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# On the optimal level of complexity for the representation of groundwater-dependent wetland systems in land surface models

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**Upland and Fen Evapotranspiration**

The ET rates at the FEN and Old Jack Pine (OJP) towers are simulated using the MESH model (MESH-FEN and MESH-OJP) and the results are compared with observed ET. The simulated ET at the FEN site (Figure S1) is overestimated in some years, compared with the measured fluxes. This is because of limitations with how MESH simulates evapotranspiration from wetlands (which are not explicitly represented in MESH), and the model always calculates evapotranspiration at the potential evapotranspiration rate. The simulated ET rates at OJP (Figure S2) have a systematic overestimation, with larger errors after 2012. This was explored in Nazarbakhsh et al. (2020), who found that the errors are happening during the melt period – a problem that is yet to be resolved in MESH. Another reason for OJP overestimation could be the missing representation of wetland and groundwater system in the MESH model.
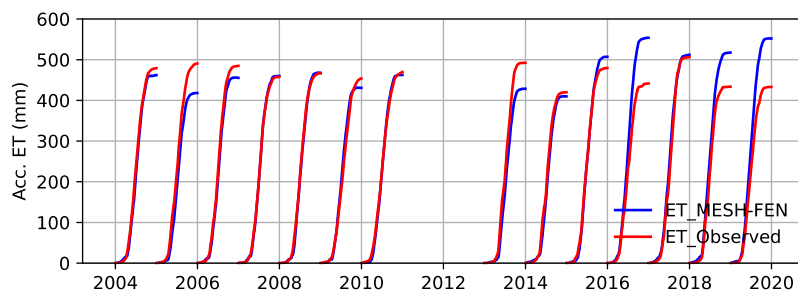


**Figure S1: Annual simulated evapotranspiration (ET) rates at wetland-FEN site in blue lines compared with observed ET at FEN flux tower represented in red lines. Years 2011 and 2012 have missing observations.**
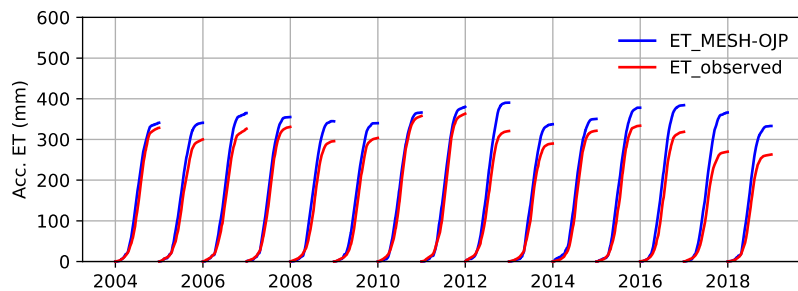


**Figure S2: Annual simulated evapotranspiration (ET) rates at upland-OJP site in blue lines compared with observed ET at OJP flux tower represented in red lines.**

**References**

Nazarbakhsh, M., Ireson, A. M., and Barr, A. G.: Controls on evapotranspiration from jack pine forests in the Boreal Plains Ecozone, Hydrological Processes, 34, 927–940, https://doi.org/10.1002/hyp.13674, 2020.