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Future changes in the Arctic Ocean fresh water balance

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Over the 21st century, the fresh water balance of the Arctic Ocean will change considerably. Climate model projections indicate that sea ice production and export will rather decline than increase. At the same time, fresh water input by precipitation and continental run-off will increase due to a more intense hydrological cycle and increased melting from the Greenland icesheet. This puts the burden of increased fresh water export from the Arctic onto the ocean. The main gateway for the increase in fresh water export from the Arctic Ocean will be Fram Strait. Fresh water can be exported as near surface water, as Polar Water in a thicker layer of the East Greenland Current near the surface, and as intermediate water in which fresh water from the shelf seas has been incorporated. CMIP3 results indicate that the Polar Water layer will become thicker and Intermediate Water will become fresher. The increasing thickness of the Polar Water layer implies larger geostrophic southward transports in Fram Strait. Here, we will demonstrate the mechanisms leading to a new adjustment of the Arctic Ocean fresh water balance as they occur in coupled climate models from CMIP3. Comparison with more detailed regional ocean-sea ice models regarding this processes will be given. Finally, we propose a new mechanism for the increasing high northern latitude oceanic heat transport that has been observed in future projections.