ACINN Graduate Seminar, Innsbruck University
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Wednesday, 9 Dec 2020, 11:45

The albedo-climate penalty of hydropower

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The lower albedo of hydropower reservoirs compared to terrestrial landscapes results in a positive radiative forcing offsetting some of the negative radiative forcing by hydroelectricity generation. Here we show, by quantifying the difference in remotely sensed albedo between globally distributed hydropower reservoirs and their surrounding landscape, that 19 % of all investigated plants required 40 years and more for the negative radiative forcing from the fossil fuel displacement to offset the albedo effect. The length of these break-even times depends on the specific combination of climatic and environmental constraints, power plant design characteristics and country-specific electricity carbon intensities. We conclude that future hydropower plants need to minimize the albedo penalty in order to make a meaningful contribution towards limiting global warming to 1.5°C and avoid a no-win situation for climate and environment.

[1] https://www.uibk.ac.at/acinn/graduate-seminar/index.html.en