Supporting Information for Improved representation of river runoff in Estimating the Circulation and Climate of the Ocean Version 4 (ECCOv4) simulations: implementation, evaluation and impacts to coastal plume regions

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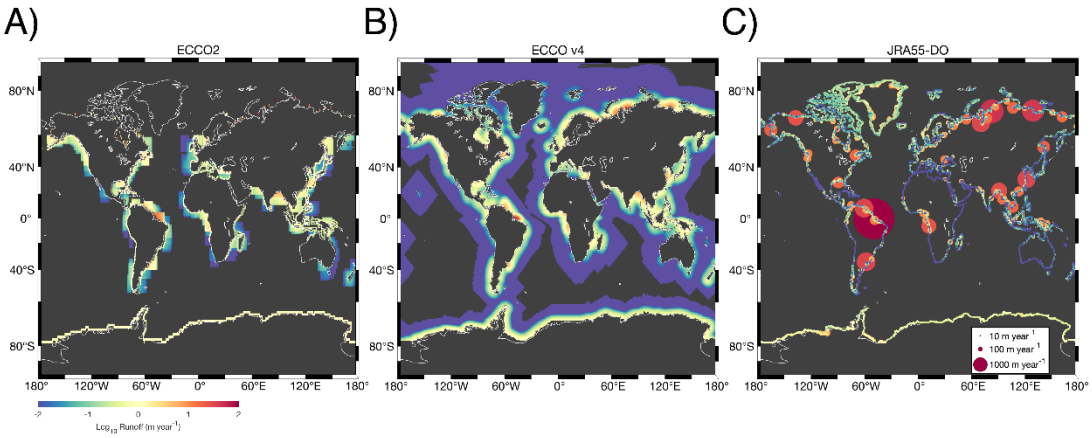

Figure S1: River discharge used in experiments: **(a)** 1°x 1°climatological ECCO2 river forcing for CS510C; **(b)** 1°x 1°climatological ECCOv4 river forcing for LLC90C and LLC270C; **(c)** the realistic JRA55-DO river forcing for LLC90R, LLC270R, LLC540R and CS510R.

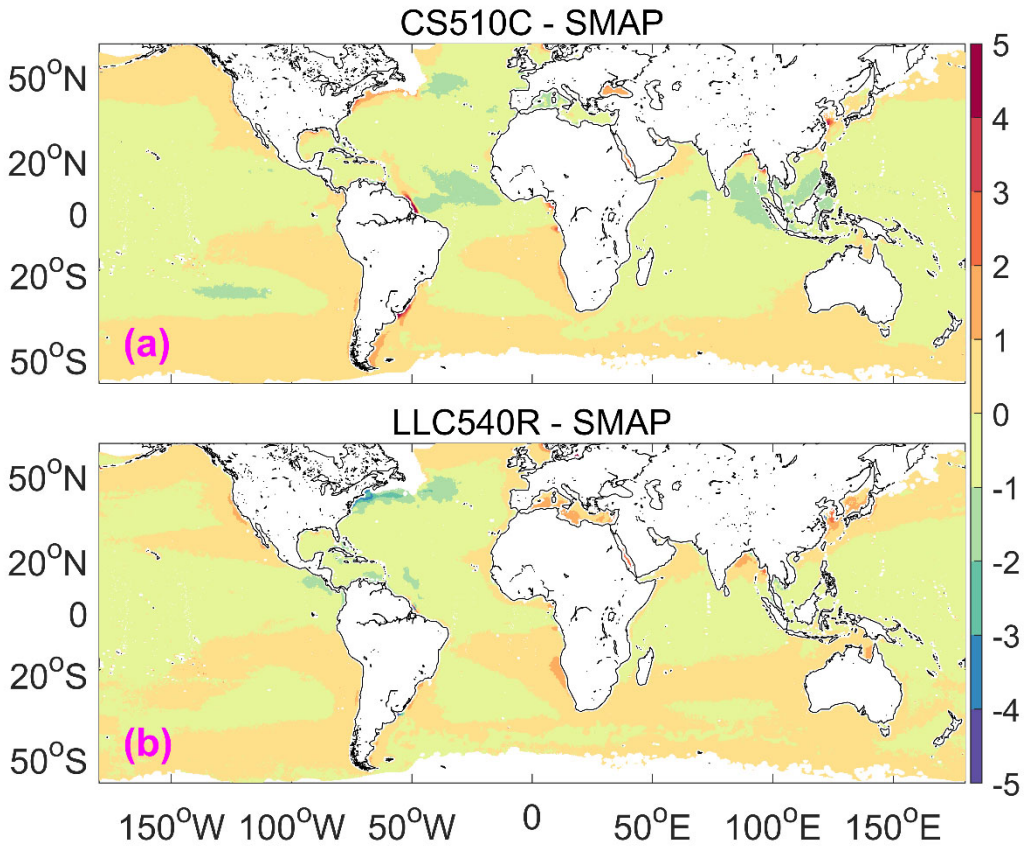

Figure S2: The 33-month (Apr 2015–Dec 2017) averaged salinity bias relative to SMAP for the global ocean for the reference run (CS510C) and highest resolution run with daily, point-source runoff forcing (LLC540R). The model SSS is interpolated to the 0.25° SMAP grid for display purposes.

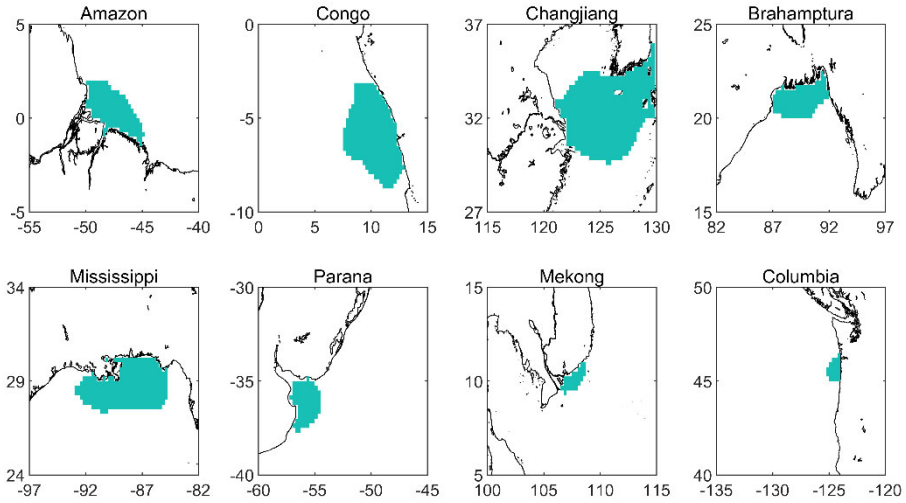

Figure S3: The eight river mouth regions that were identified by reconstructing the SSS anomaly field from the 1st EOF mode of WOA18.

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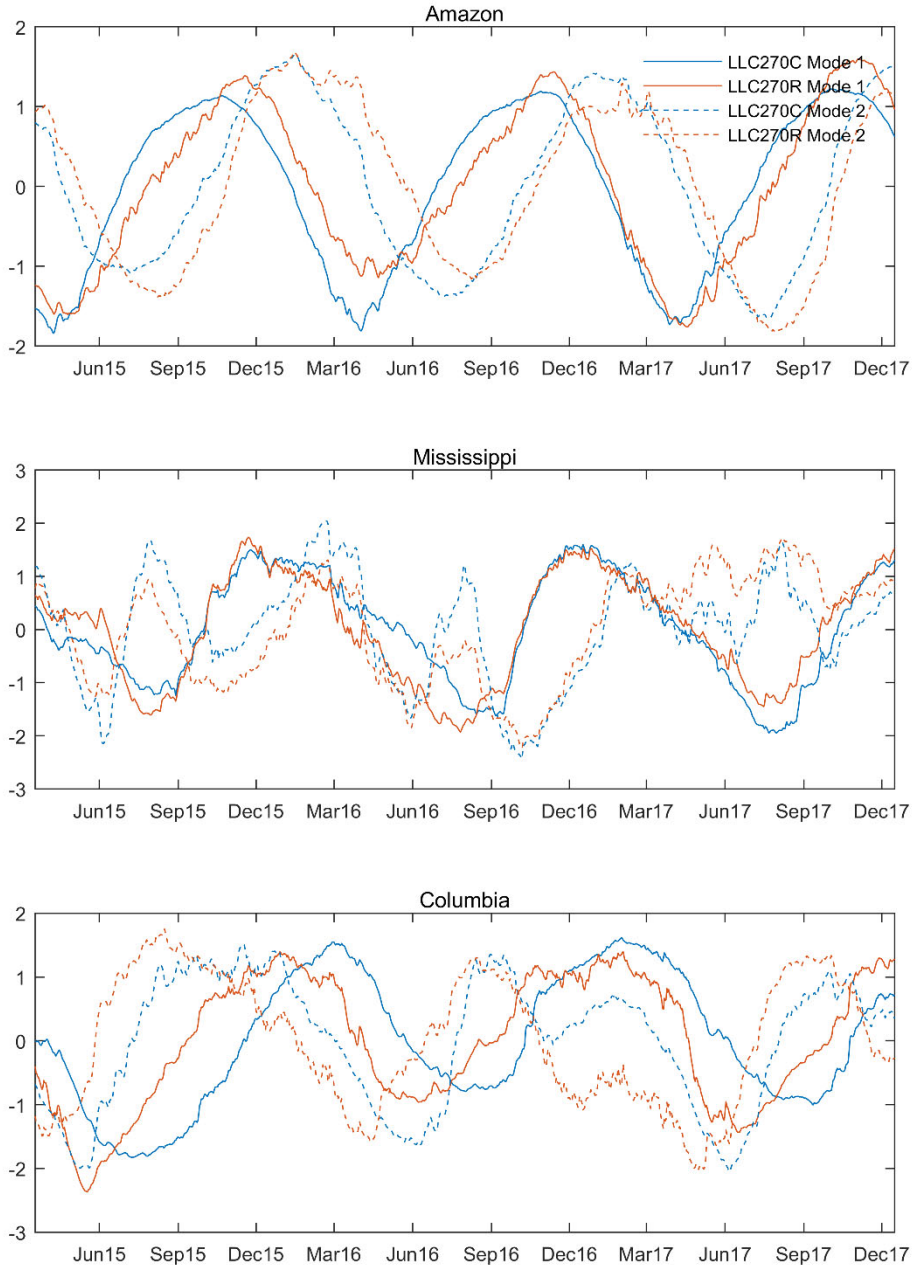

Figure S4: PC timeseries of the 1st and 2nd EOF of LLC270C and LLC270R simulations for the Amazon, Mississippi, and Congo rivers.

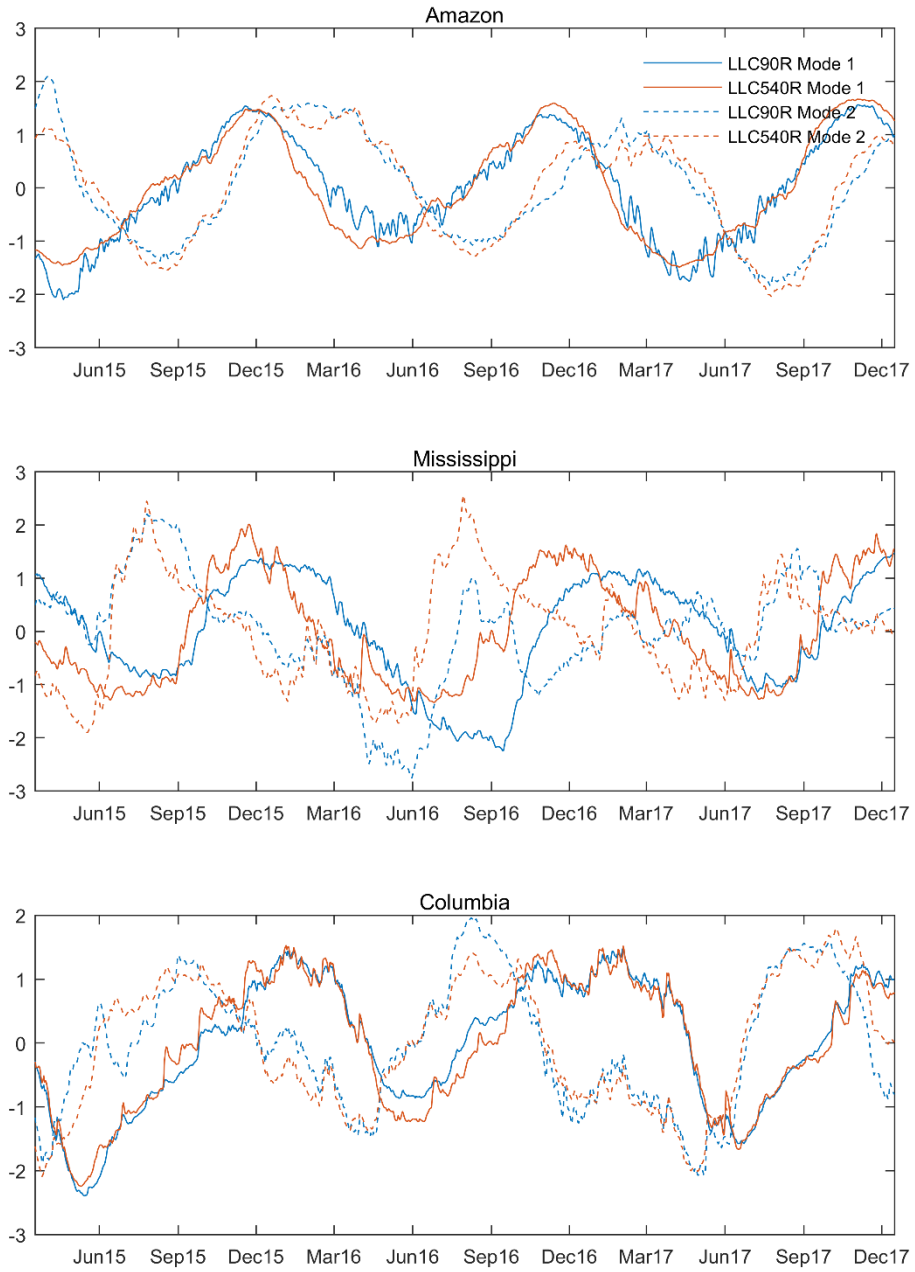

Figure S5: PC timeseries of the 1st and 2nd EOF of LLC90R and LLC540R simulations for the Amazon, Mississippi, and Congo rivers.

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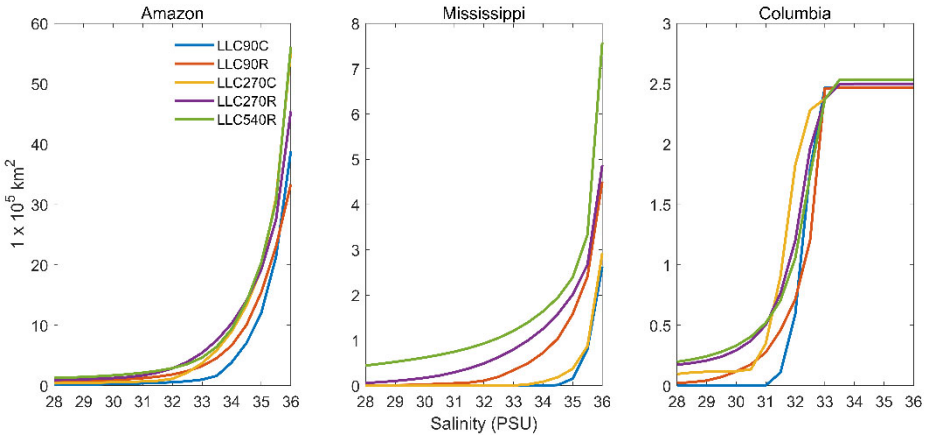

Figure S6: 2015-2017 averaged plume area at salinity threshold S_a from 28 to 36 for the Amazon, Mississippi and Columbia River regions.