



Can current global climate models be used to predict the future of arctic sea ice?

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We take the seasonal cycle of the Central Arctic downwelling shortwave and longwave radiation generated by the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC AR4) coupled Global Climate Models (GCMs), and use the standard thermodynamic models of sea ice to calculate its near-equilibrium thickness. The variance between GCMs in simulated cloud cover is large, producing an intermodel range of approximately 40Wm^{-2} in the downwelling longwave radiation. For present day equilibrium sea ice (≈ 3 m) with well-documented albedo, the GCM-generated radiation forcings produce equilibrium thicknesses that range from 1 to greater than 10 meters, encompassing more than 80 % of the observed thickness distribution, which is primarily the result of ice deformation rather than thermodynamics. Given the uncertainties of future radiation climates, and in the absence of knowledge about future values of the ice albedo, our analysis suggests that current GCMs do not lend themselves to reliably predict the future of Arctic sea ice cover.