Conférence de l'Institut Coriolis pour l'Environnement de l'École Polytechnique

CARBON CAPTURE AND STORAGE

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Access to energy is central to human well-being and as a result energy demand is expected to grow. Unfortunately, today's energy infrastructures, mainly fueled by fossil carbon, are unsustainable. Affordable alternatives to replace fossil fuels still need to be developed. The use of fossil carbon results in thirty billion tons of annual carbon dioxide emissions, which is a potent greenhouse gas and drives global warming. In order to stop climate change, carbon dioxide emissions must nearly completely cease. After stopping emissions and without active removal of carbon dioxide from the atmosphere, it will take natural processes millennia to return the atmosphere to pre-industrial carbon dioxide levels. Capture and storage technologies offer one solution to this conundrum. We will discuss technologies for the capture of carbon dioxide – at large point sources or directly from the atmosphere – and technologies for the subsequent safe and permanent disposal of the captured carbon. Together, these technologies can eliminate all carbon dioxide emissions and therefore maintain access to one of the largest and most convenient energy resources the world has ever seen, while at the same time eliminating their detrimental side effects of climate change, ocean acidification and eutrophication of the biosphere with excess carbon. Point source capture is likely to be cheaper than air capture, but direct capture from ambient air will make it possible to close the carbon cycle entirely. Closure is achieved either through permanent storage of the carbon or through recycling the carbon as a synthetic fuel produced from carbon dioxide, water and non-fossil energy. Operating at sufficient scale, air capture combined with storage could also reverse the past rise in carbon dioxide and return the atmosphere to the lower concentrations of the twentieth century.

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