

(1) SUEWS – the Surface Urban Energy and Water balance Scheme

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(3) Available modes for the model runs: Research

(4) Components & processes: Atmosphere, Hydrosphere, Biosphere & Physical

(5) Brief model description

SUEWS is an urban land surface model simulating the surface energy and water balance in a neighborhood (or local) scale (Järvi et al. 2011, Ward et al. 2016). In the model, the simulated area is divided into seven surface types (buildings, paved surfaces, evergreen trees/shrubs, deciduous trees/shrubs, grass, bare soil and water) below which there is a single soil layer except under the water surface. For each surface, the water state is calculated from a running water balance accounting for evaporation, runoff and drainage separately but dynamic interaction between the soil and surface states are allowed. SUEWS includes sub-models for net all-wave radiation, anthropogenic and storage heat fluxes, and irrigation. The model uses only commonly measured meteorological data as forcing in addition to information about the surface characteristics of the simulated area. There is also a preprocessor allowing the model to be used with different re-analysis or climate simulation datasets (Kokkonen et al. 2017).

The model has been optimized to simulate the urban processes in cold climate regions and it includes realistic simulation of snow and seasonally varying vegetation phenology (Järvi et al. 2014, 2017). SUEWS is part of the Urban Multi-scale Environmental Predictor (UMEP), which is an integrated tool for city-based climate services including in addition thermal comfort model, climate extreme finder and pre-processing of GIS datasets (Lindberg et al. 2017).

References

- Järvi L., Grimmond C.S.B., Taka M., Nordbo A., Setälä H. and Strachan I. (2014). *Developments of the Surface Urban Energy and Water balance Scheme (SUEWS) for cold climate cities. Geosci. Mod. Dev.* 7, 1691-1711.
- Järvi L., Grimmond C.S.B. and Christen A. (2011). *The Surface Urban Energy and Water Balance Scheme (SUEWS): Evaluation in Los Angeles and Vancouver. J. Hydrology* 411, 219-237.
- Järvi L., Grimmond C.S.B., McFadden J.P., Christen A., Strachan I.B., Taka M., Warsta L. and Heimann M. (2017). *Warming effects on the urban hydrology in cold climate regions. Scientific Reports* 7, 5833.
- Kokkonen T., Grimmond C.S.B., Rätty O., Ward H.C., Christen A., Oke T.R., Kotthaus S. and Järvi L. (2017). *Sensitivity of Surface Urban Energy and Water Balance Scheme (SUEWS) to downscaling of reanalysis forcing data. Urban Climate*, doi: 10.1016/j.uclim.2017.05.001.
- Lindberg F., Grimmond C.S.B., Gabey A., Huang B., Kent C.W., Sun T., Theeuwes N.W., Järvi L., Ward H.C., Capel-Timms I., Chang Y., Jonsson P., Krave N., Liu D., Meyer D., Olofson K.F.G., Tan J., Wästberg D., Xue L. and Zhang Z. (2017). *Urban Multi-scale Environmental Predictor (UMEP): An integrated tool for city-based climate services. Environment Modelling and Software* 99, 70-87.
- Ward H., Kotthaus S., Järvi L. and Grimmond C.S.B. (2016). *Surface urban energy and water balance scheme (SUEWS): development and evaluation at two UK sites. Urban Climate* 18, 1-32.