EMS Annual Meeting Abstracts Vol. 10, EMS2013-410, 2013 13th EMS / 11th ECAM © Author(s) 2013



Evaluating modelled surface long wave downward radiation with Cabauw observations: The GABLS3 SCM case.

F. C. Bosveld

KNMI, De Bilt, Netherlands (Fred.Bosveld@knmi.nl, 0031-30-2206787)

In the nocturnal atmospheric boundary layer turbulent mixing, energy exchange with the land surface and long wave radiation are intimately coupled. Here we focus on the role of long wave radiation. A significant part of the downward long wave radiation that reaches the surface originates from levels within the nocturnal boundary layer. The nocturnal boundary layer has a typical depth of a few hundred meters and is characterized by a decreasing temperature towards the surface. A change in the temperature profile will result in a change in the surface radiation balance and in a change of the radiation flux divergence over the depth of the nocturnal boundary layer. Visa versa changes in surface radiation and radiation divergence will change the tendencies of temperature in the nocturnal boundary layer.

When evaluating long wave radiation in atmospheric models it appears difficult to discriminate between the effect of the thermodynamic profile on the long wave radiation and the performance of the long wave radiation scheme in the model. Errors in the thermodynamic profile may be unrelated to errors in the long wave radiation scheme, but may result from imperfect representation of turbulence mixing or from an unrealistic coupling to the land surface.

The GABLS3 SCM case is based on Cabauw observations, which includes high accuracy BSRN radiation observations and thermodynamic observations of a 200 m meteorological tower. The Brunt formula estimates long wave downward surface radiation from the surface values of temperature and humidity. We extended this formula by including thermodynamic information from the lowest 200m and derived optimized parameters based on clear sky observations. The inclusion of this profile information enables a very accurate prediction of long wave downward surface radiation both for the nocturnal case and for the day time convective case with a single set of optimized parameters.

19 models participated in the GABLS3 SCM intercomparison and evaluation study. Results will be shown on the evaluation of the modelled long wave radiations by applying the extended Brunt formula.