



## **The impact of changes in Antarctic runoff on the Southern Ocean sea ice**

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In a warming climate, observations indicate that the sea ice extent around Antarctica has increased over the last decades. One of the suggested explanations is the stabilizing effect of increased mass loss of the Antarctic ice sheet, which freshens the surface waters and reduces vertical heat transport in the ocean.

We performed a sensitivity study with an eddy-permitting sea ice-ocean model comparing a set of numerical simulations with additional supply of water at the Antarctic ocean surface. Here, we investigate the response of sea ice and on-shelf water properties to variations in the amount and distribution of the prescribed surface freshwater flux.

Our results confirm that an increase in fresh water input can increase the sea ice extent. However, a very strong increase of freshwater will eventually invert the trend. The spatial distribution of the freshwater is of great influence in our simulations. It affects sea ice dynamics and can strongly alter regional sea ice concentration and thickness. Furthermore, we find that additional coastal runoff generally leads to fresher and warmer dense shelf waters. We estimate that currently the contribution by increased Antarctic runoff to the observed trend in the sea ice extent is between 15 and 50%.