



Uncertainty in projections of Southern Ocean carbon uptake and acidification

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We investigate projections of carbon uptake and the associated acidification of the Southern Ocean over 2006-2080 using output from two ensembles of the Community Earth System Model run under business as usual (RCP8.5) and mitigation (RCP4.5) emission scenarios. On basin-wide and regional scales we observe a rapid onset of aragonite undersaturation in surface waters by mid-century that may be detrimental to calcareous organisms. An analysis of variance reveals that the speed of transition from supersaturation to undersaturation is driven almost entirely by emission scenario, as internal variability in saturation depth across ensemble members is small. Regional differences are observed in the timing and magnitude of aragonite saturation state changes. In the Patagonian Shelf region, undersaturation of the top 200m of the water column is observed by 2080 regardless of emission scenario. Whereas, in the Weddell Sea, saturation state is significantly different between the two emission scenarios by 2080, and undersaturation of the surface waters is “avoidable” if we follow RCP4.5, rather than RCP8.5.