New applications for an EMIC coupled to an atmospheric chemistry model - The University of Victoria Earth system climate model version 2.10 + FAIR chemistry module

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As an Earth system model of intermediate complexity (EMIC), the University of Victoria Earth system climate model (UVic-ESCM) has a comparably low computational cost (4.5–11.5 h per 100 years on a simple desktop computer). It is therefore a well-suited tool to perform experiments that are not yet computationally feasible in a state-of-the-art Earth system model. For example, the UVic-ESCM can be used to perform large perturbed parameter ensembles to constrain uncertainties, but also run a multitude of scenarios while at the same time simulating a well resolved carbon cycle. Thanks to its representation of many important components of the carbon cycle and the physical climate and its ability to simulate dynamic interactions between them, the UVic-ESCM is additionally a more comprehensive tool for process level uncertainty assessment compared to integrated assessment models (IAMs).

The coupling of this EMIC with an atmospheric chemistry module based on the FAIR simple climate model, now allows to directly implement GHG emission files as an input to the model, which makes it a valuable tool for many 'what-if' questions about climate turnaround times. Especially in the context of assessing the carbon cycle responses to future long-term climate change scenarios including e.g. marine CDR or terrestrial CDR implementations. In this presentation we will introduce this new model setup and show examples of first applications of this novel tool, while showcasing the advantages that it brings about.