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Potential of bioenergy with carbon capture and storage to limit global warming to 1.5°C and its climate implications

Helene Muri
University of Oslo, Dept. of Geosciences, Oslo, Norway (helene.muri@geo.uio.no)

The increasing awareness of the many damaging aspects of climate change over this century and beyond has prompted research into ways of reducing and reversing the recent man-made increase of the carbon concentrations in the atmosphere. Most IPCC emission scenarios stabilising climate at low levels, like the 1.5°C target as outlined by the Paris Agreement, require large scale deployment of Bio-Energy with Carbon Capture and Storage (BECCS). Here, the potential of large scale BECCS deployment in reaching the 1.5°C global warming target is evaluated alongside associated climate and carbon cycle responses. An Earth system model with fully coupled carbon cycle and interactive biogeochemistry is used to assess different BECCS deployment scenarios, including an extreme case scenario, alongside strong mitigation. Large-scale BECCS deployment influence not only the global carbon cycle, but also the feedbacks between the atmosphere and land surface. Changing the land cover to biocrops affects the terrestrial store of carbon, and also the physical properties of the land surface, i.e. biophysical forcing, which leads to important feedbacks in the climate system. The climate implications, including changes to the hydrological cycle, of large scale BECCS deployment will be presented.