



How overconfident are current projections of anthropogenic carbon dioxide emissions?

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Analyzing the risks of climate change requires sound probabilistic projections of anthropogenic carbon dioxide emissions. Previous projections have broken important new ground, but many rely on out-of-range projections, are limited to the 21st century, or provide only implicit probabilistic information. Here we take a step towards resolving these problems by assimilating globally aggregated observations of population size, economic output, and carbon dioxide emissions over the last three centuries into a simple economic model. We use this model to derive probabilistic projections of business-as-usual carbon dioxide emissions to the year 2150. We demonstrate how the common praxis to limit the calibration timescale to decades can result in biased and overconfident projections. The range of several carbon dioxide emission scenarios (e.g., SRES) misses potentially important tails of our projected probability density function. Studies that have interpreted the range of carbon dioxide emission scenarios as an approximation for the full forcing uncertainty may well be biased towards overconfident climate change projections.