

## An inconvenient “truth” about using sensible heat flux as a surface boundary condition in models under stably stratified regimes

Sukanta BASU<sup>1</sup>, Albert A.M. HOLTSLAG<sup>2</sup>, Bas J.H. VAN DE WIEL<sup>2</sup>,  
Arnold F. MOENE<sup>2</sup>, and Gert-Jan STEENEVELD<sup>2</sup>

<sup>1</sup>Atmospheric Science Group, Department of Geosciences, Texas Tech University  
Lubbock, Texas, USA; e-mail: sukanta.basu@ttu.edu

<sup>2</sup>Department of Meteorology and Air Quality, Wageningen University  
Wageningen, The Netherlands

### A b s t r a c t

In single column and large-eddy simulation studies of the atmospheric boundary layer, surface sensible heat flux is often used as a boundary condition. In this paper, we delineate the fundamental shortcomings of such a boundary condition in the context of stable boundary layer modelling and simulation. Using an analytical approach, we are able to show that for reliable model results of the stable boundary layer accurate surface temperature prescription or prediction is needed. As such, the use of surface heat flux as a boundary condition should be avoided in stable conditions.

**Key words:** boundary condition, land-atmosphere interaction, large-eddy simulation, PBL modelling, stable boundary layer