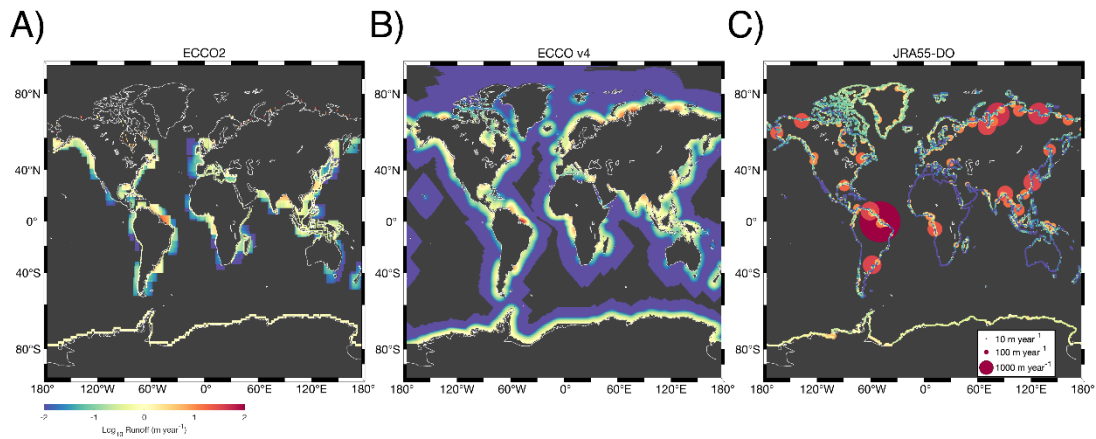Geoscientific
Model Development

Supplement of

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
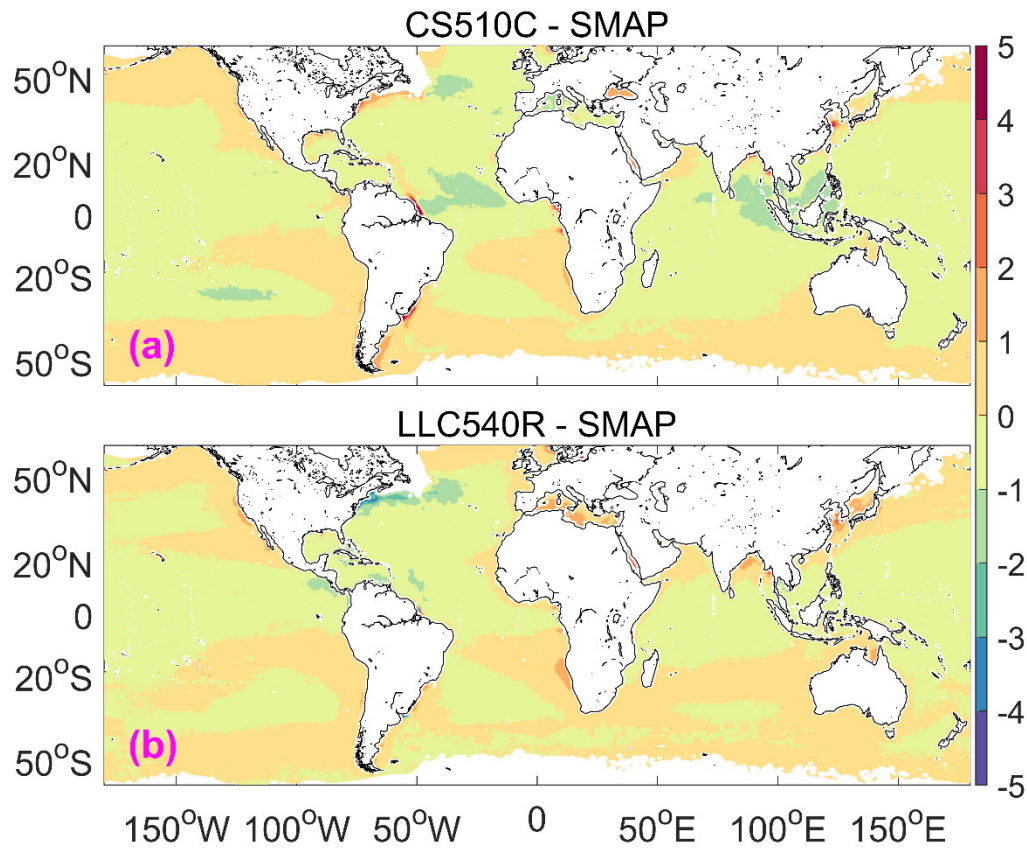
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Figure S1: River discharge used in experiments: **(a)** 1°x 1°climatological ECCO2 river forcing for CS510C; **(b)** 1°x 1°climatological ECCOv4 river forcing for LLC90C and LLC270C; **(c)** the realistic JRA55-DO river forcing for LLC90R, LLC270R, 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.
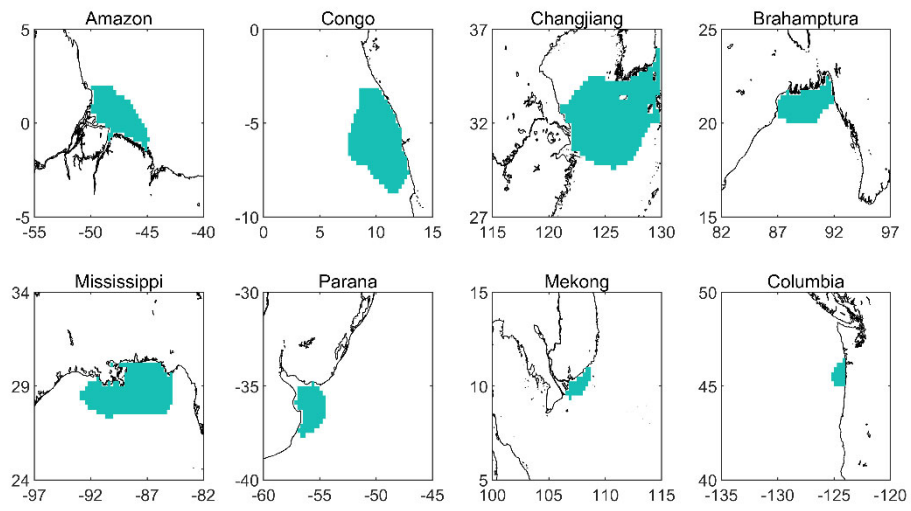
Figure S3: The eight river mouth regions that were identified by reconstructing the SSS anomaly field from the 1st EOF mode of WOA18.

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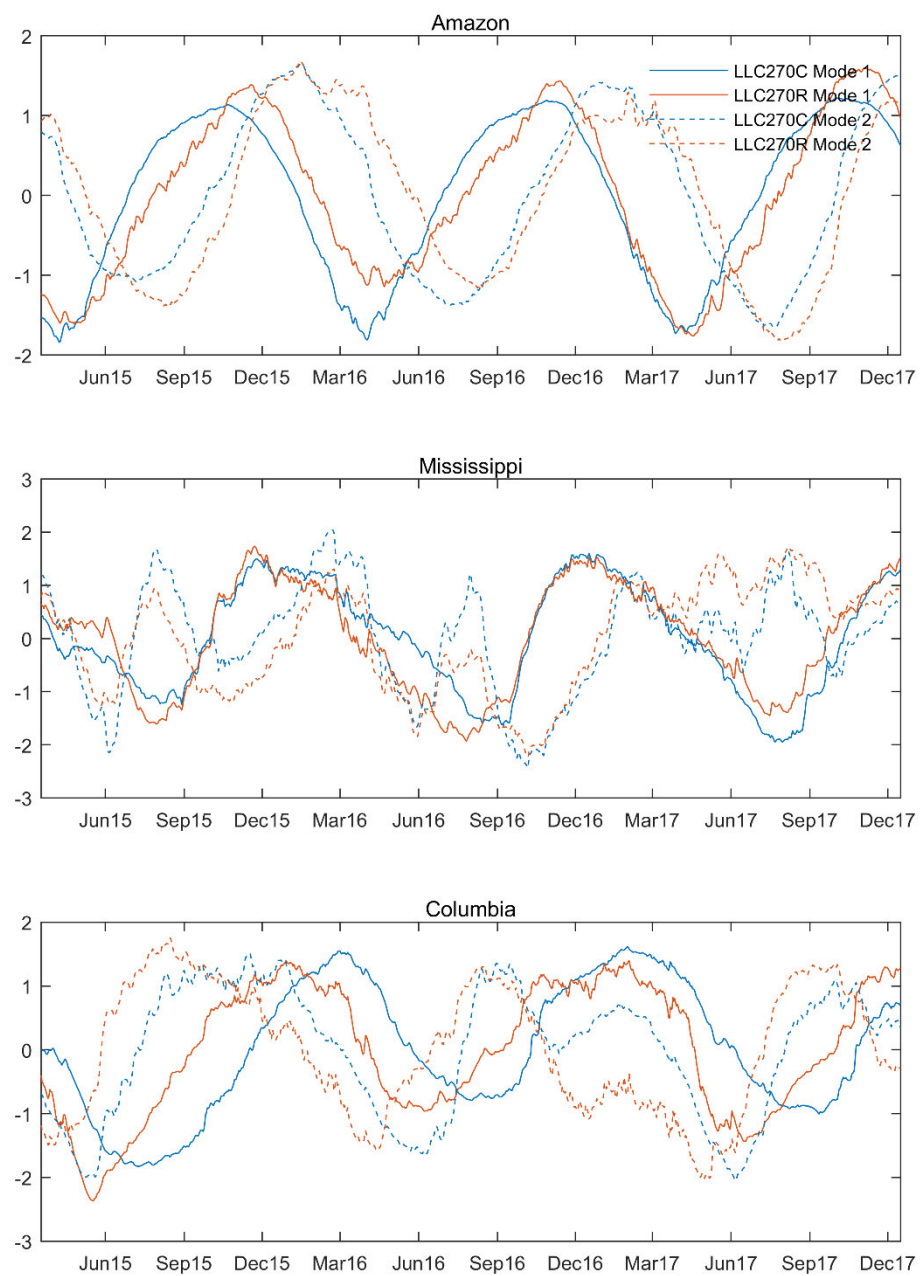
Figure S4: PC timeseries of the 1st and 2nd EOF of LLC270C and LLC270R simulations for the Amazon, Mississippi, and Columbia rivers.

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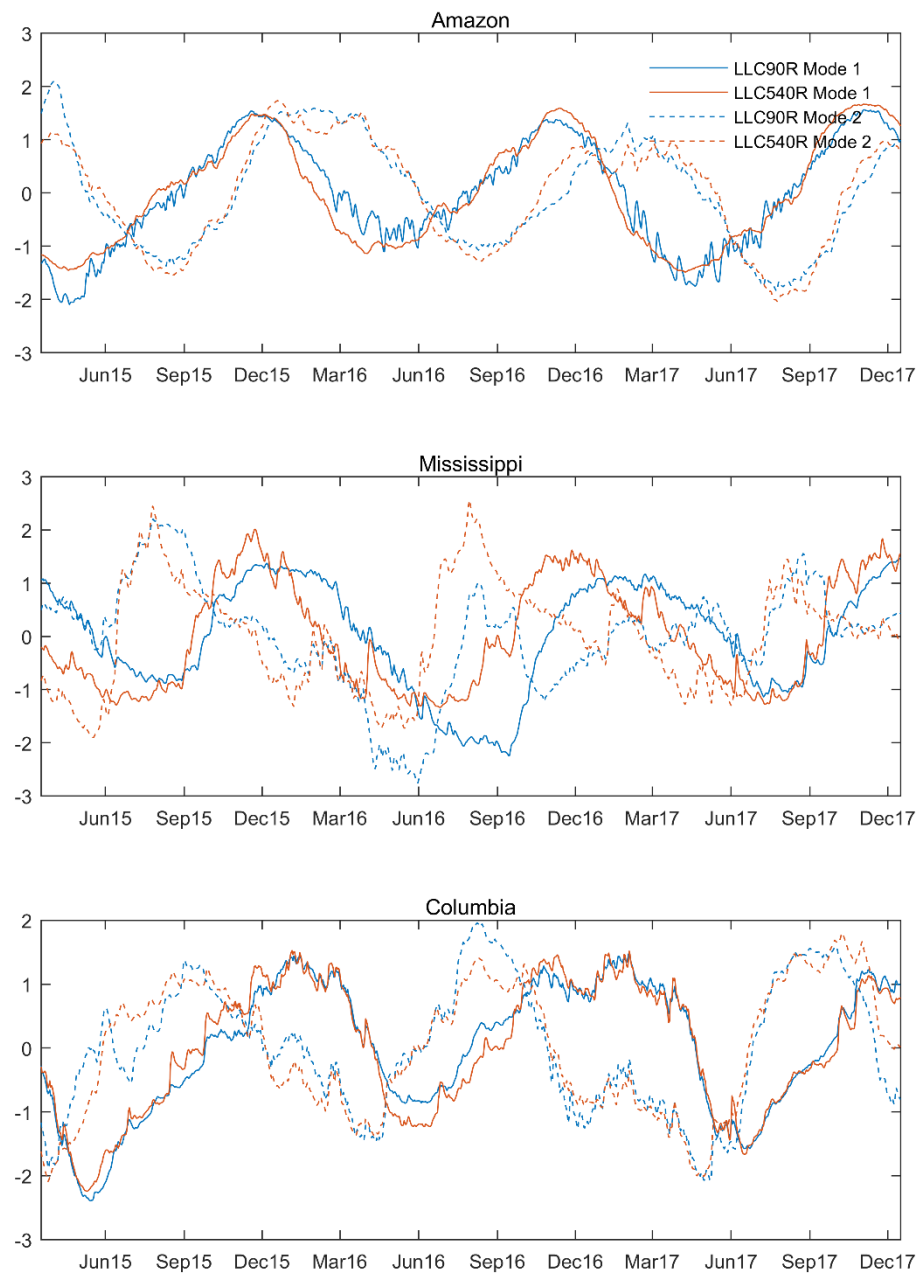
Figure S5: PC timeseries of the 1st and 2nd EOF of LLC90R and LLC540R simulations for the Amazon, Mississippi, and Columbia rivers.
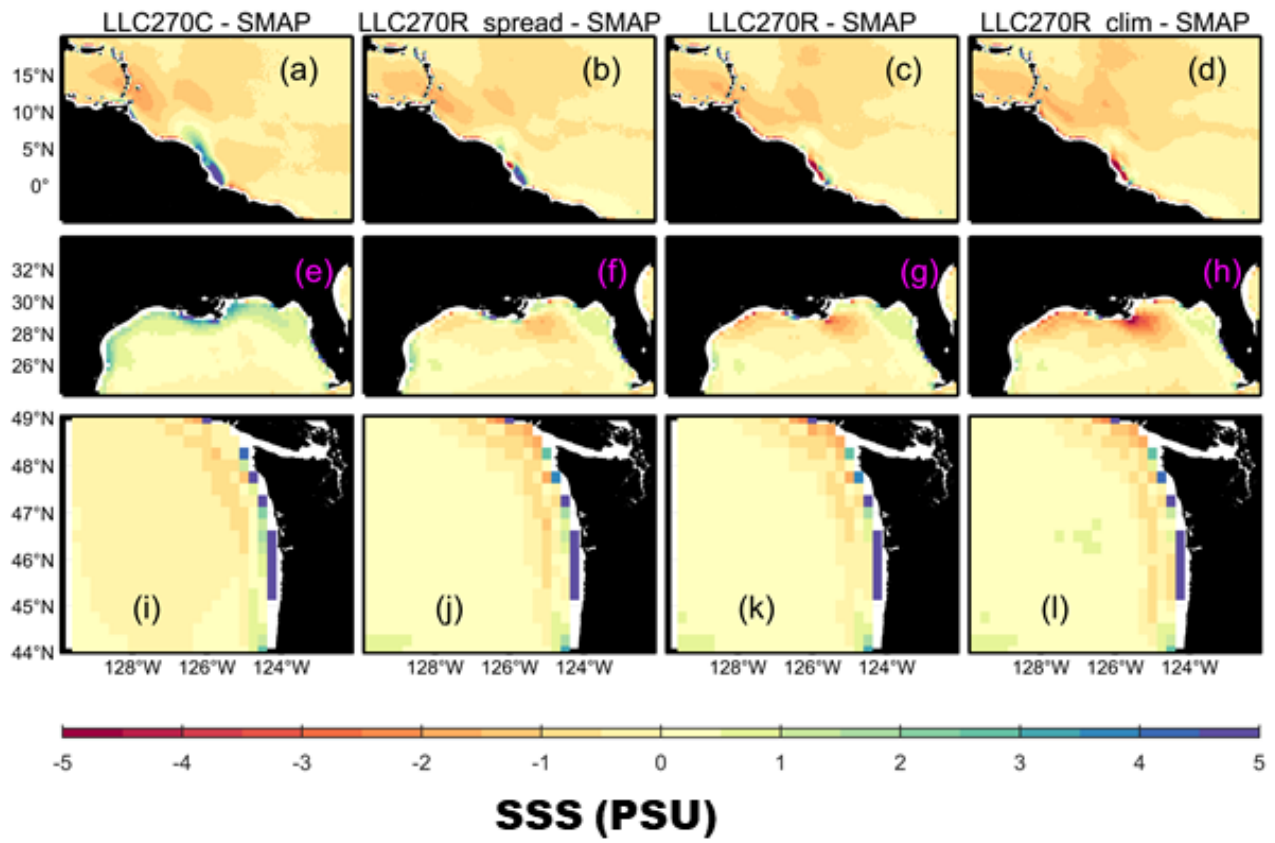
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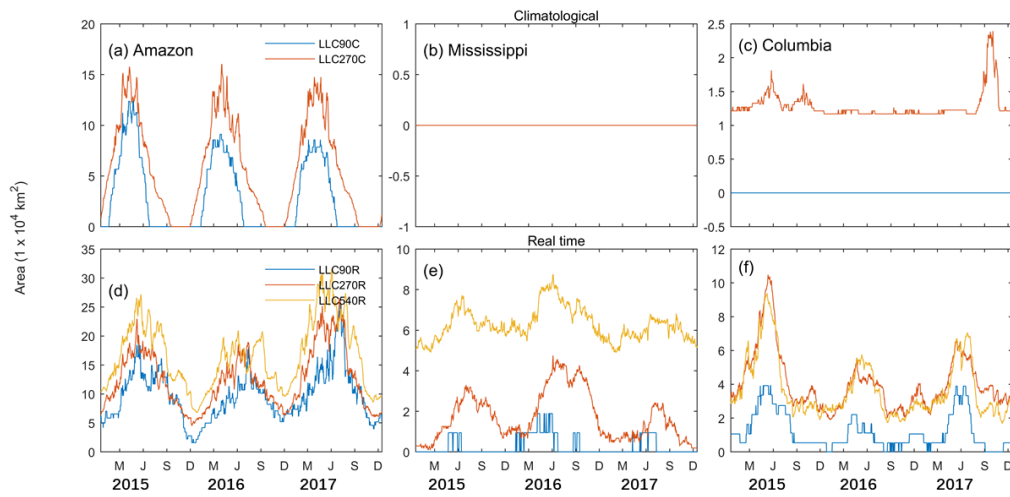
Figure S6: Area within 30 PSU in the Amazon, Mississippi, and Columbia river regions for the various experiments.
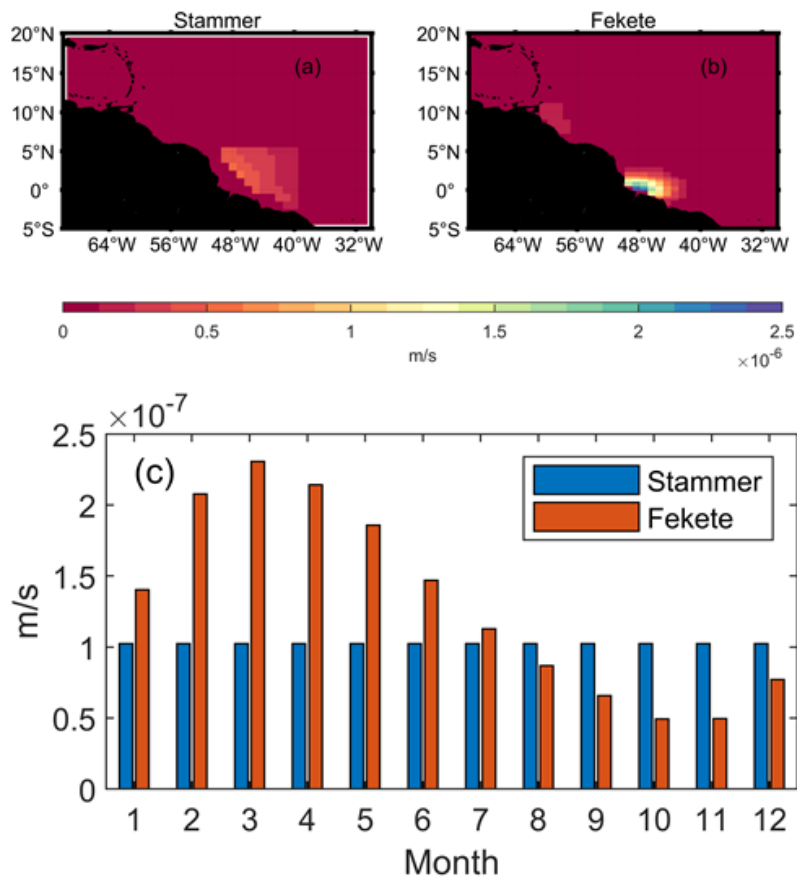
Figure S7: Comparison between ECCO2(Cube-sphere grid) Stammer and ECCOv4 (LLC grid) Fekete runoff forcing.

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Figure S8: Zoomed-in view of SSS difference between different LLC270 experiments and SMAP observations for large (Amazon, a–d), medium (Mississippi, e–h), and small (Columbia, i–l) rivers.