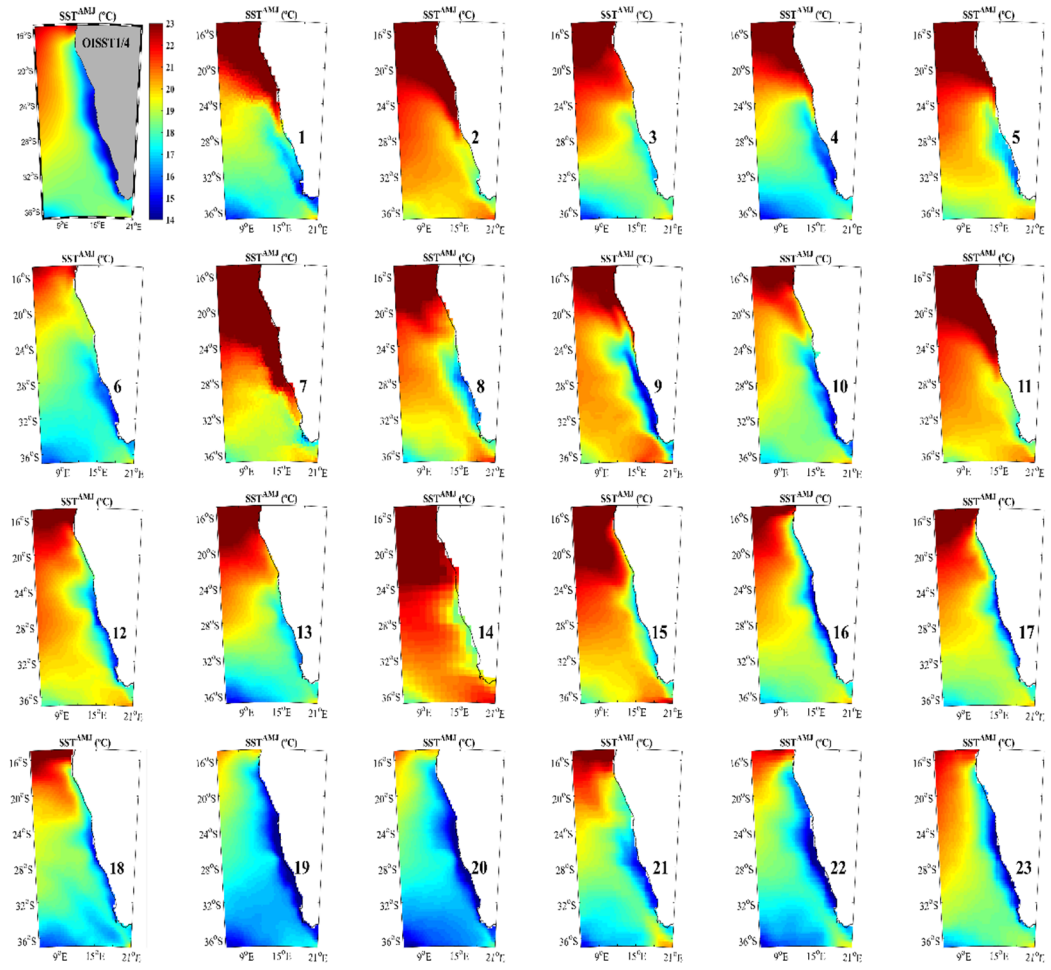
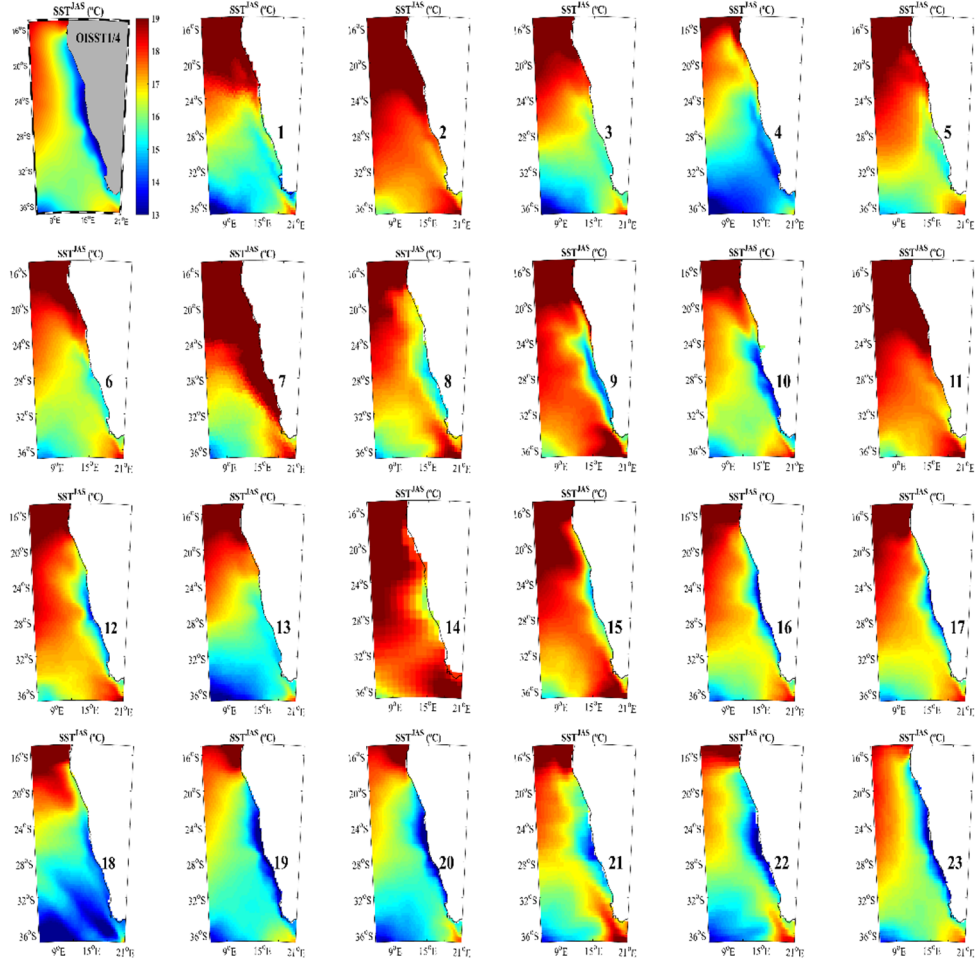


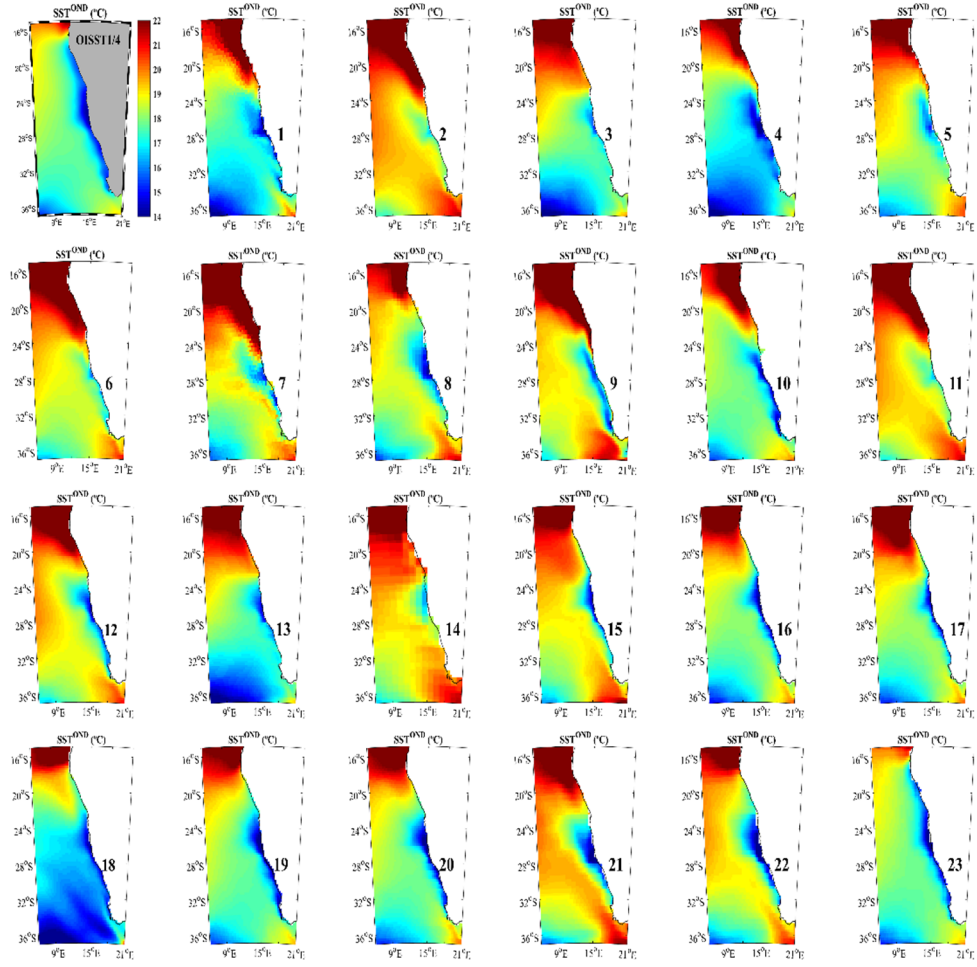
**Figure S1:** Mean of the seasonal SST for JFM ( $^{\circ}\text{C}$ ) for the Benguela upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



**Figure S2:** Mean of the seasonal SST for AMJ (°C) for the Benguela upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.

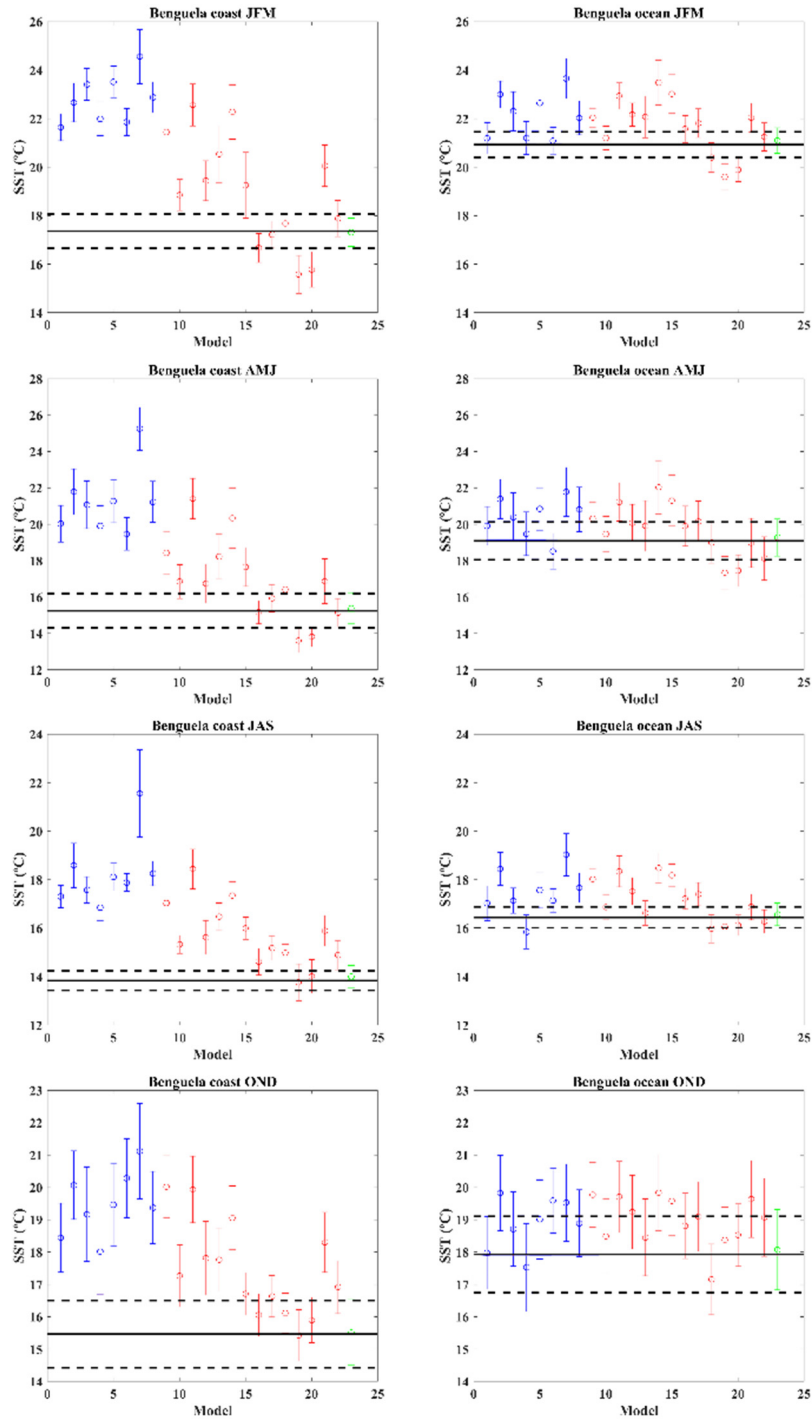


**Figure S3:** Mean of the seasonal SST for JAS (°C) for the Benguela upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.

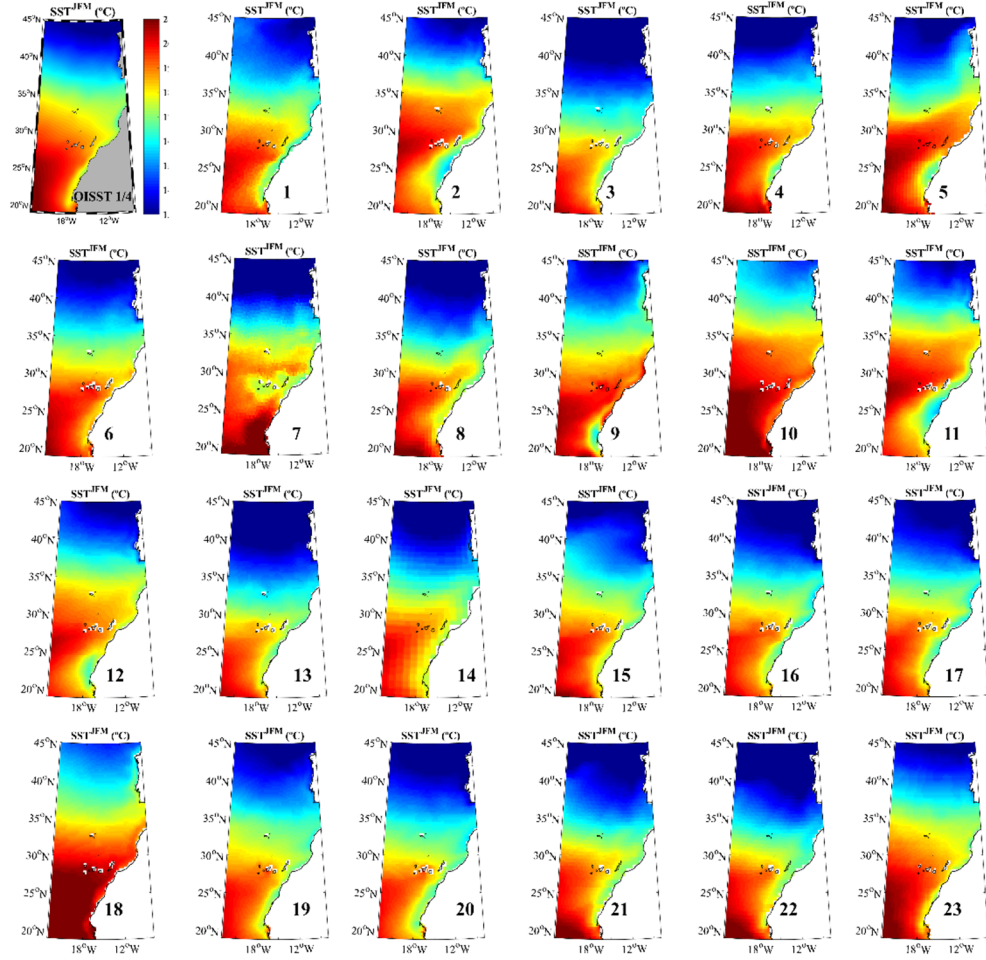


**Figure S4:** Mean of the seasonal SST for OND (°C) for the Benguela upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.

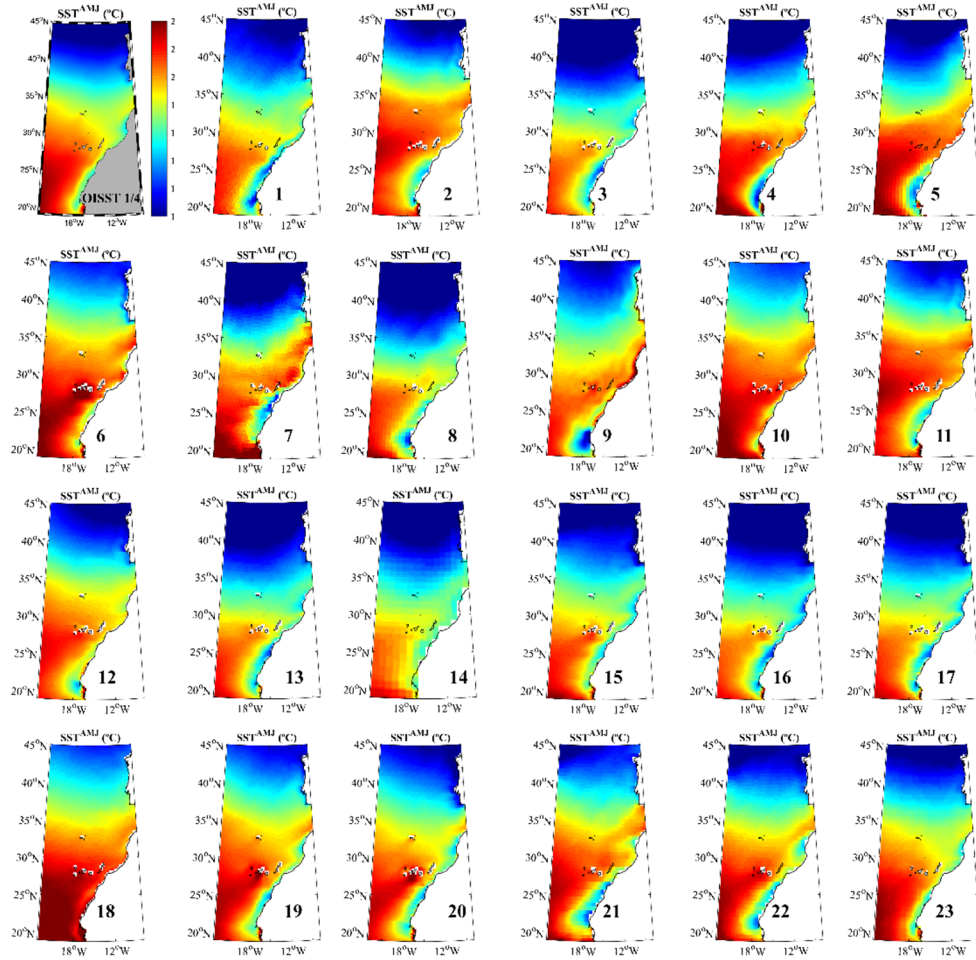




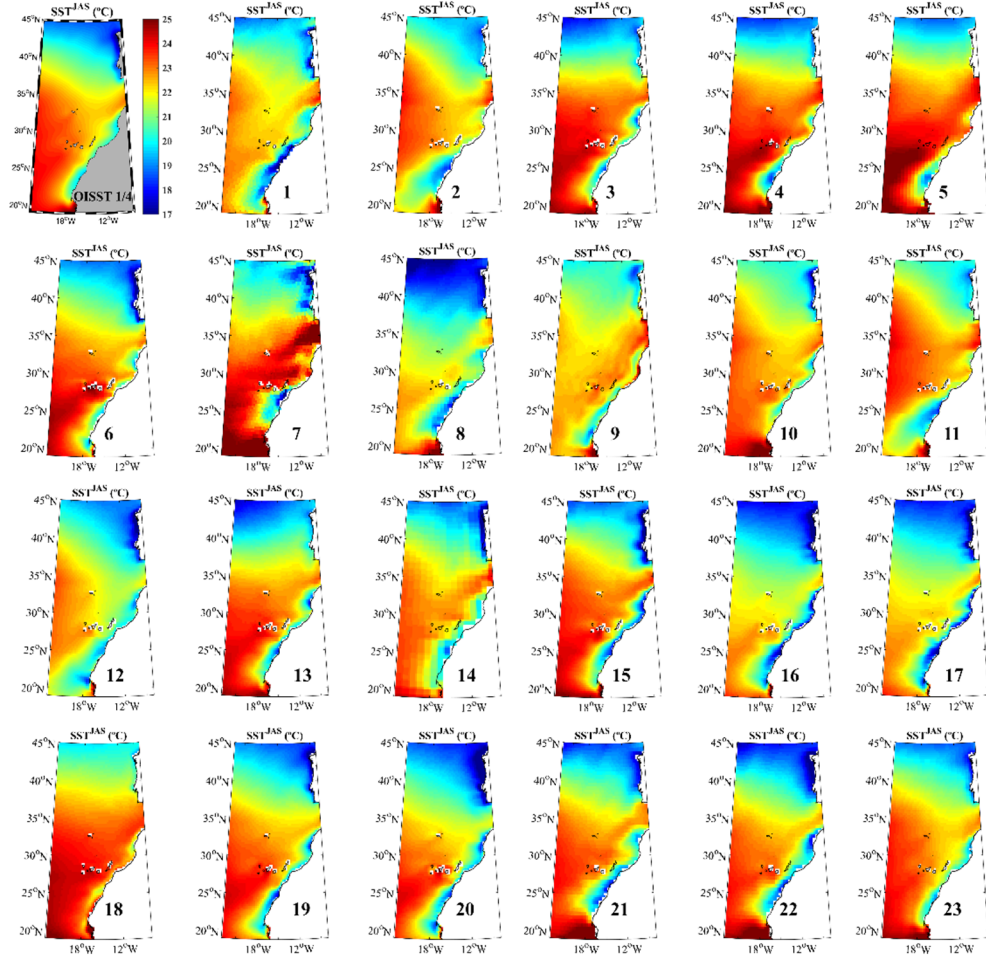
**Figure S5:** Benguela upwelling system seasonal mean SST value ( $\pm 1$  SD) for the OISST  $\frac{1}{4}$  (black solid line) and each CMIP6 model for coastal (left panels) and oceanic (right panels) points. The number and color of each model refer to Table 1.



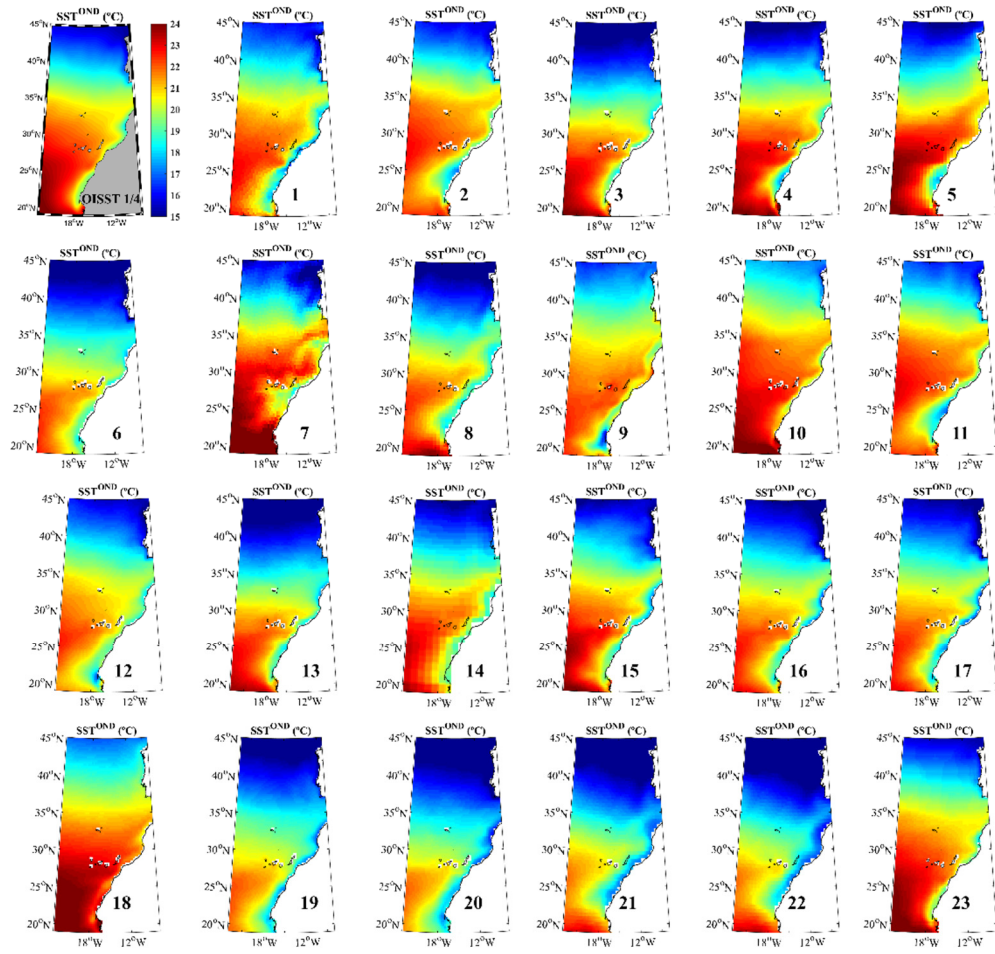
**Figure S6:** Mean of the seasonal SST for JFM (°C) for the Canary upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



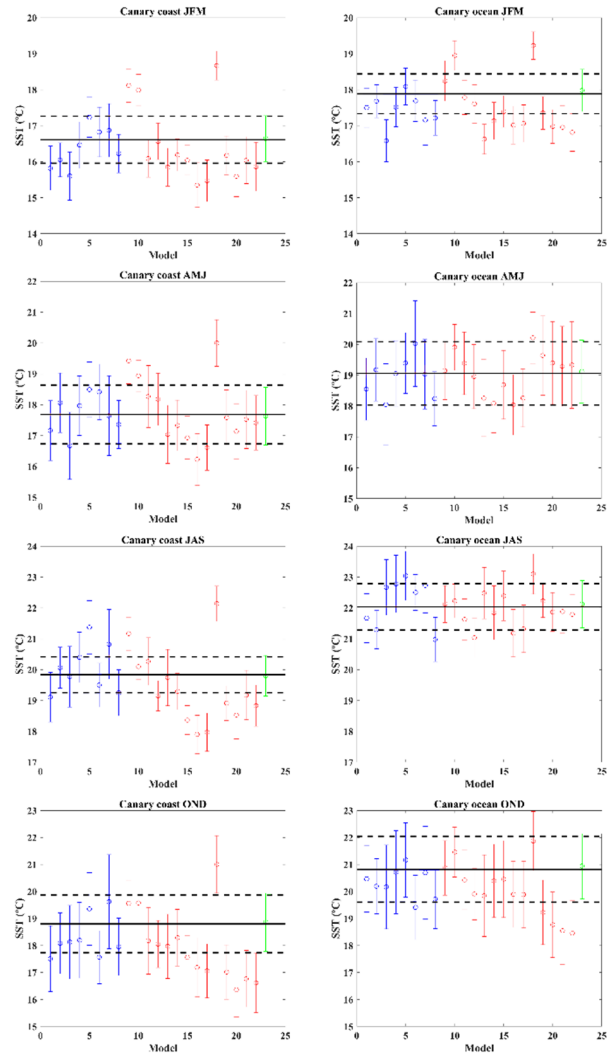
**Figure S7:** Mean of the seasonal SST for AMJ (°C) for the Canary upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



**Figure S8:** Mean of the seasonal SST for JAS (°C) for the Canary upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.

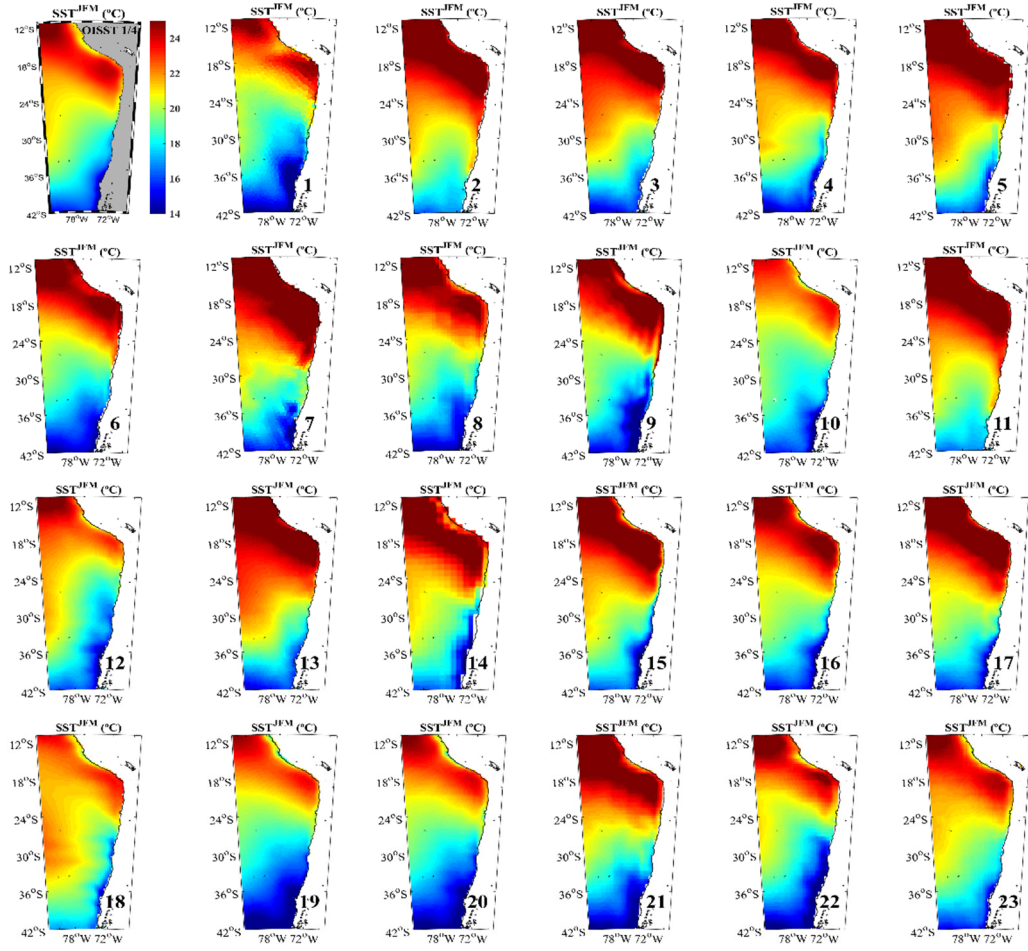


**Figure S9:** Mean of the seasonal SST for OND (°C) for the Canary upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.

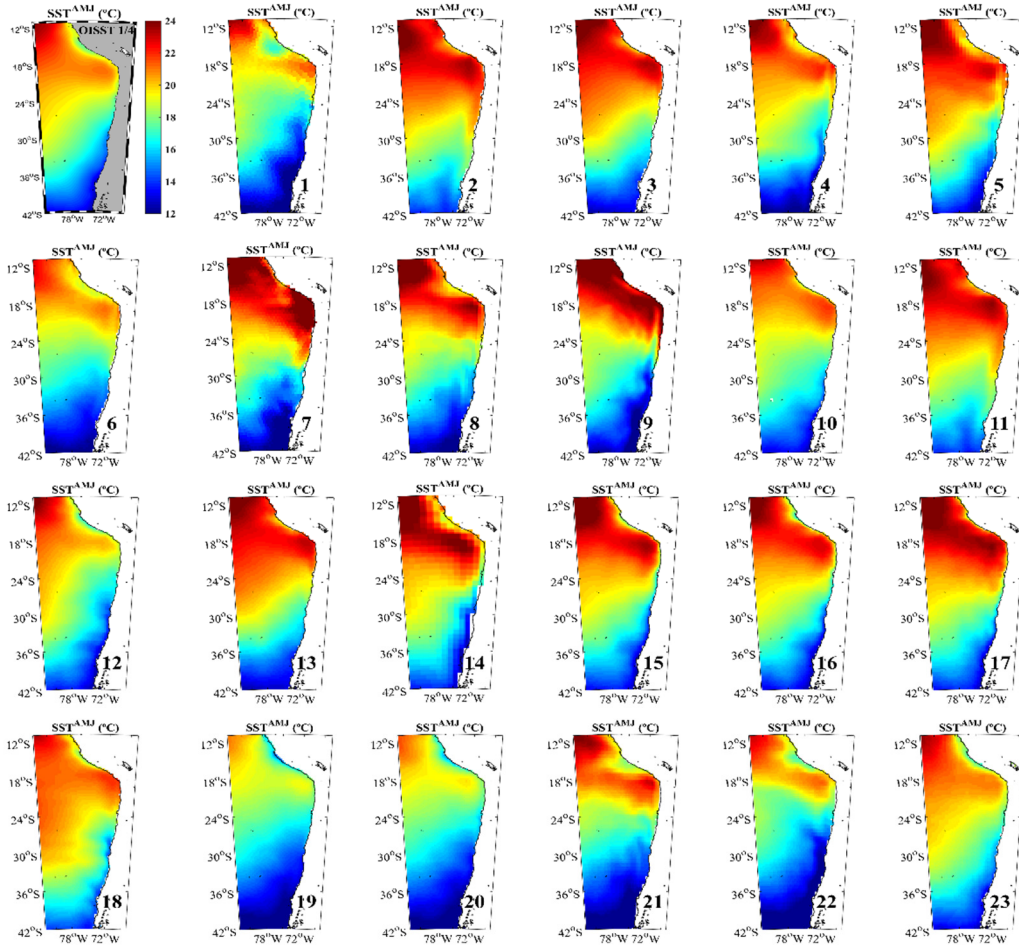


**Figure S10:** Canary upwelling system seasonal mean SST value ( $\pm 1$  SD) for the OISST  $\frac{1}{4}$  (black solid line) and each CMIP6 model for coastal (left panels) and oceanic (right panels) points. The number and color of each model refer to Table 1.

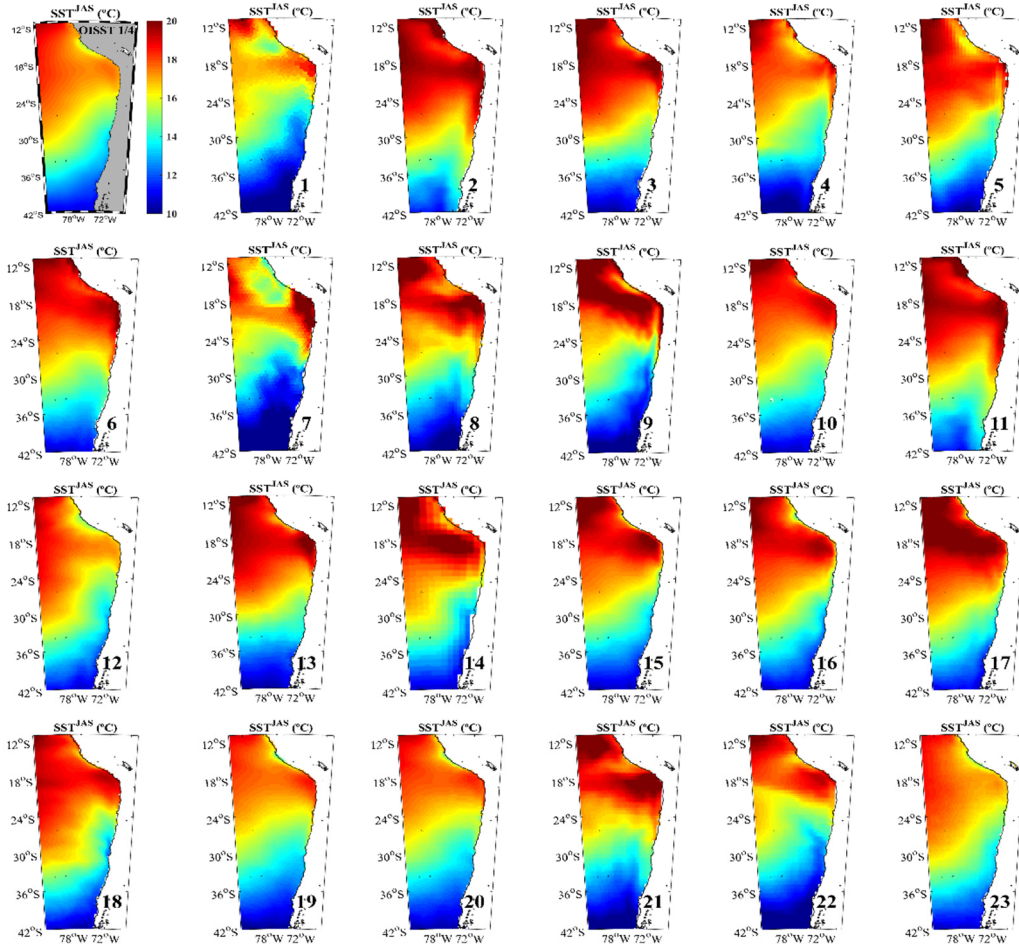




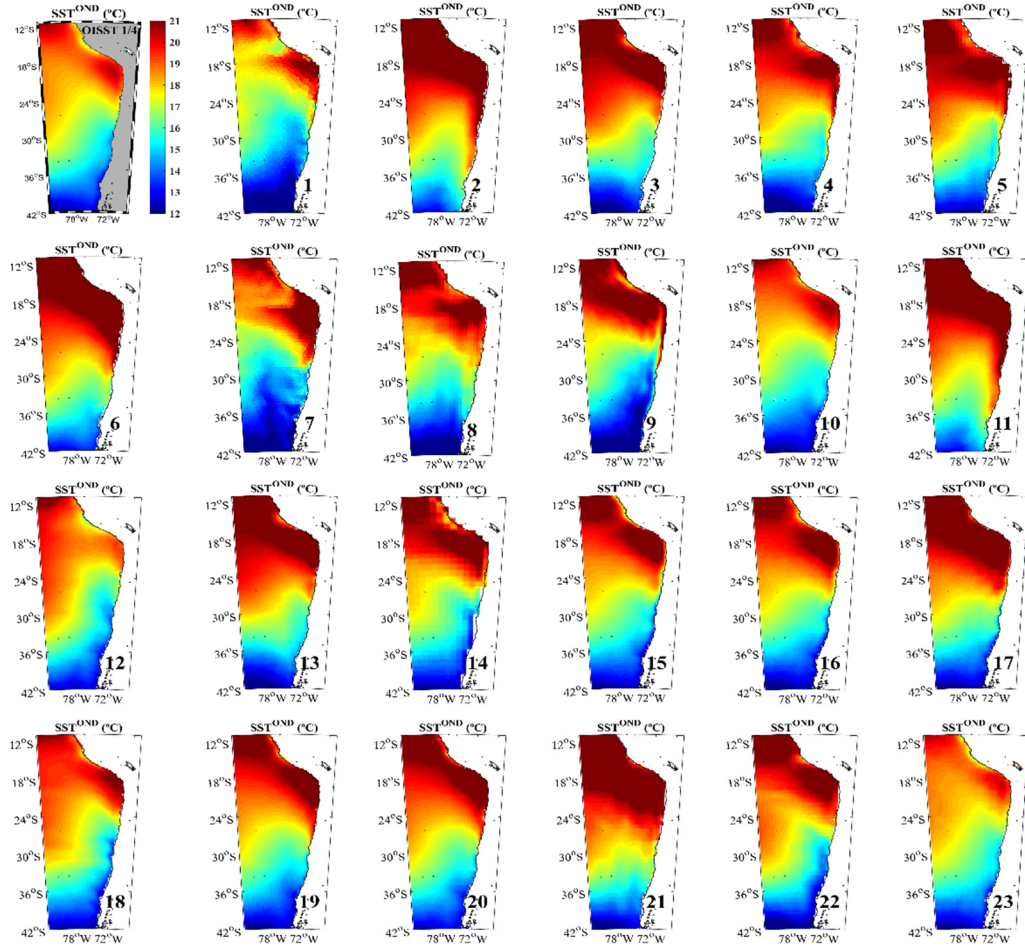
**Figure S11:** Mean of the seasonal SST for JFM (°C) for the Humboldt upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



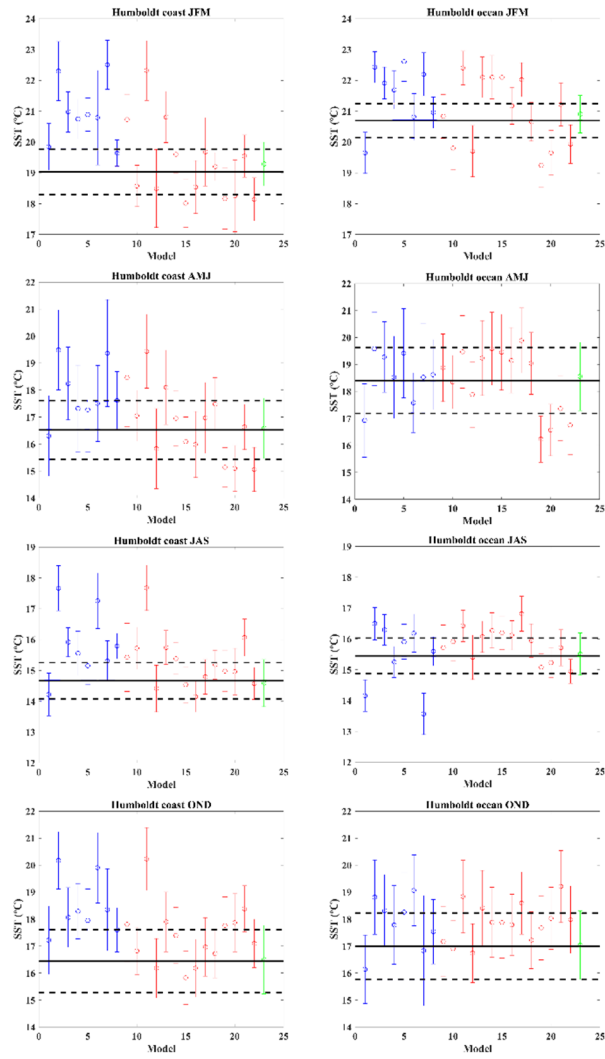
**Figure S12:** Mean of the seasonal SST for AMJ (°C) for the Humboldt upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



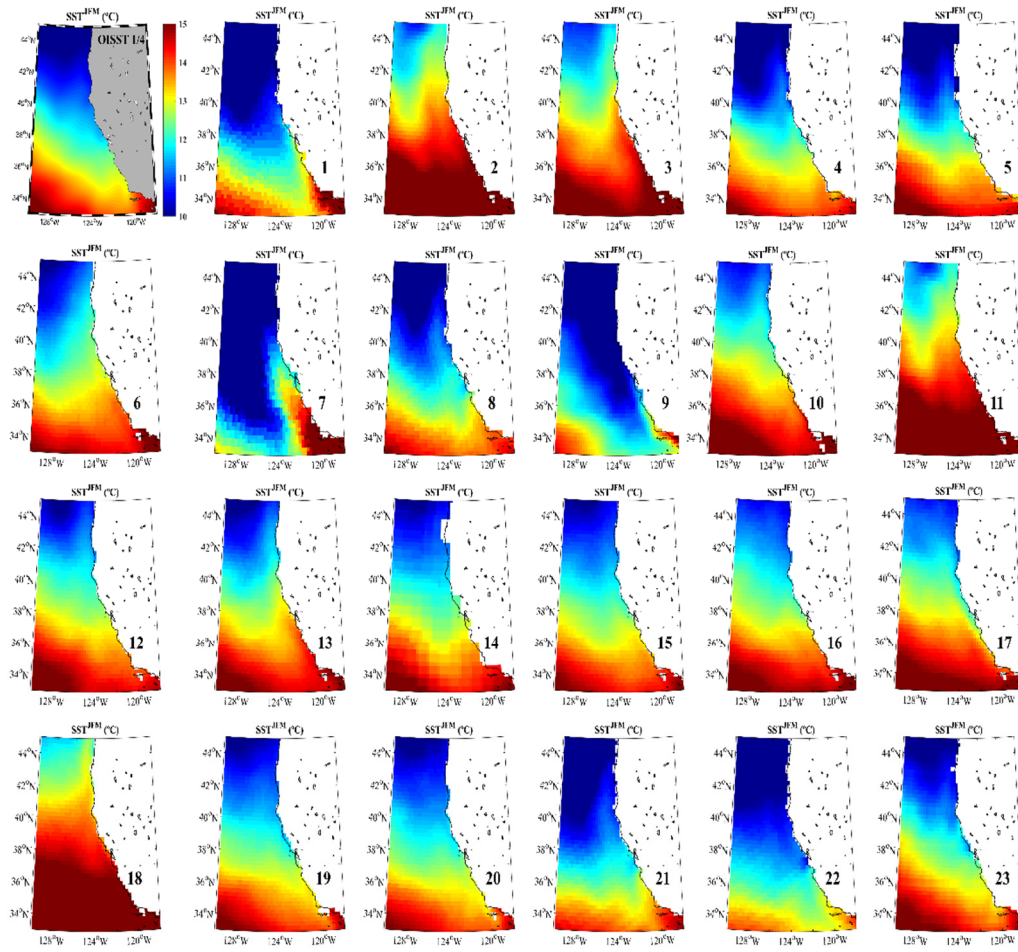
**Figure S13:** Mean of the seasonal SST for JAS (°C) for the Humboldt upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



**Figure S14:** Mean of the seasonal SST for OND (°C) for the Humboldt upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.

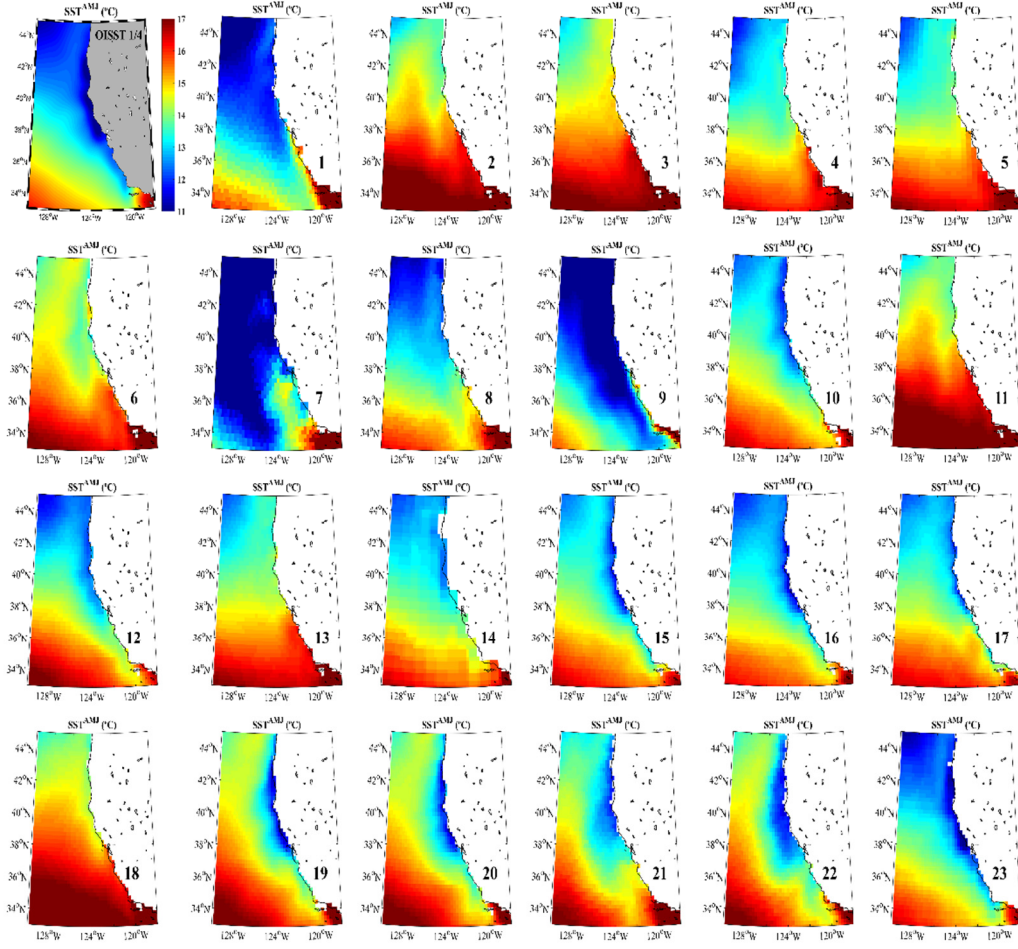


**Figure S15:** Humboldt upwelling system seasonal mean SST value ( $\pm 1$  SD) for the OISST 1/4 (black solid line) and each CMIP6 model for coastal (left panels) and oceanic (right panels) points. The number and color of each model refer to Table 1.

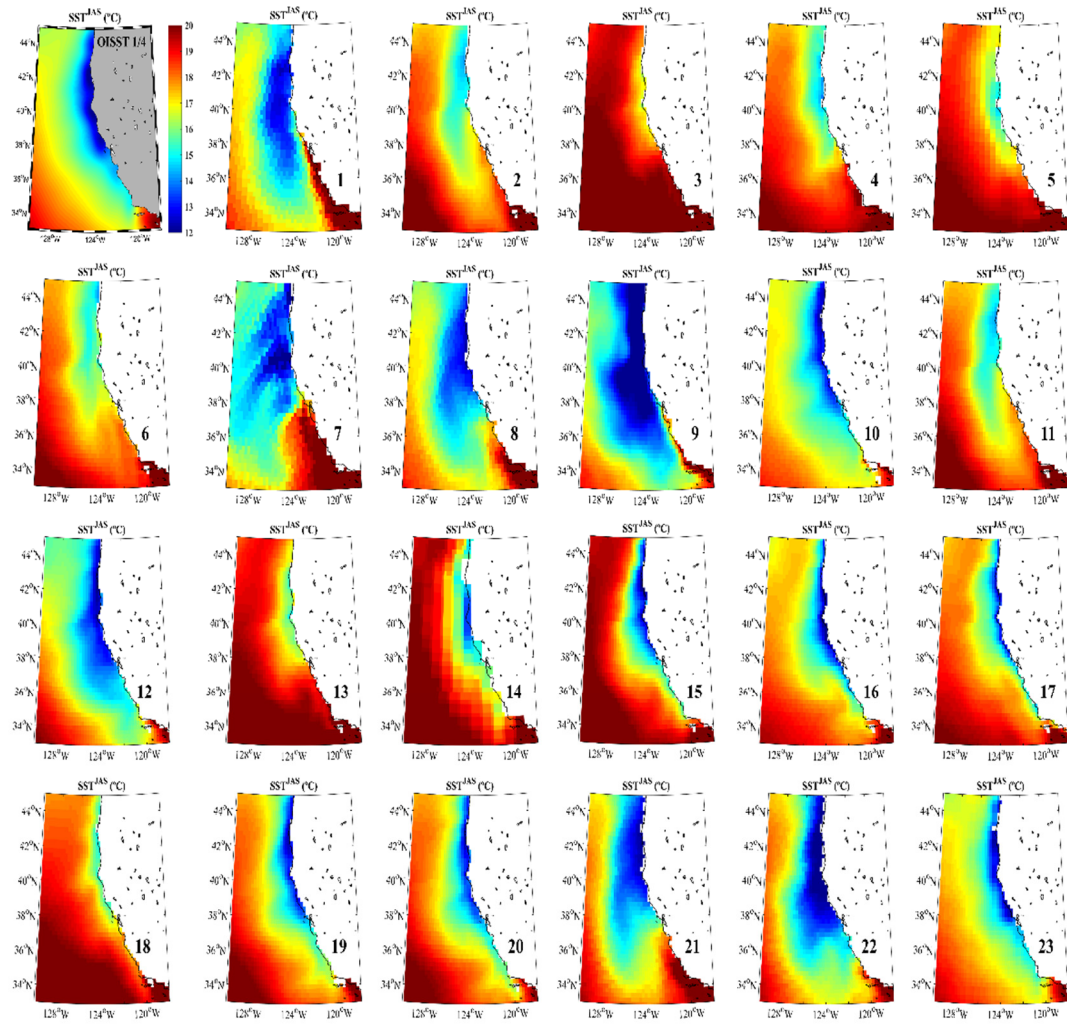


**Figure S16:** Mean of the seasonal SST for JFM (°C) for the California upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.

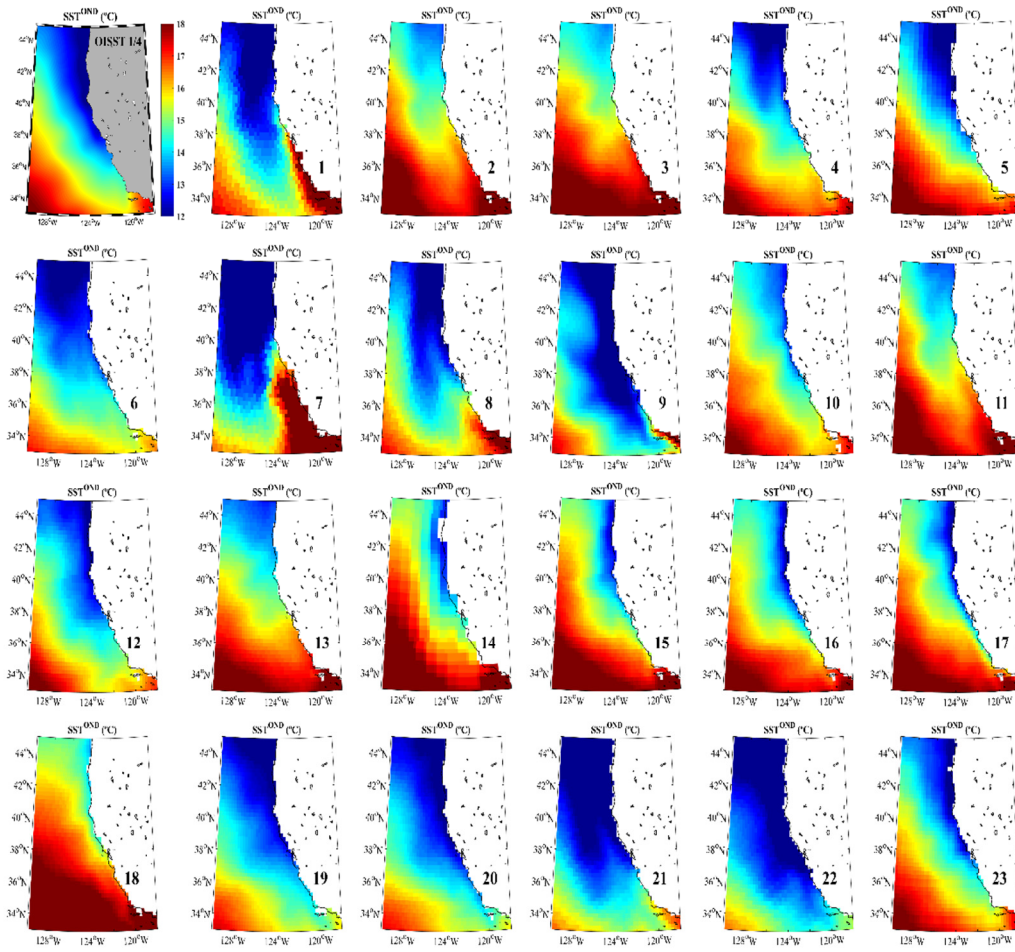




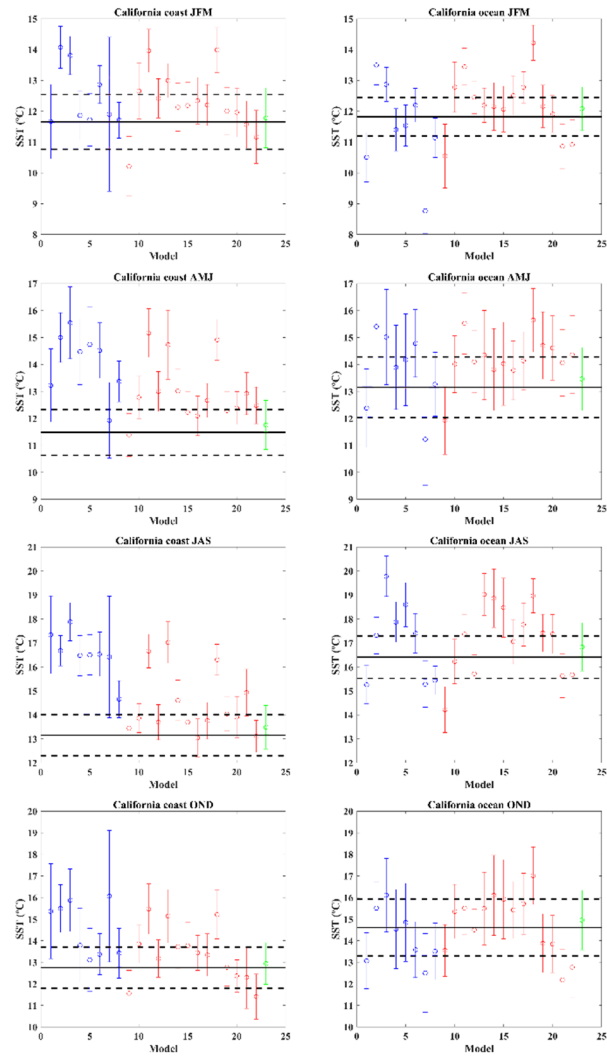
**Figure S17:** Mean of the seasonal SST for AMJ (°C) for the California upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



**Figure S18:** Mean of the seasonal SST for JAS (°C) for the California upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



**Figure S19:** Mean of the seasonal SST for OND (°C) for the California upwelling system from 1982 to 2014. The numbers of each map refer to Table 1.



**Figure S20:** California upwelling system seasonal mean SST value ( $\pm 1$  SD) for the OISST  $\frac{1}{4}$  (black solid line) and each CMIP6 model for coastal (left panels) and oceanic (right panels) points. The number and color of each model refer to Table 1.