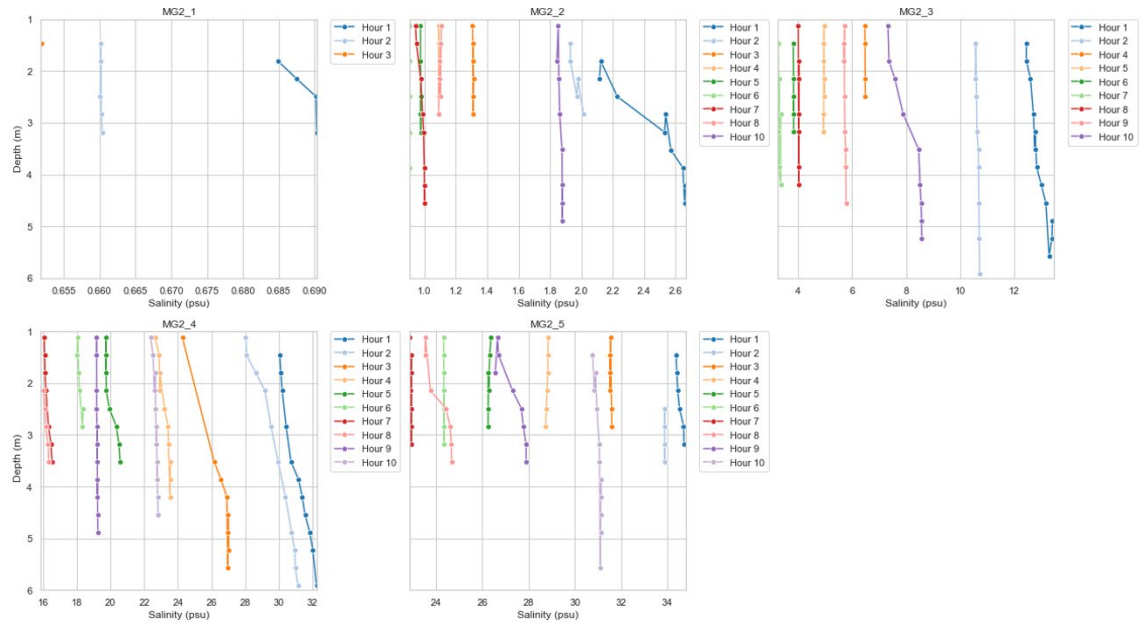
## Supplementary Materials



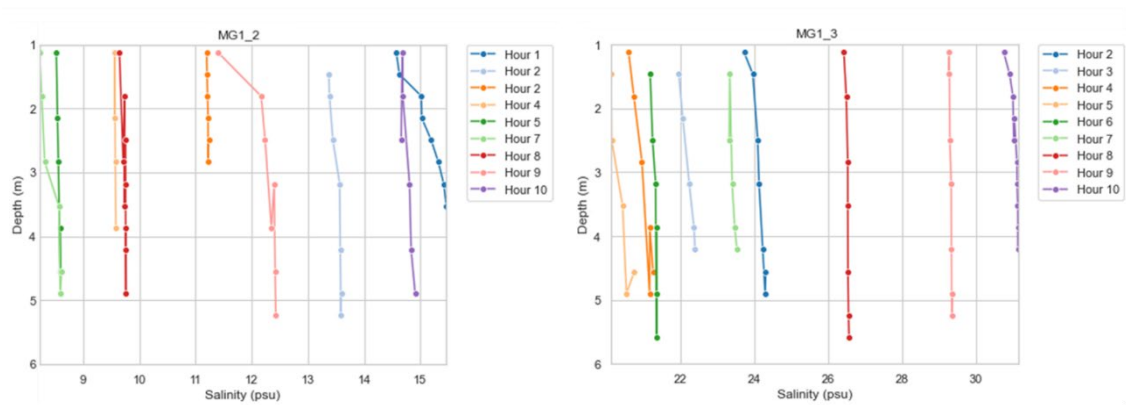
**Figure S1.** (a) Temporal discrepancies (minutes) between model data and observed data corresponding to MG1 vessel trip. (b) Spatial discrepancies (km) between model and observed data points for the MG1 vessel trip. (c) Map showing the locations of each point used for validation (blue represents observation points from vessel trip, and red represents simulation points).



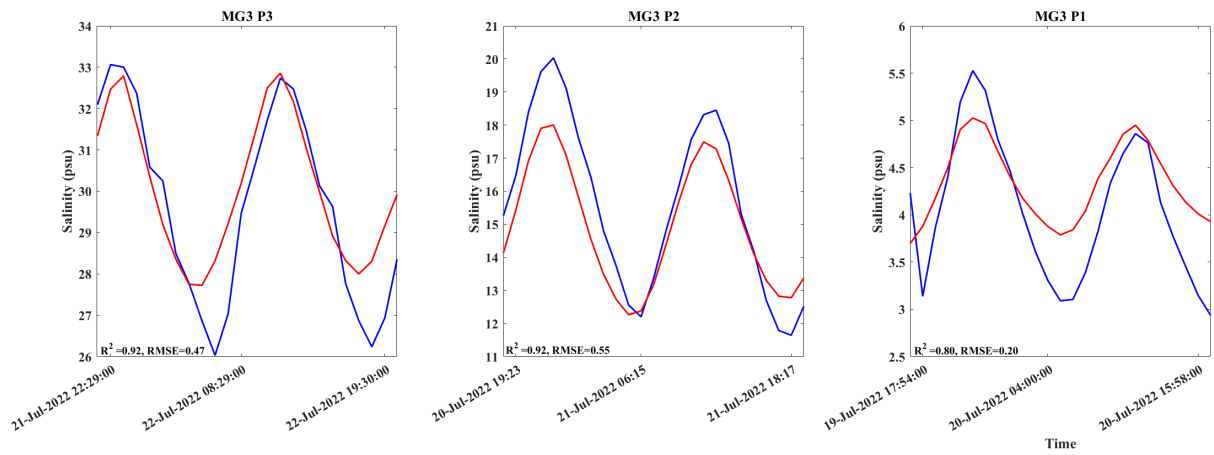
**Figure S2.** Top panel corresponds to the tidal current velocity at each sampling station during the MG3 campaign, with different colors indicating the tidal phases during which each CTD profile was taken. The bottom panel displays the CTD profiles at each sampling point along the Guadalquivir River during the MG3 campaign.



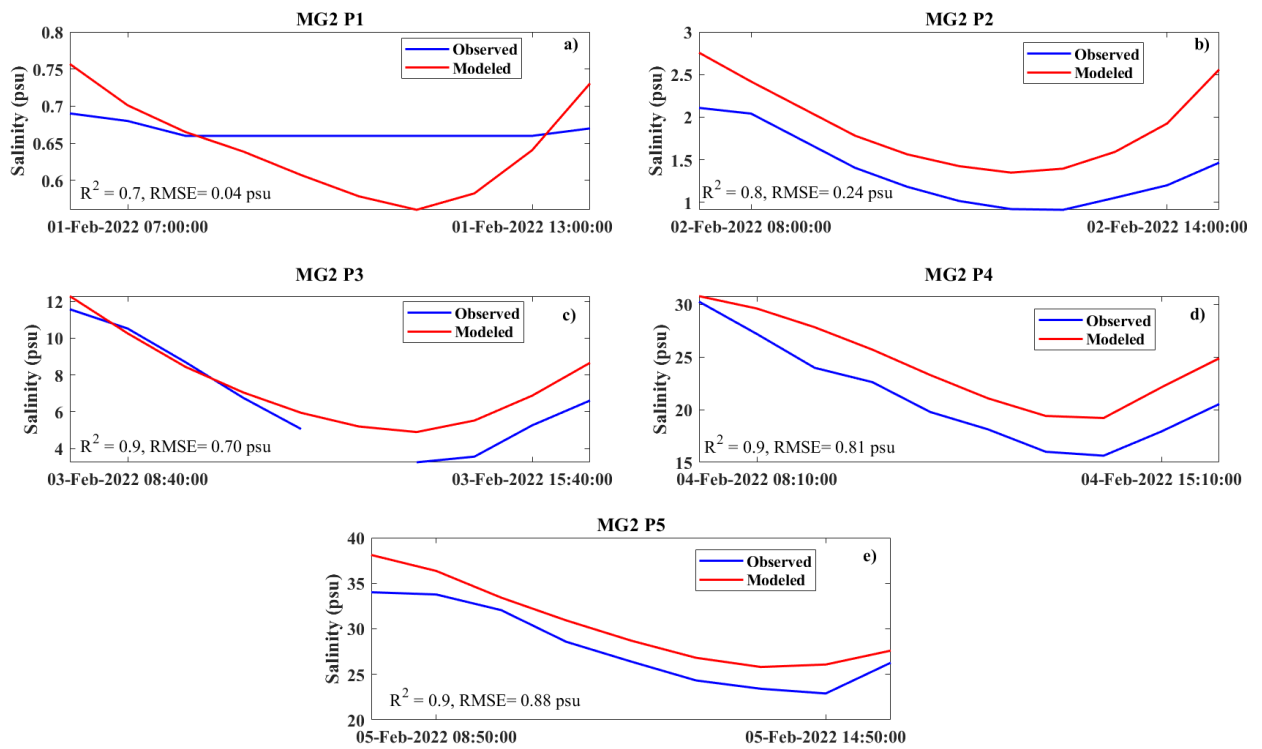
**Figure S3.** Salinity profiles collected with CTD (Conductivity, pressure and depth) at five locations (see Fig 5.1a) in the Guadalquivir Estuary (MG2-1, to MG2-5). A maximum of 10 profiles were recorded at each station, with measurements taken hourly during MG2 campaign.



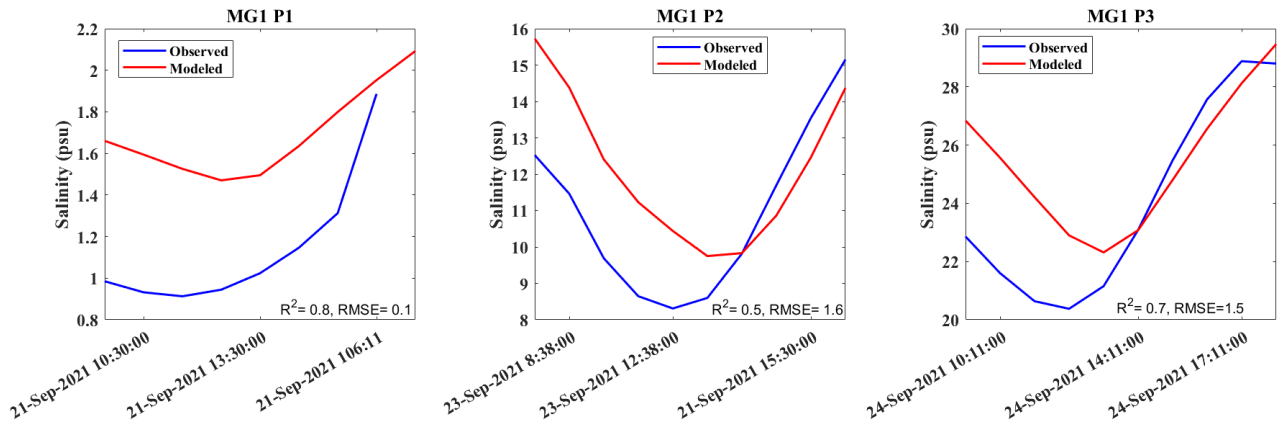
**Figure S4.** Salinity profiles collected with CTD (Conductivity, pressure and depth) at two locations (see Fig 5.1a) in the Guadalquivir Estuary (MG1-2, to MG1-3). A maximum of 10 profiles were recorded at each station, with measurements taken hourly during MG1 campaign.



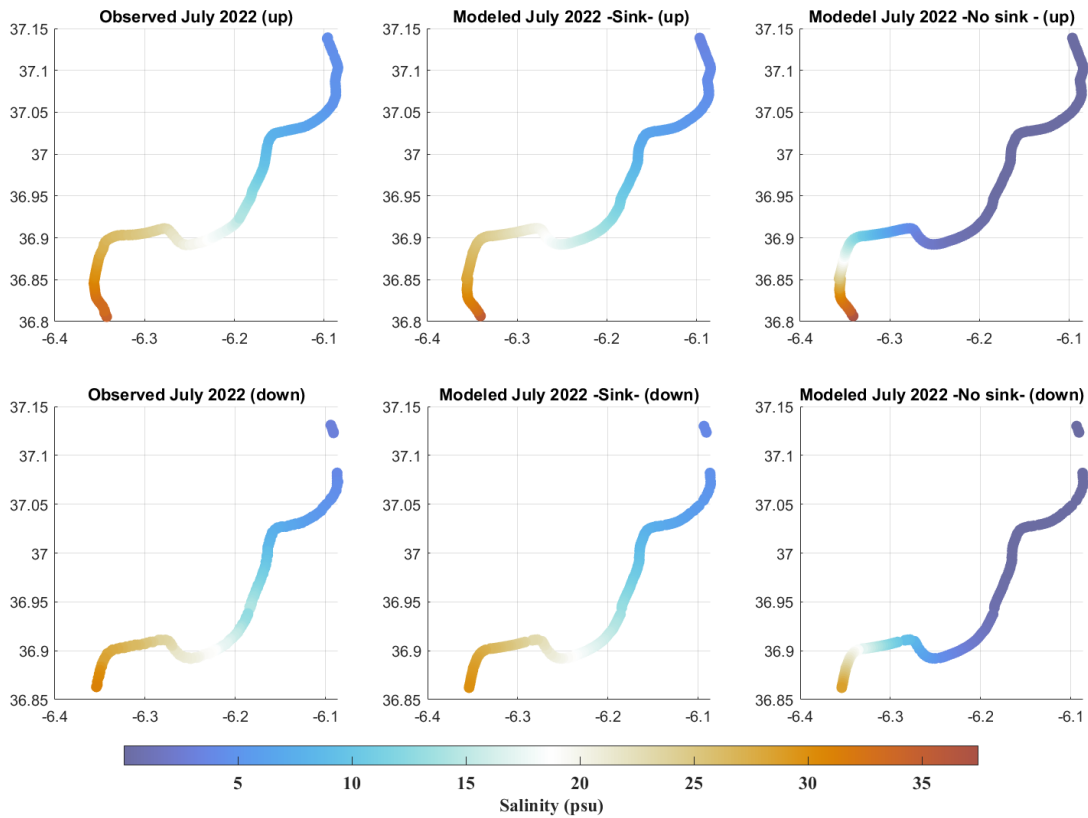
**Figure S5.** Temporal variability of salinity (psu) collected at different sample points during 5 days of MG3 campaign.



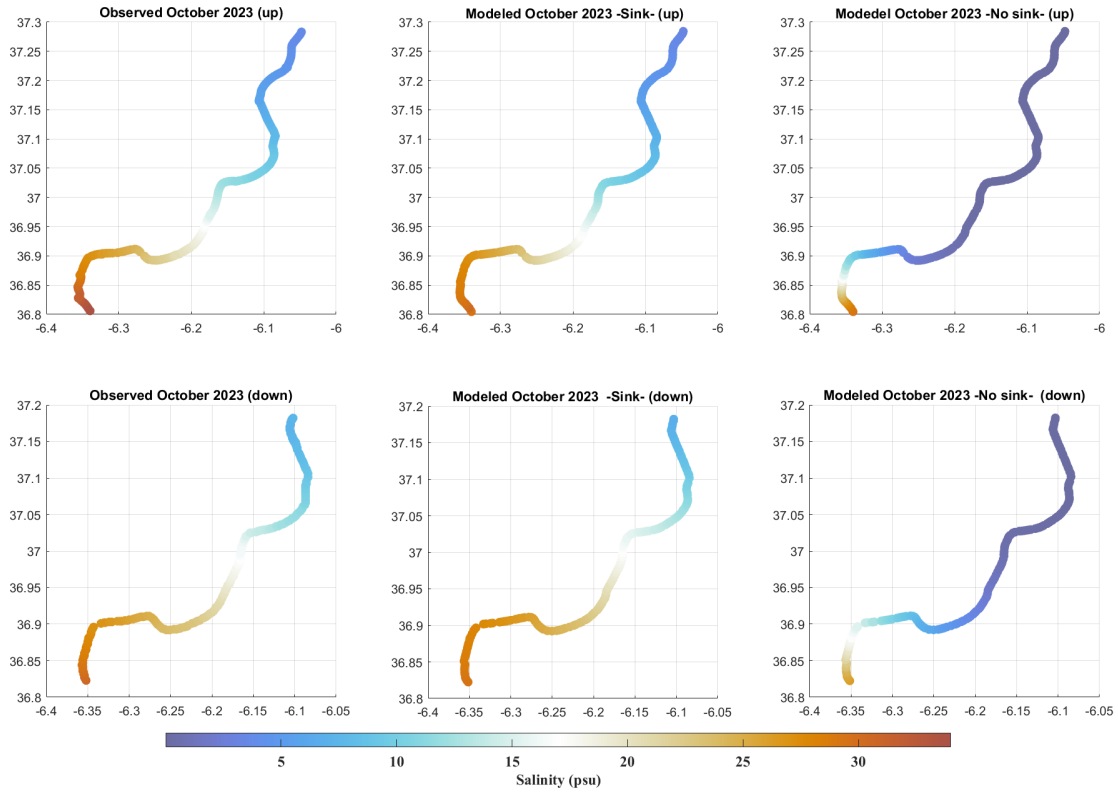
**Figure S6.** Temporal variability of salinity (psu) collected at different sample points during 5 days of MG2 campaign.



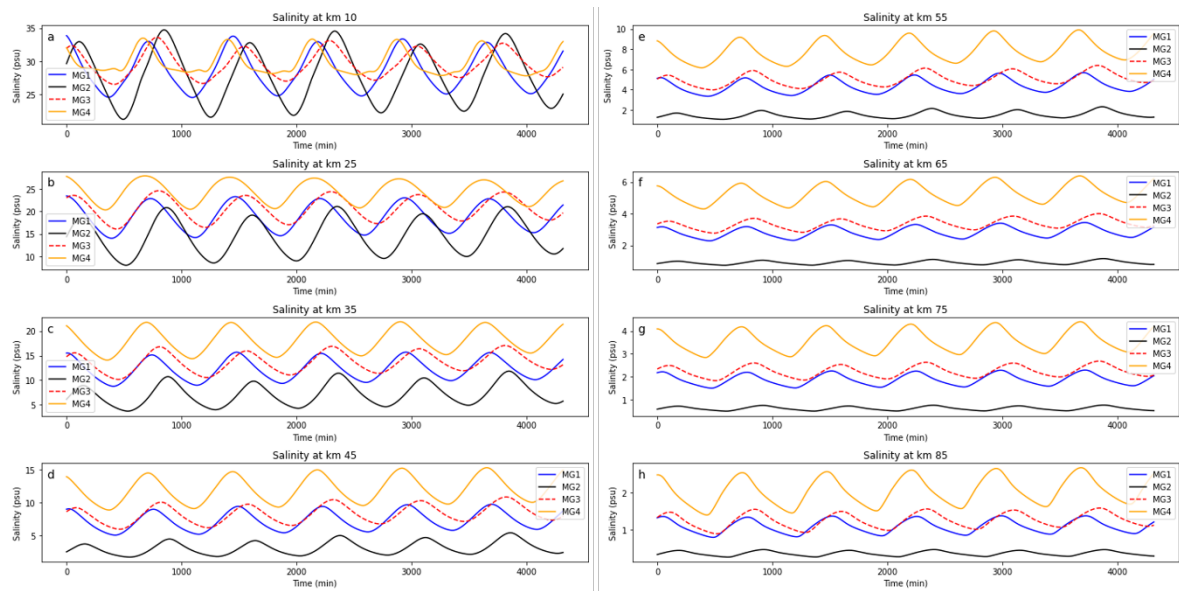
**Figure S7.** Temporal variability of salinity (psu) collected at different sample points during 5 days of MG1 campaign.



**Figure S8.** Salinity concentration maps (psu) of the Guadalquivir River Estuary from the oceanographic campaigns of 19/07/2022 (a, b, c) and 20/07/2022-21/07/2022 (d, e, f). Observations data are shown in a and d. Simulation including water volume reductions are presented in b and e. Figures c and f correspond to model simulation avoiding sinks.



**Figure S9.** Salinity concentration maps (psu) of the Guadalquivir River Estuary from the oceanographic campaigns of 17/10/2023 (a, b, c) and 18/10/2023 (d, e, f). Observations data are shown in a and d. Simulation including water volume reductions are presented in b and e. Figures c and f correspond to model simulation avoiding sinks.



**Figure S20.** Salinity simulation temporal variability along the Guadalquivir River Estuary at km 10 (a), km 25 (b), km 35 (c), km 45 (d), km 55 (e), km 65 (f), km 75 (g), km 85 (h) for MG1, MG2, MG3 and MG4 oceanographic campaign.