



Influence of the African Great Lakes on the regional climate

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Although the African Great Lakes are important regulators for the East-African climate, their influence on atmospheric dynamics and the regional hydrological cycle remains poorly understood. We aim to assess this impact by conducting a regional climate model simulation which resolves individual lakes and explicitly computes lake temperatures. The regional climate model COSMO-CLM, coupled to a state-of-the-art lake parameterization scheme and land surface model, is used to dynamically downscale the COSMO-CLM CORDEX-Africa evaluation simulation to 7 km grid spacing for the period 1999-2008. Evaluation of the model reveals good performance compared to both in-situ and satellite observations, especially for spatio-temporal variability of lake surface temperatures and precipitation. Model integrations indicate that the four major African Great Lakes almost double precipitation amounts over their surface relative to a simulation without lakes, but hardly exert any influence on precipitation beyond their shores. The largest lakes also cool their near-surface air, this time with pronounced downwind influence. The lake-induced cooling happens during daytime, when the lakes absorb incoming solar radiation and inhibit upward turbulent heat transport. At night, when this heat is released, the lakes warm the near-surface air. Furthermore, Lake Victoria has profound influence on atmospheric dynamics and stability as it induces cellular motion with over-lake convective inhibition during daytime, and the reversed pattern at night. Overall, this study shows the added value of resolving individual lakes and realistically representing lake surface temperatures for climate studies in this region.

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