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Exploring the Robustness of the Carbon Cycle Response

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Climate change research has progressed in recent years to address the process which fractionate carbon dioxide between the individual reservoirs in the carbon cycle. We present here for the first time results from an experiment to explore in a systematic way the uncertainties in the terrestrial carbon cycle using an ensemble of fully coupled atmosphere - ocean - carbon cycle GCMs based on HadCM3. We have identified key terrestrial parameters which are both uncertain and play a key role in the terrestrial response. An ensemble of 17 GCMs is then used to explore the implication of these parameters (within their plausible parameter ranges) for the future CO₂ and climate response. These uncertainties imply a large range of future atmospheric CO₂ concentrations, while being broadly consistent with current observations. We present these results in more detail and start to ask the question: "What observation can we use to constrain this future range".