



## Arctic Sea Ice Decline: Faster than Forecast?

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Climate models have long predicted warming in response to greenhouse gas (GHG) loading will be especially pronounced in the Arctic. This Arctic amplification is closely tied to loss of the sea ice. Arctic sea ice extent at the end of the summer melt season has declined by more than 30% over the last 50 years, at a rate of -8% per decade. If this trend continues, an ice free Arctic is possible by the year 2060. To address whether or not this is reasonable, comparisons are made between observed Arctic ice extent and modeled output from the Intergovernmental Panel on Climate Change Fourth Assessment (IPCC AR4). A striking conclusion from these comparisons is that Arctic sea ice is declining faster than projected by the majority of the models (current ice conditions are more than  $1\sigma$  below multi-model mean extent). From 1953-2006, the observed September trend is  $-7.8 \pm 0.6$  %/decade, compared to the multi-model mean trend of  $-2.5 \pm 0.2$  %/decade. For 1979-2006, the numbers are  $-9.1 \pm 1.5$  % (observed) and  $-4.3 \pm 0.3$  % (modeled). Even larger differences are found for the last 10 years. At present, summer minima levels are approximately 30 years ahead of the mean model forecast. While the AR4 models are powerful tools for projecting the future state of the Earth system, incorporating many refinements in physics, parameterization and resolution compared to their predecessors, there is ample room for improvement.

In summary, a seasonally ice-free Arctic Ocean by the year 2060, as suggested by satellite observations, seems plausible; yet current models struggle to encompass the suite of causes and feedbacks in the GHG-induced decline.