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Large-eddy simulation of the diurnal cycle of the atmospheric boundary layer and influence of the radiative forcing during the Wangara experiment.

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The ability to simulate the whole diurnal cycle of the atmospheric boundary layer in order to study the complex turbulent structures remains a difficult topic. Consequently large-eddy simulations (LES) are performed with the open source CFD code Code_Saturne [Archambeau et al., 2004]. First the code is validated on an atmospheric convective case [Schmidt and Schumann, 1989] where different subgrid-scale (SGS) models are compared: two non-dynamical SGS models [Smagorinsky, 1963] [Nicoud and Ducros, 1999] and two dynamical SGS models [Germano et al., 1991 ; Lilly, 1992] [Wong and Lilly, 1994]. Then LES are performed to simulate the whole diurnal cycle of the Wangara experiment (Day 33-34). The results are compared to measurements , RANS "k-ε" model and other LES performed by [Basu et al., 2008] using a locally averaged scale-dependent dynamic (LASDD) SGS model. Thereafter the influence of the radiative forcing on the atmosphere is studied testing several SGS models. The results are especially discussed on nocturnal low level jet and potential temperature gradient in the stable boundary layer.

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