B03: Physical and Biogeochemical Land Surface Processes in a Changing Climate

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Session Description

The Earth's climate has been warming in recent decades in response to increases in atmospheric carbon dioxide (CO_2) and other greenhouse gases. The interactions between climate change and physical and biogeochemical land surface processes are varied and dynamic. Increasing temperature affects not only the length of the mid-to-high latitude growing season, but also the speed of biogeochemical reactions governing rates of growth, decomposition and nutrient cycles. Evaporation tends to increase with temperature, influencing soil moisture and precipitation patterns, as well as plant moisture stress and soil biogeochemical processes. The CO_2 fertilization effect is an important but poorly understood negative feedback mechanism that may help to mitigate changes in climate by increasing carbon sequestration. The response of nutrient cycles, such as nitrogen, is important for determining whether nutrient availability to plants will enhance or limit expected increases in photosynthetic rates. Changes in temperature and precipitation patterns also have the potential, over time, to alter the distribution of plant functional types over the globe, but the factors controlling the range and success of vegetation species are complex, and so the effect on the net carbon balance of the land surface is uncertain. The extent of seasonal snow and ice cover represents a large positive feedback mechanism, the snow-albedo feedback, which interacts strongly with temperature, precipitation phase, and vegetation distribution. There is a large spread in the simulated albedos for snow-covered surfaces in the CMIP5 climate models, much of which appears to be related to the representation of vegetation masking in the boreal forest, and which contributes to a large spread in the snow albedo feedback in these models. In this session we welcome papers that investigate or model the response of land surface physical and biogeochemical processes to climate change, or that contribute to improved understanding of processes that affect these interactions.

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