AGGREGATION OF MOMENTUM AND TEMPERATURE ROUGHNESSES BASED ON SATELLITE DATA

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High-resolution satellite-based surface temperature, leaf area index and land cover maps can provide a basis for mapping the effective roughnesses at larger scales e.g. the grid scale of regional weather forecast and climate models by combining the satellite information into a two-dimensional atmospheric flow model in the horizontal domain. The momentum roughness z0 is prescribed by empirical knowledge of each land cover class. The model is based on Hasager and Jensen (1999, QJ, 125, 2075-2102). In this first version of the model only a roughness map and a wind speed at the calculation level is used as input, and the effective roughness for momentum, <z0>, is calculated for neutral stability, but it was demonstrated how a surface temperature map and the air temperature at the calculation level can be included: through an iterative process the value of <z0> for non-neutral conditions is calculated assuming a fixed ratio between the roughness length for temperature z0t and momentum. The new model development gives an explicit calculation of the effective roughness for temperature, <z0t>. The approach is to apply a set of equations for the viscous sub-layer resistance or local z0t of the different land cover types in the terrain and iteratively solve these. It may be noted that for the vegetated land cover types a map of leaf area index needs to be included, and that <z0t> in this new model is no longer proportional to <z0>. The paper describes some details of the model and discuss typical calculation results.