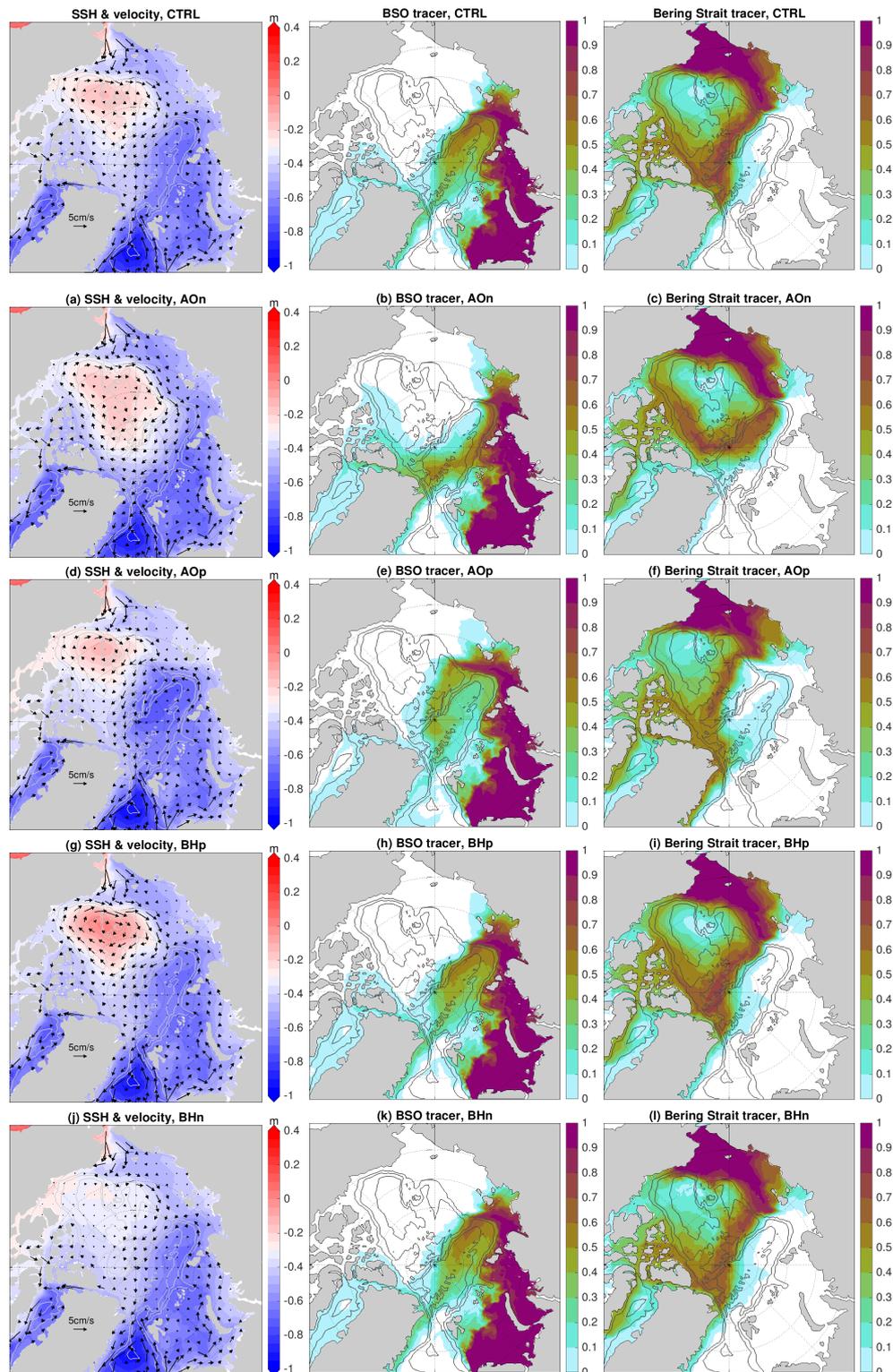
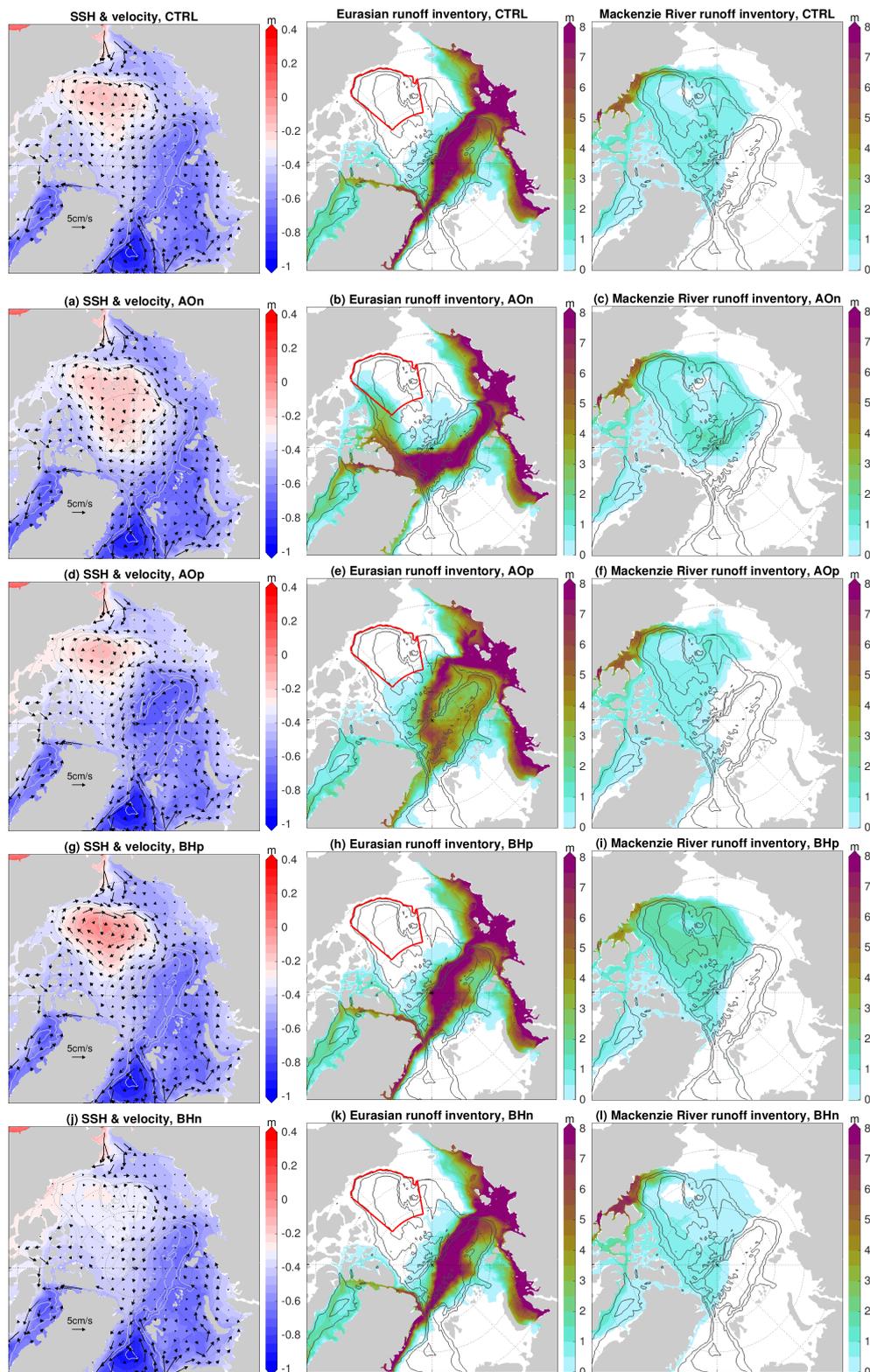


## *Supplementary Material*

### SUPPLEMENTARY FIGURES



**Figure S1.** Left: Sea surface height (SSH) and upper 150 m mean velocity in the fourth model year. Middle column: The upper 150 m mean value of Barents Sea Opening (BSO) passive tracer concentration in the fourth model year. Right: The upper 150 m mean value of Bering Strait passive tracer concentration in the fourth model year. (A)(B)(C): the case with negative Arctic Oscillation (AO) forcing. (D)(E)(F): the case with positive AO forcing. (G)(H)(I): the case with positive Beaufort High (BH) forcing. (J)(K)(L): the case with negative BH forcing. The control run results are shown in the top row of the figure for reference. The 500, 2,000, and 3,500 m isobaths are shown with gray contour lines.



**Figure S2.** Left: Sea surface height (SSH) and upper 150 m mean velocity in the fourth model year. Middle column: The inventory of Eurasian runoff (in m) in the fourth model year. Right: The inventory of Mackenzie River runoff in the fourth model year. (A)(B)(C): the case with negative Arctic Oscillation (AO) forcing. (D)(E)(F): the case with positive AO forcing. (G)(H)(I): the case with positive Beaufort High (BH) forcing. (J)(K)(L): the case with negative BH forcing. The control run results are shown in the top row of the figure for reference. The red boxes in the middle column indicate the Beaufort Gyre region. The 500, 2,000, and 3,500 m isobaths are shown with gray contour lines.