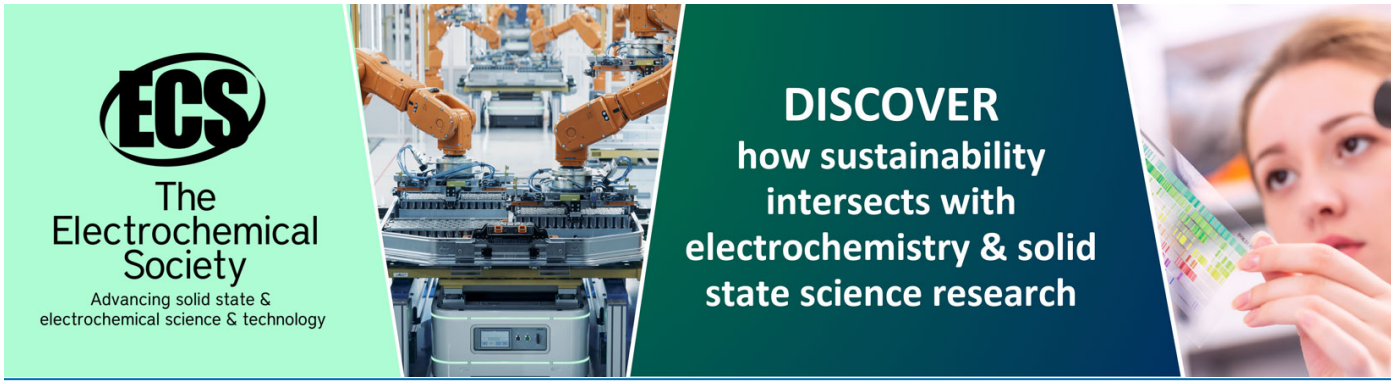
Southern ocean acidification: A tipping point at 450ppm atmospheric CO2



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Southern ocean acidification: a tipping point at 450ppm atmospheric CO2

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Southern Ocean acidification via anthropogenic CO¬2 uptake is expected to be detrimental to multiple calcifying plankton species by lowering the concentration of carbonate ion (CO32-) to levels where calcium carbonate (both aragonite and calcite) shells begin to dissolve. Natural seasonal variations in carbonate concentrations could either hasten or dampen the future onset of this ocean acidification. We present a large-scale Southern Ocean observational analysis that examines the seasonal magnitude and variability of carbonate ion and pH. Our analysis shows an intense winter-time minimum in carbonate ion south of the Antarctic Polar Front and when combined with projected fossil fuel CO2 uptake will induce aragonite under-saturation as early as the year 2030. Some prominent calcifying plankton have important veliger larval development during winter and they will have to experience detrimental carbonate conditions much earlier than previously thought, with possible deleterious flow-on impacts for the wider Southern Ocean marine ecosystem.

