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*Supplement of*

## **Evaluating integrated surface/subsurface permafrost thermal hydrology models in ATS (v0.88) against observations from a polygonal tundra site**

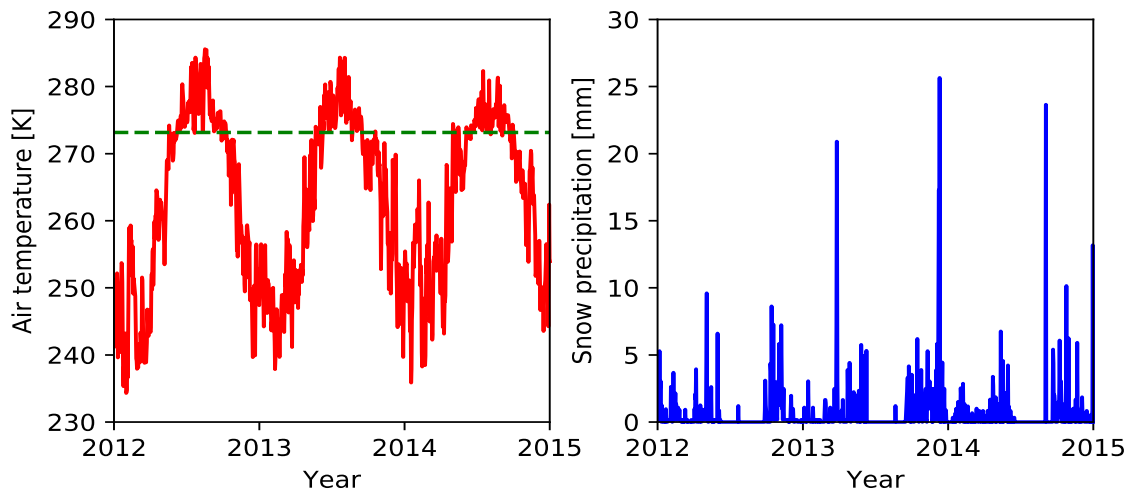
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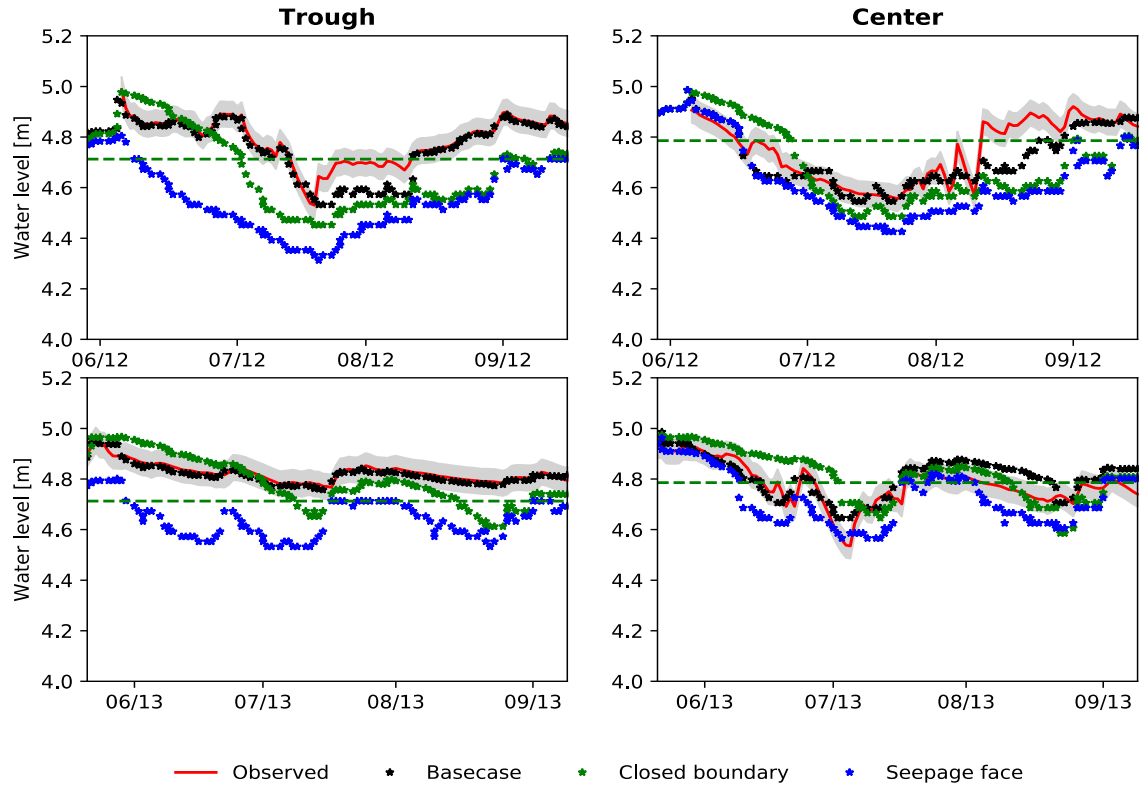
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**Table S1.** Quantitative measures of model performance to observed soil temperatures for the period 2012-2014. Notation: NSE (Nash–Sutcliffe model efficiency coefficient), RMSE (Root Mean Squared Error), and  $R_2$  (Coefficient of determination). Warm (or cold) bias in the model is represented by positive (or negative) bias

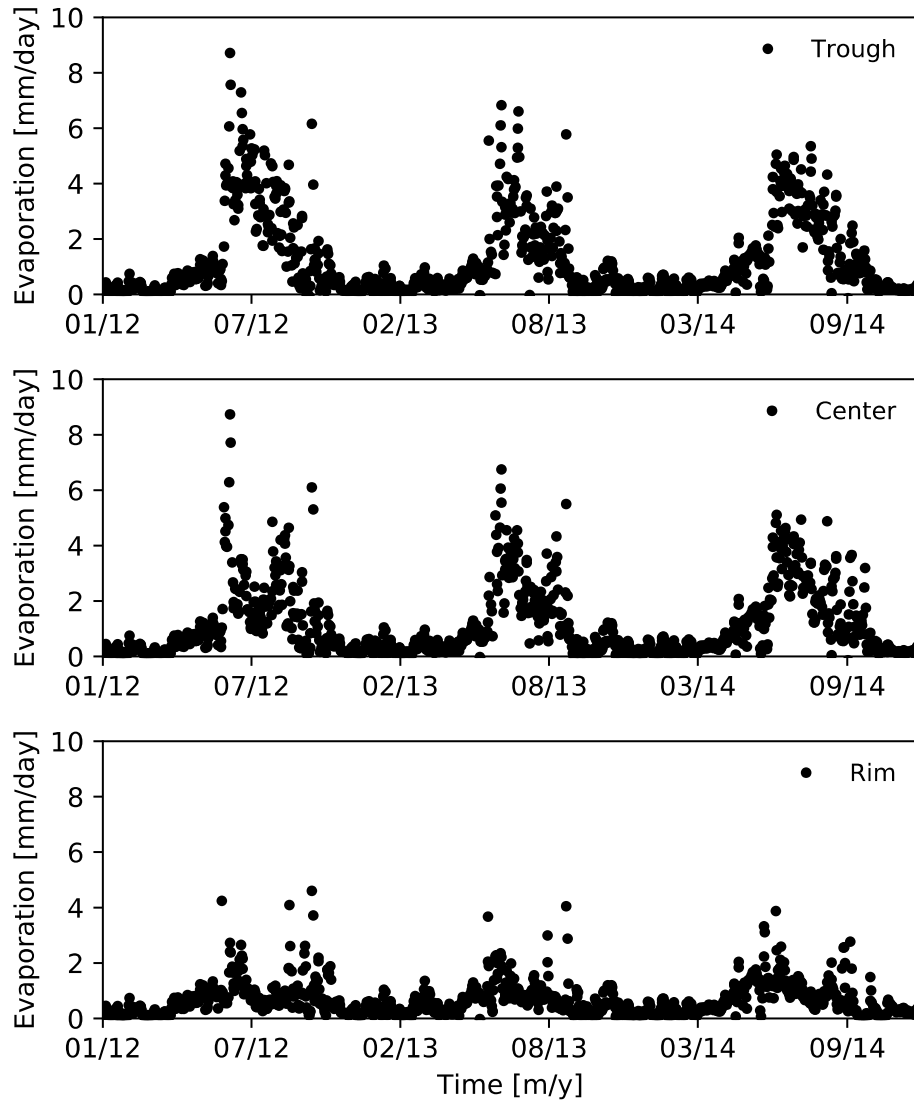
Depth [m]	Location	Efficiency metrics			
		NSE	RMSE	$R_2$	Bias
0.05	Center	0.94	1.88	0.94	-0.48
0.5	Center	0.94	1.38	0.95	-0.06
1.5	Center	0.95	0.88	0.95	0.27
0.05	Rim	0.94	2.03	0.95	-0.44
0.5	Rim	0.88	1.86	0.93	-0.36
1.5	Rim	0.96	0.88	0.94	-0.12
0.05	Trough	0.94	1.79	0.95	-0.38
0.5	Trough	0.95	1.25	0.95	-0.08
1.5	Trough	0.96	0.79	0.95	0.15



**Figure S1:** Daily averaged air temperature and precipitation at the study area for years 2012-2015.



**Figure S2:** Shown in the observed and simulated water tables from different boundary conditions. Results demonstrate that run-off is important during snowmelt run-on to polygon is important during dry summer periods.



**Figure S3:** Simulated evaporation versus time for trough, center, and rim microtopographic positions.