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Decreasing arctic sea ice mirrors increasing greenhouse gases

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Arctic sea ice is a keystone indicator of greenhouse-gas induced global climate change, which is expected to be amplified in the Arctic. Here we directly compare observed variations in arctic sea ice and CO_2 since the beginning of the 20^{th} century, identifying a clear and strengthening linkage, such that in recent decades the rate of sea-ice decrease mirrors the increase in CO_2, with r $\sim$ –0.89. We present a semi-empirical relation between annual sea-ice extent to global atmospheric CO_2 concentrations, in which sea-ice reductions are linearly, inversely proportional to the magnitude of increase of CO_2 over the last few decades. This closely approximates sea ice changes during the most recent three decades, with a proportionality constant of 0.023 million km^2 per ppm CO_2. When applied to future emission scenarios of the Intergovernmental Panel on Climate Change (IPCC), this relationship results in substantially faster ice decreases in the 21^{st} century than predicted by IPCC models.