Geophysical Research Abstracts
Vol. 14, EGU2012-2392, 2012
EGU General Assembly 2012

Land surface model over forest and lake surfaces in a boreal site - Evaluation of the tiling method

A. Manrique Suñén (1), A. Nordbo (2), G. Balsamo (1), A. Beljaars (1), and I. Mammarella (2)
(1) ECMWF, Reading, United Kingdom (a.manriquesunen@ecmwf.int), (2) University of Helsinki, Finland (annika.nordbo@helsinki.fi)

Land surface model over forest and lake surfaces in a boreal site - Evaluation of the tiling method

Andrea Manrique Suñén1, Annika Nordbo2, Gianpaolo Balsamo1, Anton Beljaars1 and Ivan Mammarella2
1 ECMWF, Reading, UK
2 University of Helsinki, Finland

The tiling method is used by many models to represent the surface heterogeneity. Each grid-box is divided into fractions of different types of surface, and an area-weighted average of the energy fluxes is computed to couple with the atmosphere. This method provides a flexible characterisation of land complexity, and separate information of sub grid variables. However, not much assessment of its validity has been carried out.
To evaluate results for two contrasting surfaces, the Hydrology Tiled ECMWF Scheme for Surface Exchanges has been run offline for the year 2006, forced by the ERA-Interim reanalysis data over a boreal site in southern Finland for two cases. The first one corresponds to a full coverage of the grid-box by high vegetation, and the second one to a full coverage by a lake. The lake model Flake was incorporated into the system to represent inland water processes. It uses a simple parameterisation which has proved to perform well for numerical weather prediction. The resulting fluxes for both cases have been compared to observational data from two stations situated near each other in a Scots pine forest (Hyytiälä) and in a small boreal lake (Valkea-Kotinen), in southern Finland. The turbulent fluxes at the sites were measured using the Eddy-covariance technique. Net radiation, change in heat storage, wind speed, air temperature, and specific humidity and surface pressure were also available for each site.
The diurnal and seasonal cycles of the energy fluxes for these contrasting surfaces have been evaluated, and the different energy partitioning has been explained. In general, the effect of the lake's thermal inertia is well represented by the model. The only shortcoming of the lake model appears to be an excess of evaporation during summer time, especially overnight. This is demonstrated to be due to a too dry atmosphere imposed by the forcing, as the forcing data comes from a grid point situated over forest. A new model run using the observed meteorology at the lake site as forcing reduces the excess of latent heat.
In summary, the results show a good performance of the land surface scheme, and the tiling method appears as an efficient technique to combine fluxes from contrasting surfaces. The method is therefore highly suitable for the representation of sub-grid lakes in numerical weather prediction models.