Supplemental Material for:

An evaluation of high-resolution ocean reanalyses in the California Current System

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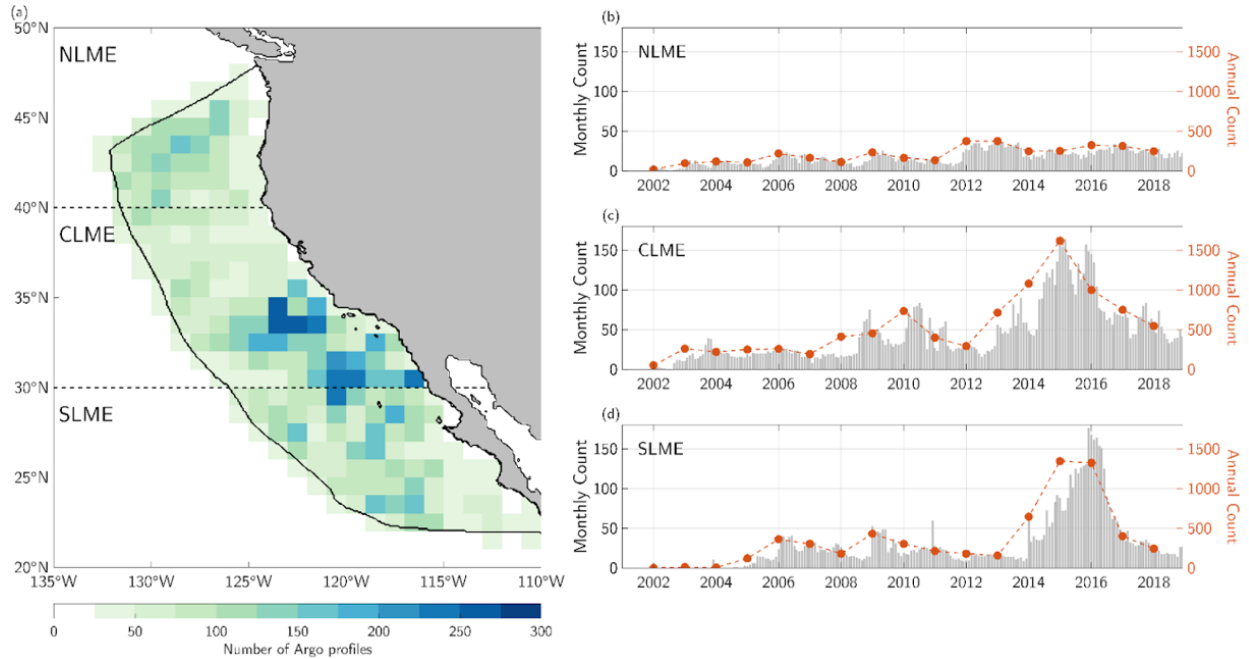Corresponding author: Dillon J. Amaya, dillon.amaya@noaa.gov, 816-916-8348

**Figure S1** Shading in (a) denotes total number of Argo profiles since 2002, binned in 1° x 1° grid cells. Black line outlines in the CCLME. (b)-(d) The total number of Argo profile measurements as a function of time, integrated over the three CCLME sub-regions. Gray bars denote total monthly counts. Orange dots and lines denote the total annual count.

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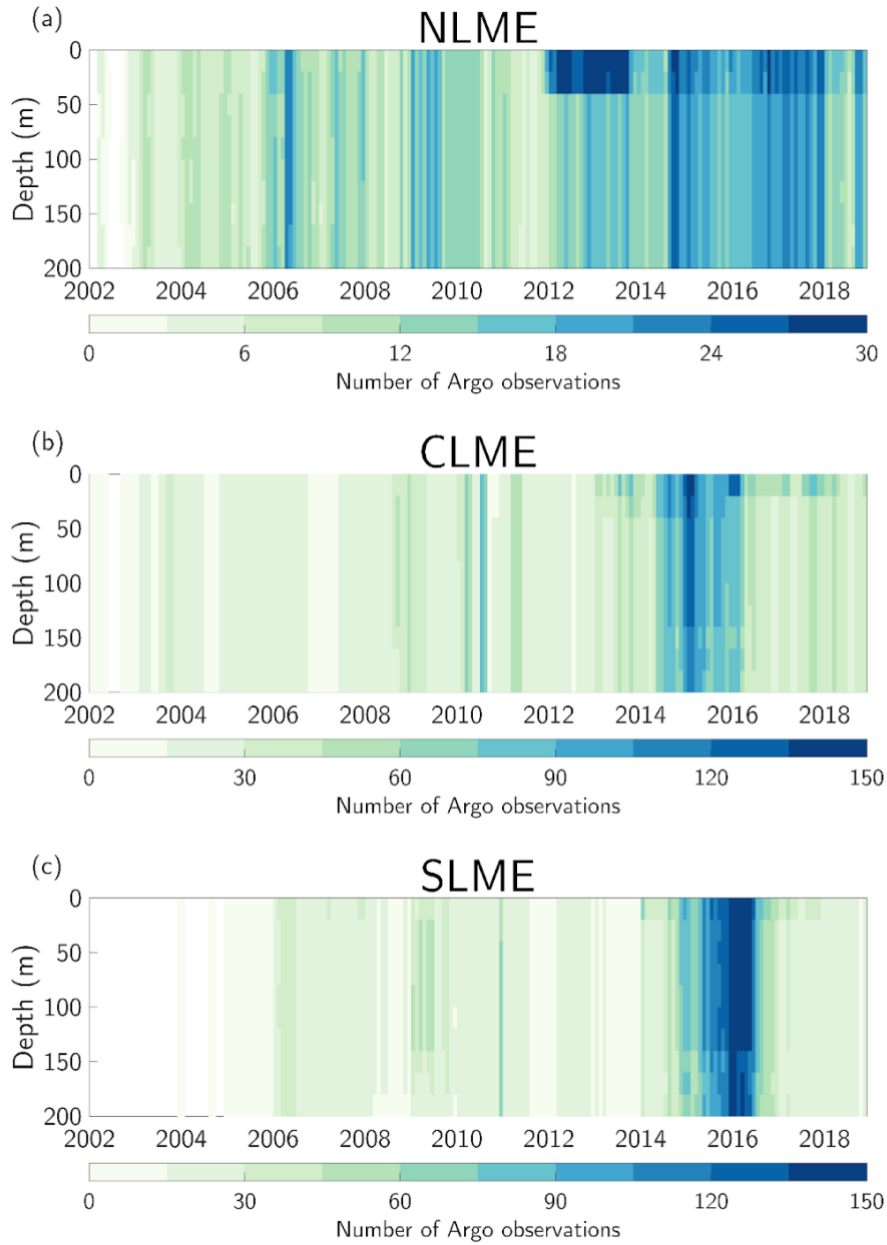
Figure S2 Total number of Argo profile measurements as a function of time and depth. Measurement counts are binned in the vertical in 20 m bins for three CCLME sub-regions– (a) North LME (NLME), (b) Central LME (CLME), and (c) South LME (SLME). Note change in color bar between the (a) and (b)-(c).
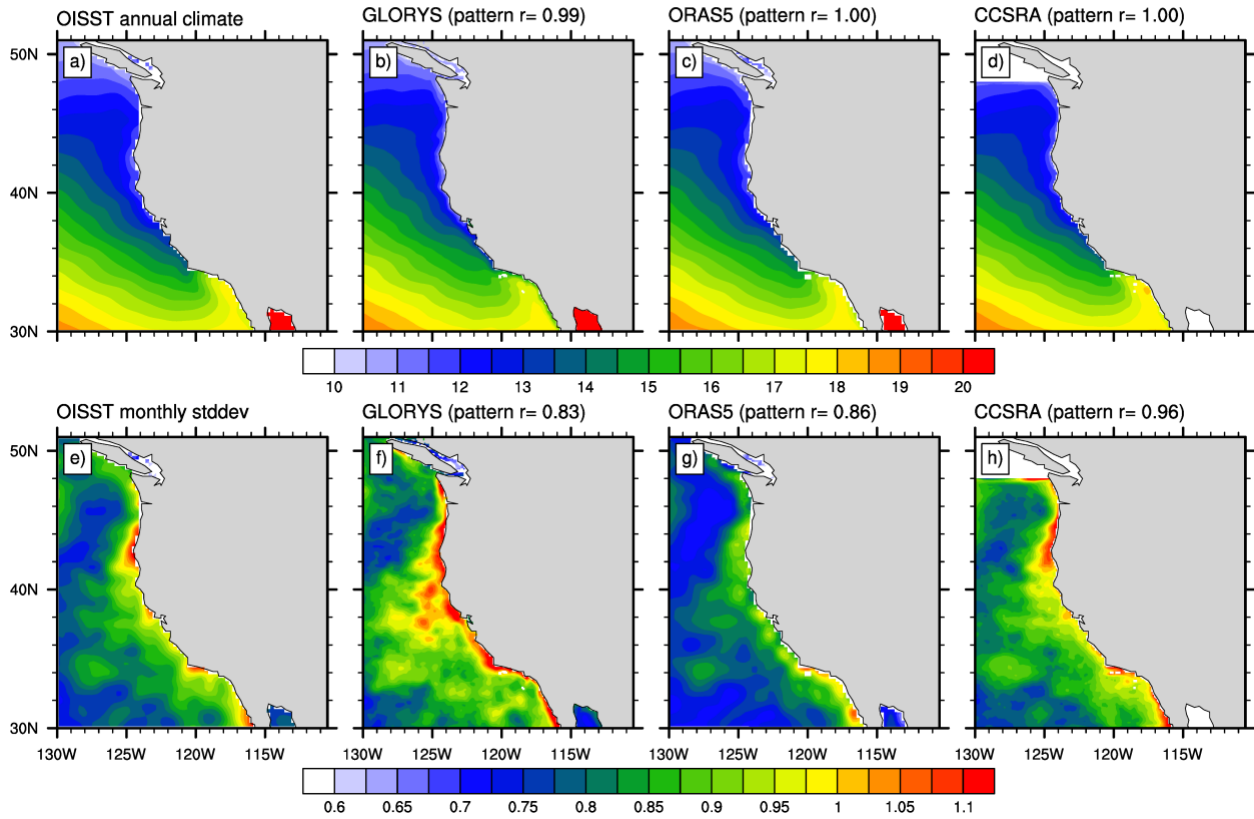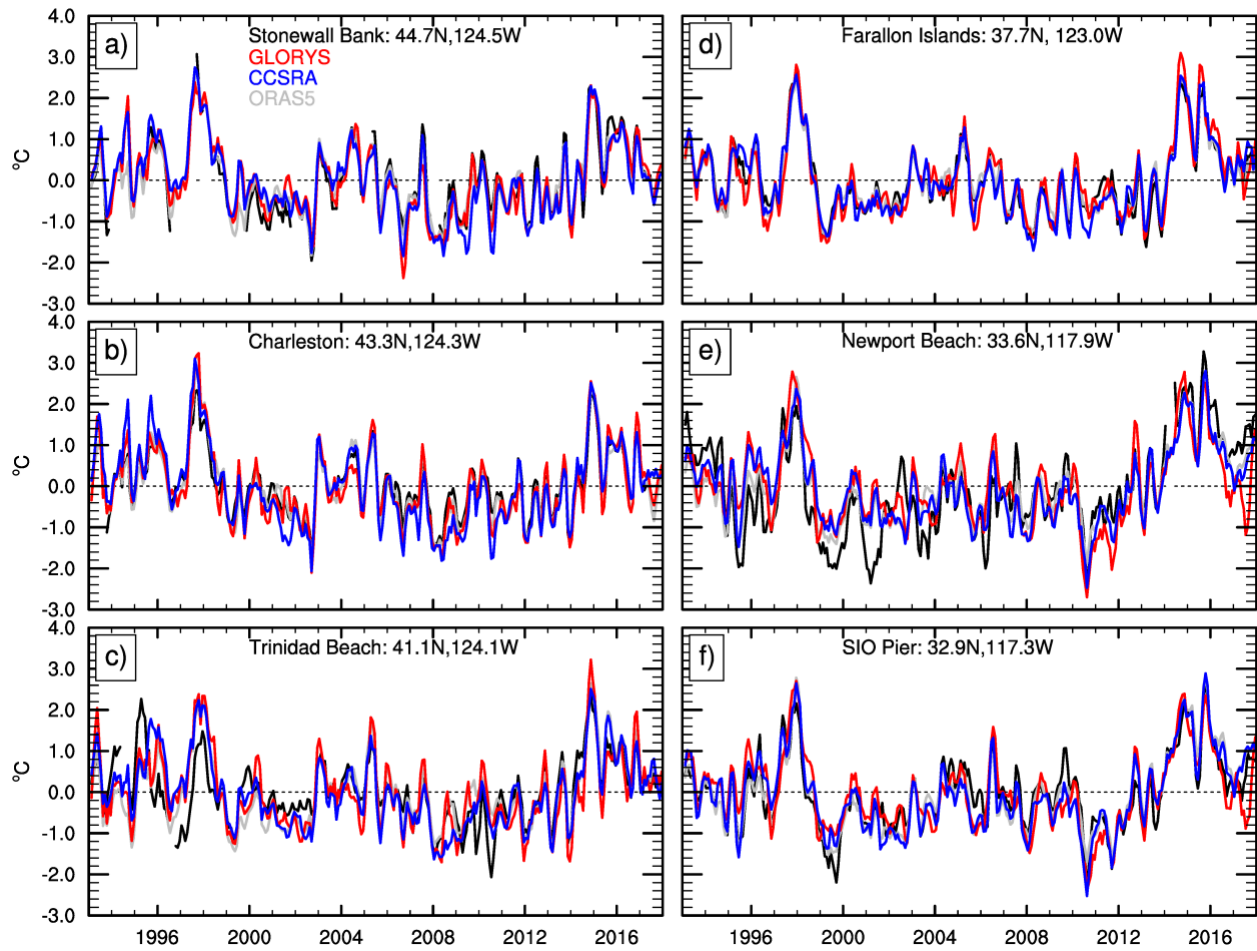
Figure S3 Annual mean SST patterns (˚C) from (a) OISST, (b) GLORYS, (c) ORAS5, and (d) CCSRA. (e)-(h) as in (a)-(d), but for monthly mean SST standard deviation (˚C). Pattern correlations between the observation and each reanalyses for the mean state and the monthly variability are shown in the titles.
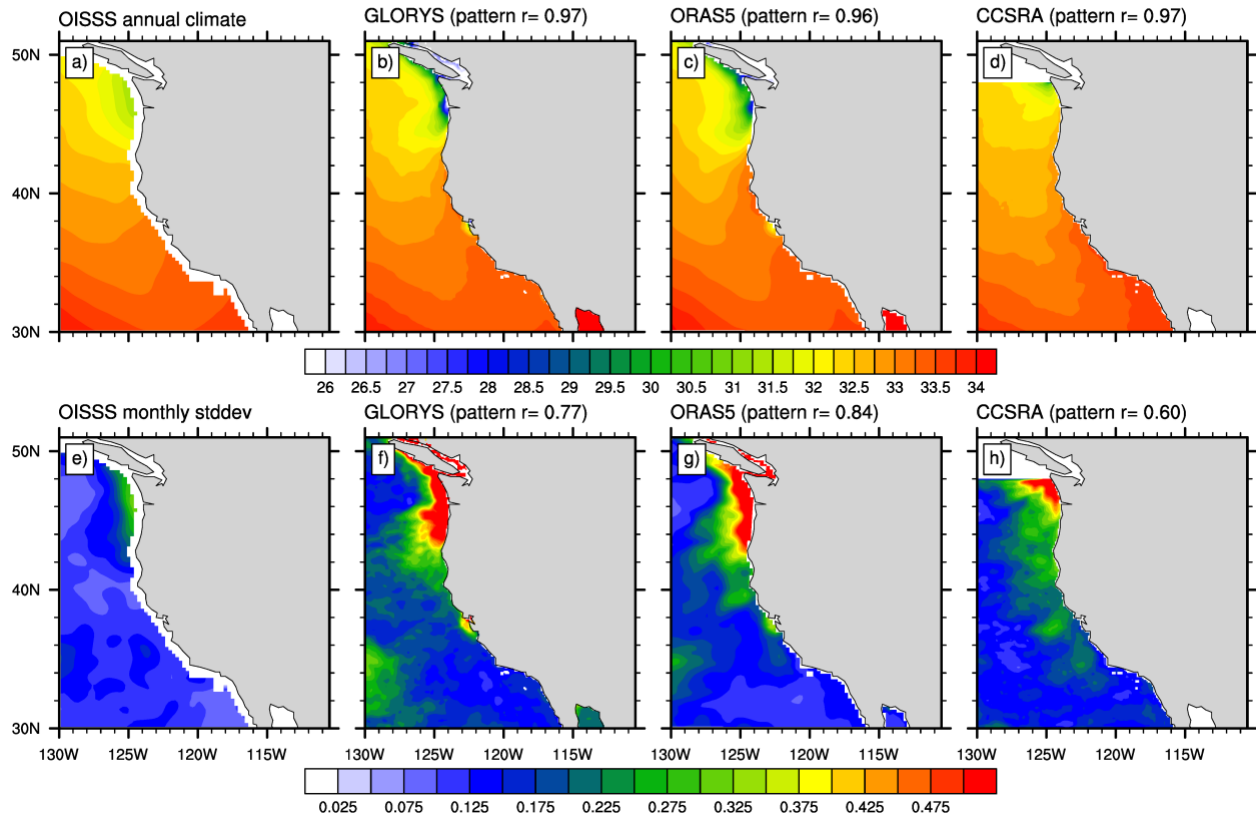
Figure S4 (a)-(f) Time series of 3-month running mean SST anomalies from six shore stations (yellow diamonds in main text Figure 1) along the U.S. west coast (black) and the nearest grid point in the GLORYS (red), CCSRA (blue) and ORAS5 (grey) reanalyses.
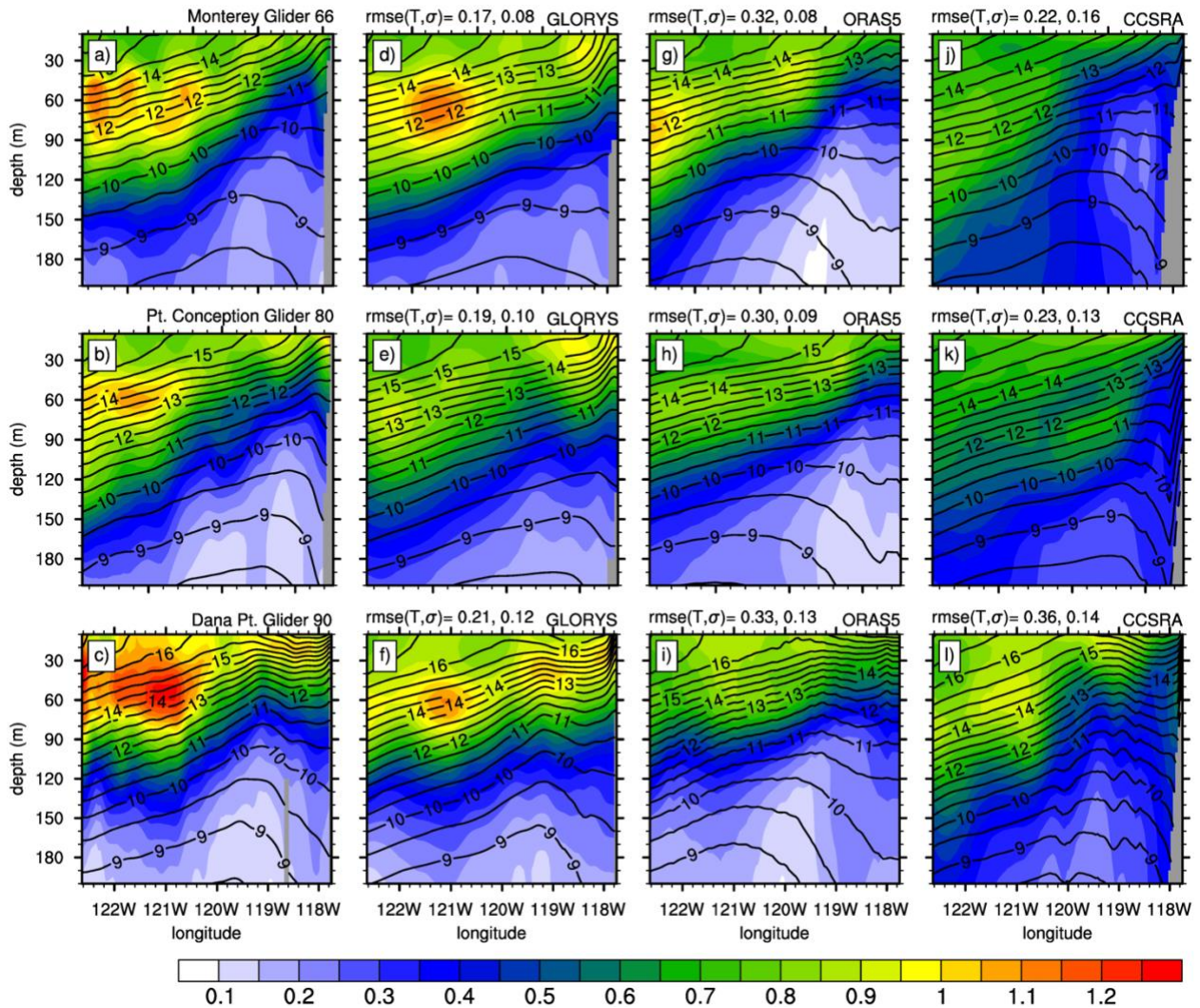
SSS (PSU) 2012-2018

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Figure S5 As in Figure S3, but for OISSS and reanalysis sea surface salinity (PSU).

**Annual Mean Temperature and Standard Deviation 2007-2018 (°C)**

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Figure S6 Annual mean temperature (contours; ˚C) and standard deviation (shading; ˚C) depth cross-section along California Underwater Glider Network (CUGN). (top row) Line 66 from Monterey (middle row) Line 80 from Pt. Conception, and (bottom row) Line 90 from Dana Pt. Data are from (a)-(c) the CUGN, (d)-(f) GLORYS, (g)-(i) ORAS5, and (j)-(l) CCSRA for the period 2007-2018. Pattern RMSE values between the CUGN and reanalyses for the mean temperature (T) and the standard deviation (σ), respectively, are show in the panel titles of (d)-(l).
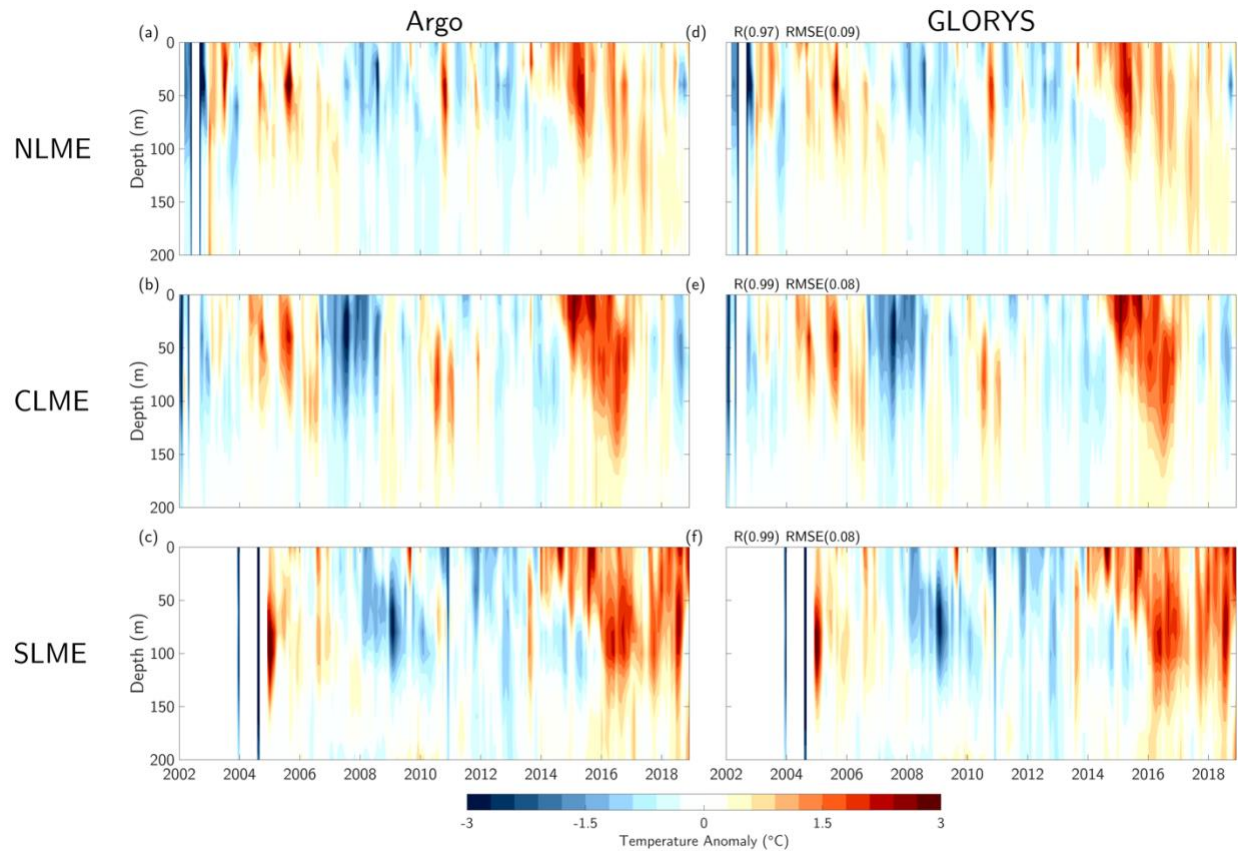
Figure S7 Depth/time cross-sections of monthly mean water temperature anomalies (˚C) averaged in three CCLME sub-regions–the North LME (NLME; top row), Central LME (CLME; middle row), and South LME (SLME; bottom row). Data are from (a)-(c) Argo profiles binned in the vertical in 20 m bins, (d)-(f) GLORYS resampled in time and in the vertical to match the Argo measurements. Titles in (d)-(f) indicate the pattern correlation and pattern root-mean-square-error (RMSE) between GLORYS and the corresponding Argo cross-section.

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Annual Mean Salinity and Standard Deviation 2007-2018 (PSU)

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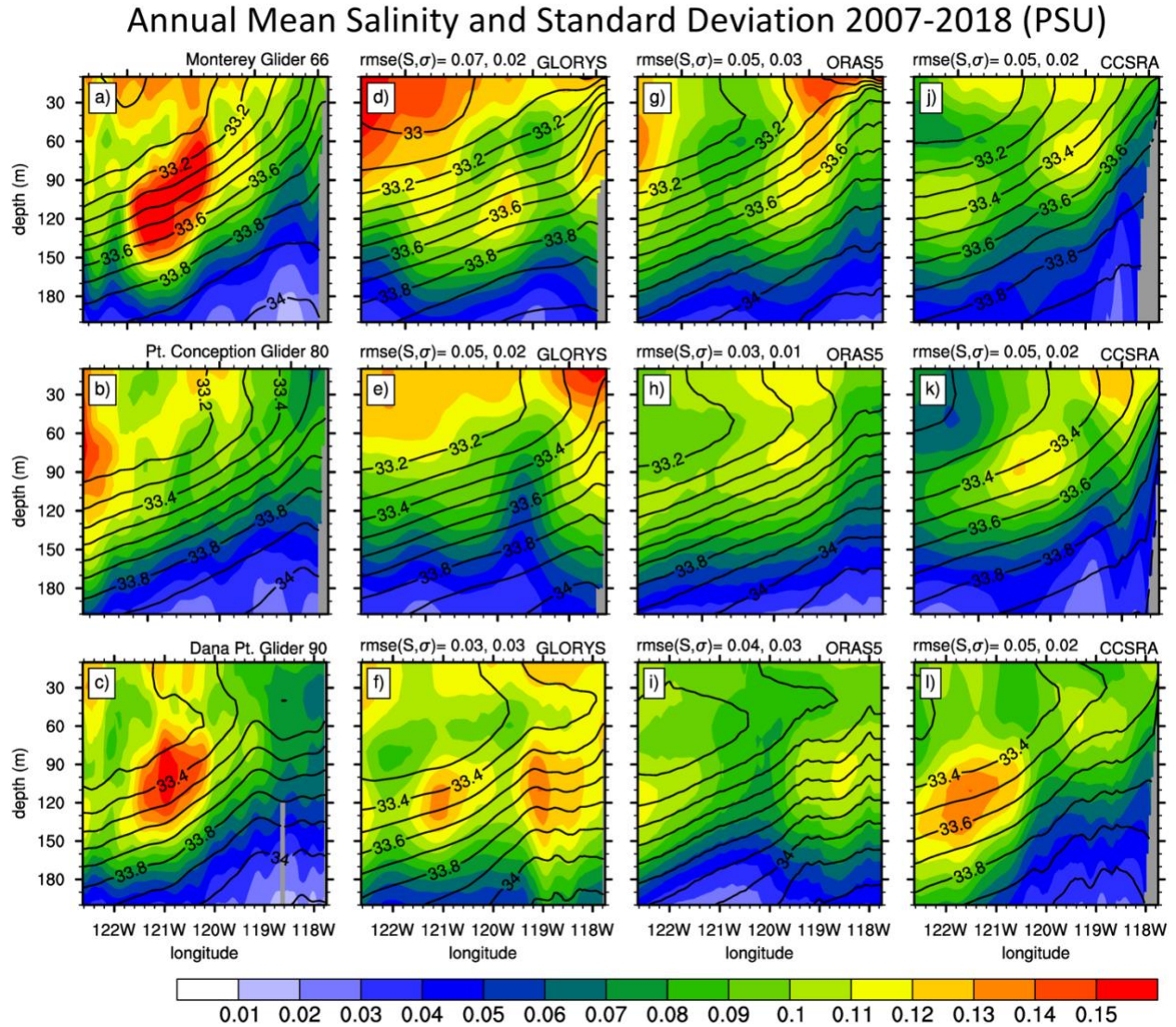
**Figure S8** As in Figure S6, but for CUGN and reanalysis water column salinity (PSU).
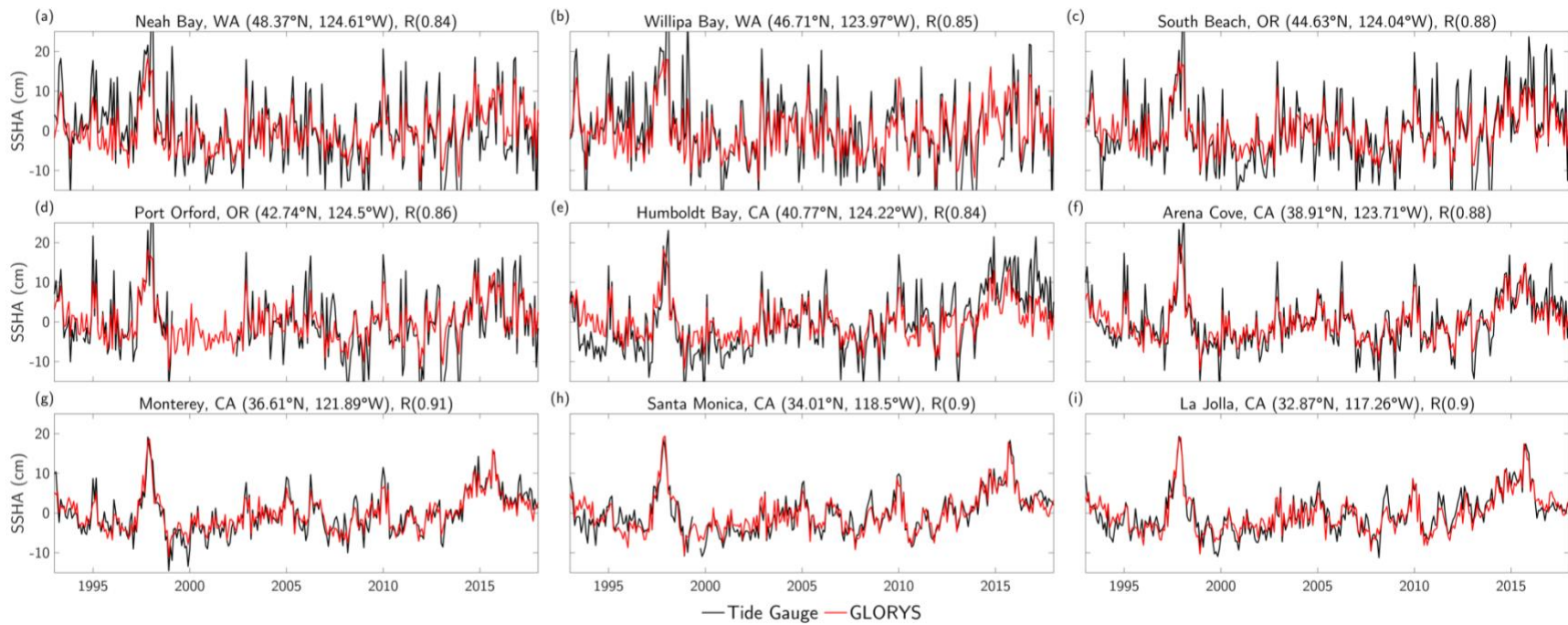
Figure S9 Monthly mean SSH anomalies (cm) at nine coastal tide gauges (black lines) and the corresponding nearest GLORYS grid cell (red). Tide gauge coordinates and the correlation between the two datasets are shown in the title of each subplot.
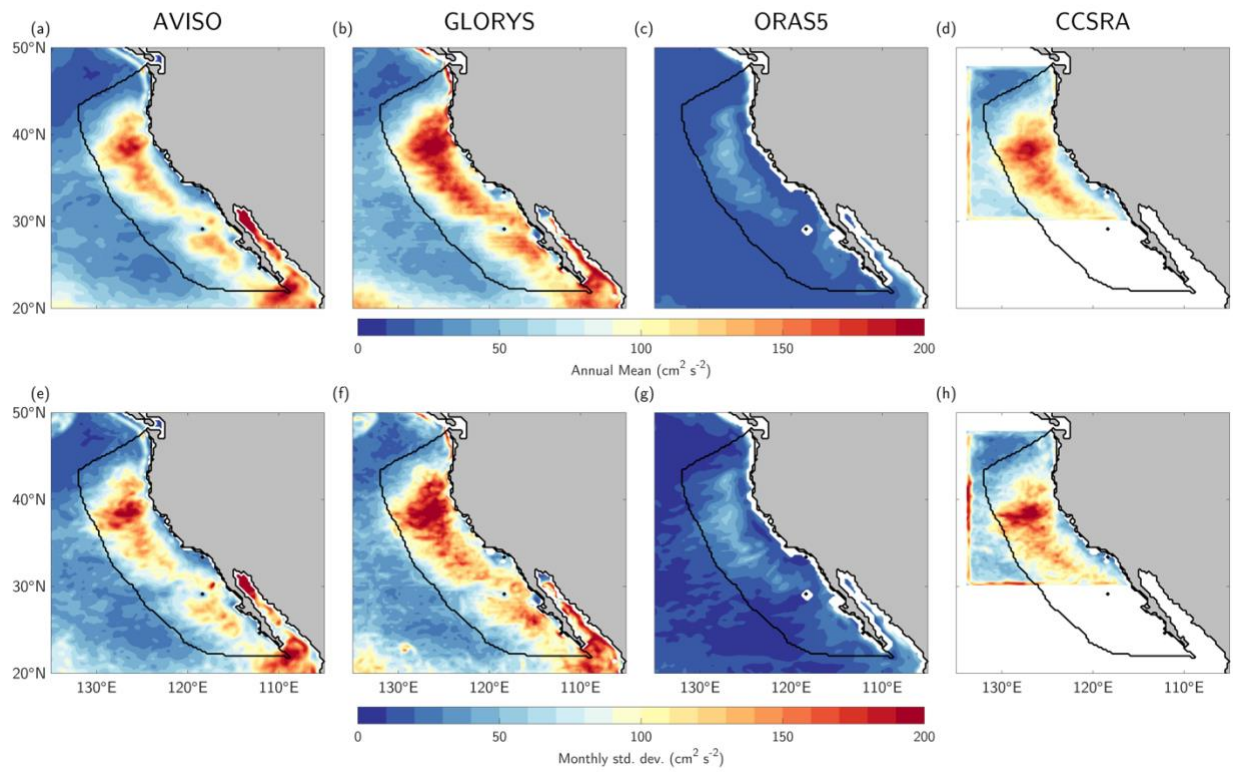
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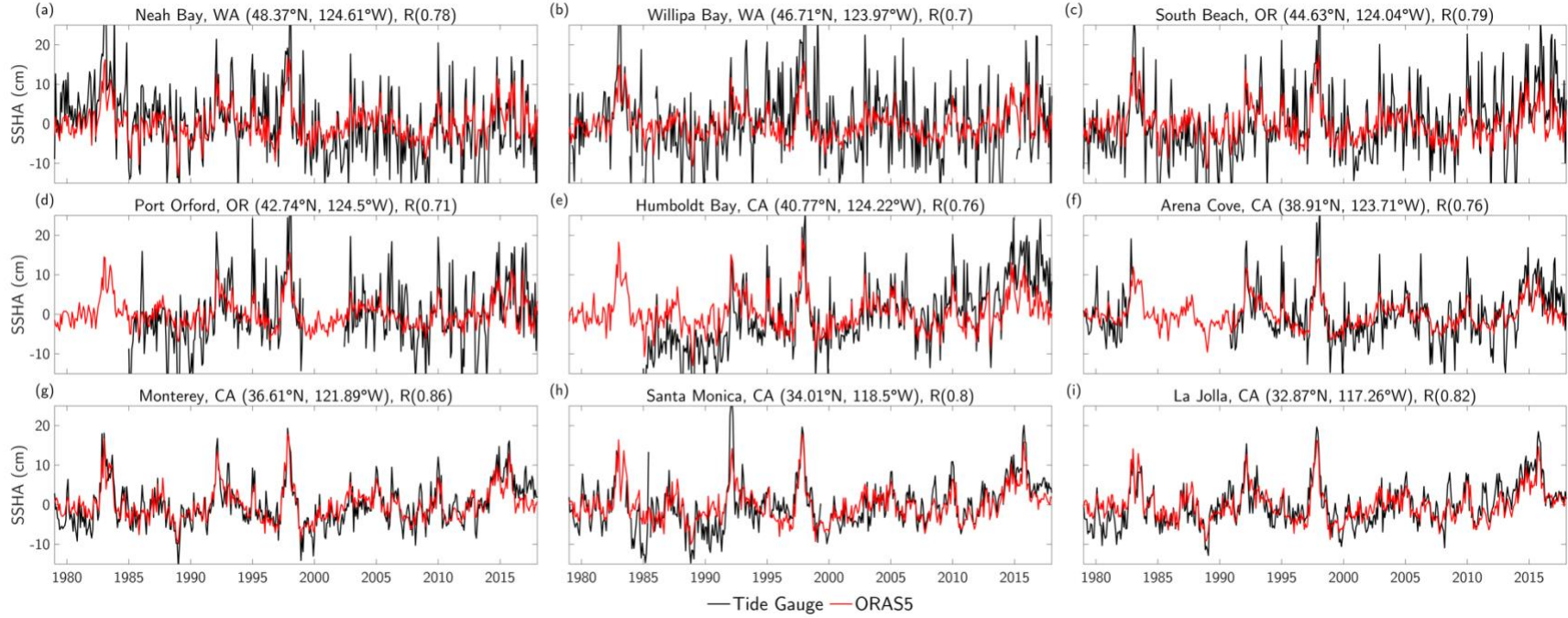
Figure S10 As in Figure S9, but for comparisons to ORAS5.

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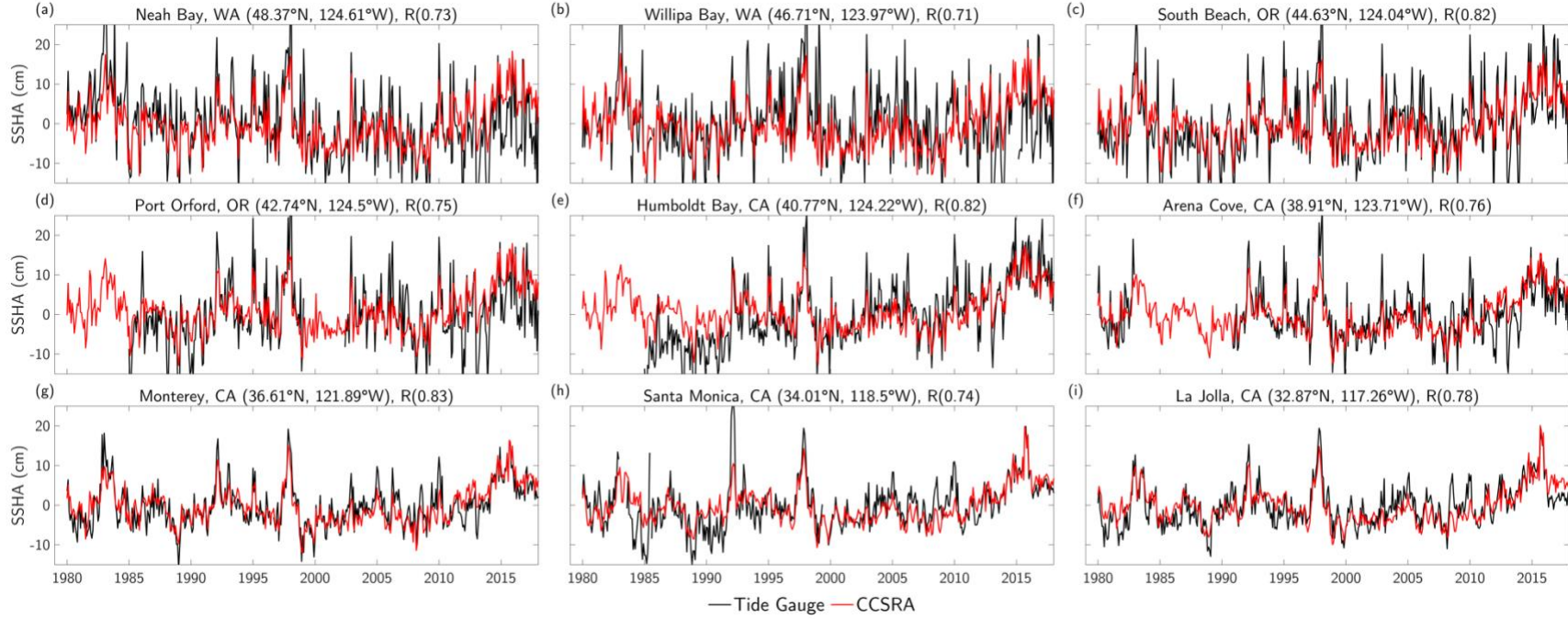
Figure S11 As in Figure S9, but for comparisons to CCSRA.

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Figure S12 Annual mean geostrophic Eddy Kinetic Energy (EKE) patterns (cm^2 s^{-2}) from (a) AVISO, (b) GLORYS, (c) ORAS5, and (d) CCSRA. (e)-(h) as in (a)-(d), but for monthly mean EKE standard deviation (cm^2 s^{-2}).