EGU2020-12282
https://doi.org/10.5194/egusphere-egu2020-12282
EGU General Assembly 2020

Natural carbon release over-rides anthropogenic carbon uptake when Southern Hemispheric westerlies strengthen

Paul Spence[1], **Laurie Menviel**[1], and Darryn Waugh[2]
[1]UNSW, Climate Change Research Centre, Australia (iampaulspence@gmail.com)
[2]John Hopkins University

The Southern Ocean is one of today's largest sink of carbon, having absorbed about 10\% of the anthropogenic carbon emissions. Southern Ocean's dynamics are principally modulated by the strength of the Southern Hemispheric westerlies, which are projected to increase over the coming century. Here, using a high-resolution ocean-sea-ice-carbon cycle model, we explore the impact of idealized changes in Southern Hemispheric westerlies on the ocean carbon storage . We find that a 20\% strengthening of the Southern Hemispheric westerlies leads to a $\sim$25 Gt loss of natural carbon, while an additional 13 Gt of anthropogenic carbon is absorbed compared to the control run, thus resulting in a net loss of $\sim$12 GtC from the ocean over a period of 42 years. This tendency is enhanced if the westerlies are also shifted polewards, with a total natural carbon loss of almost 37 GtC, and an additional anthropogenic carbon uptake of 18 GtC. While both experiments display a large natural carbon loss south of 10°S, the amplitude is three times greater in the poleward strengthening case, which is not fully compensated by the increase in anthropogenic carbon content. However, the poleward wind shift leads to significant differences in the pattern of DIC change due to a weakening of the upper overturning cell, which leads to an increase in natural and total carbon north of 35°S in the upper 2000 m.

How to cite: Spence, P., Menviel, L., and Waugh, D.: Natural carbon release over-rides anthropogenic carbon uptake when Southern Hemispheric westerlies strengthen, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-12282, https://doi.org/10.5194/egusphere-egu2020-12282, 2020