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Potential up-welling of inorganic carbon in the Artic Ocean shelf seas

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Previous modelling efforts of the Beaufort Sea shelf break in the Arctic Ocean has pointed to a marked increase in wind generated up-welling when the ice edge retreated beyond the shelf break. At present, the shelves in the Arctic Ocean are to a large extent ice covered during summer. This is likely to change due to the present warming of the Arctic region, with an increased melting of the summer sea ice cover. With an up-welling of nutrient rich waters to the low nutrient surface waters on the shelf, this process has been suggested as a potential sink for carbon due to a likely increase in production. However, since the nitrate maximum in the shelf plume is believed to be due to remineralisation of organic material (supported by e.g. an AOU and DIC maxima) there will also be an increase of dissolved inorganic carbon, balancing the potential carbon sink.

In this contribution the projected total increase in nitrate flux as well as the total inorganic carbon flux for each shelf sea in the Arctic Ocean is calculated from the modelled on-shore Ekman transport together with observed nutrient profiles. When comparing the estimate of new production with the estimated carbon flux from the Ekman transport, it is evident that up-welling most likely will act as a source of carbon in the western region in the Arctic even when considering new production. This is most likely due to the denitrification occurring in this part of the Arctic Ocean. This will result in the nitrate being the limiting factor of the new production and an excess of carbon that will exceed the new production. On the Eurasian side, the potential up-welling of carbon and new production seem in balance.