INTERFACING SINGLE COLUMN LAKE AND ATMOSPHERIC MODELS: APPLICATION OVER LAKE GENEVA FOR OBSERVED AND WARMING CLIMATE SCENARIO

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Abstract

In this paper, a single column atmospheric model coupled to a single column lake model is presented. Results of multi-year climate simulation for the present day conditions as well as these for a future warmer climate scenario in the context of doubling the concentration of atmospheric CO_2 are shown for the case of lake Geneva, Switzerland. The atmospheric model, *FIZ*, is a column version of a regional model developed for regional climate modelling based on an off-line downscaling of GCM simulations (Goyette and Laprise, 1996). The atmospheric model is physically-based and it requires outputs from a previous GCM integration. The issues of local lake climate is addressed by combining precomputed atmospheric large-scale transports of momentum, heat, and moisture, called “the dynamics,” and recomputed subgrid-scale parameterized effect (solar and infrared radiation fluxes, and latent and sensible heat fluxes), called “the physics,” with the explicit numerical computations of the evolving lower boundary conditions provided by the lake model. The lake model, called k-epsilon (or k-ε), combines a buoyancy-extended k-ε model with a seiche excitation and damping model to predict the diffusivity below the surface mixed layer (Goudsmit *et al.*, 2002). In this model, the vertical turbulent diffusivities are determined from the turbulent kinetic energy and energy dissipation. Some details of the atmospheric-lake interface module, and sensitivity of the simulated thermal profiles to this coupler parameters are presented. Finally statistics of the change in the lake thermal profiles is also shown for the case of a global climate warming scenario.

References

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