

**UNIVERSITY OF BRITISH COLUMBIA  
DEPARTMENT OF GEOGRAPHY**

**Colloquium / Research Seminar**

**Kirsten Zickfeld**

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**“Cumulative Carbon as a Framework for Climate Stabilization”**



With the development of coupled climate-carbon cycle models over the last decade new insights into the response of the Earth system to anthropogenic CO<sub>2</sub> emissions are emerging. I will present results of simulations with climate carbon-cycle models of intermediate and higher complexity showing that: (1) the global mean temperature response remains approximately constant for several centuries after complete elimination of CO<sub>2</sub> emissions; and (2) the century-scale temperature response is independent of the timing of CO<sub>2</sub> emissions and is determined only by the total amount emitted. These results can be generalized to show that the instantaneous global mean temperature response is proportional to cumulative carbon emissions. These findings have important implications for climate policy, as they suggest an international framework aimed at avoiding "dangerous anthropogenic interference" based on cumulative CO<sub>2</sub> emissions targets. We estimate that in order to stabilize global mean temperature increase at 2 °C above pre-industrial levels with a probability of at least 0.66, cumulative CO<sub>2</sub> emissions from 2001 to 2500 must not exceed a median estimate of 590 PgC.

**Tuesday, 13 March  
Geography Room 200  
at 12:30 pm**