Modeling temperatures of shallow thermokarst lakes in the continuous permafrost zone of northern Siberia

contribution for the 5th workshop on "Parameterization of Lakes in Numerical Weather Prediction and Climate Modelling"

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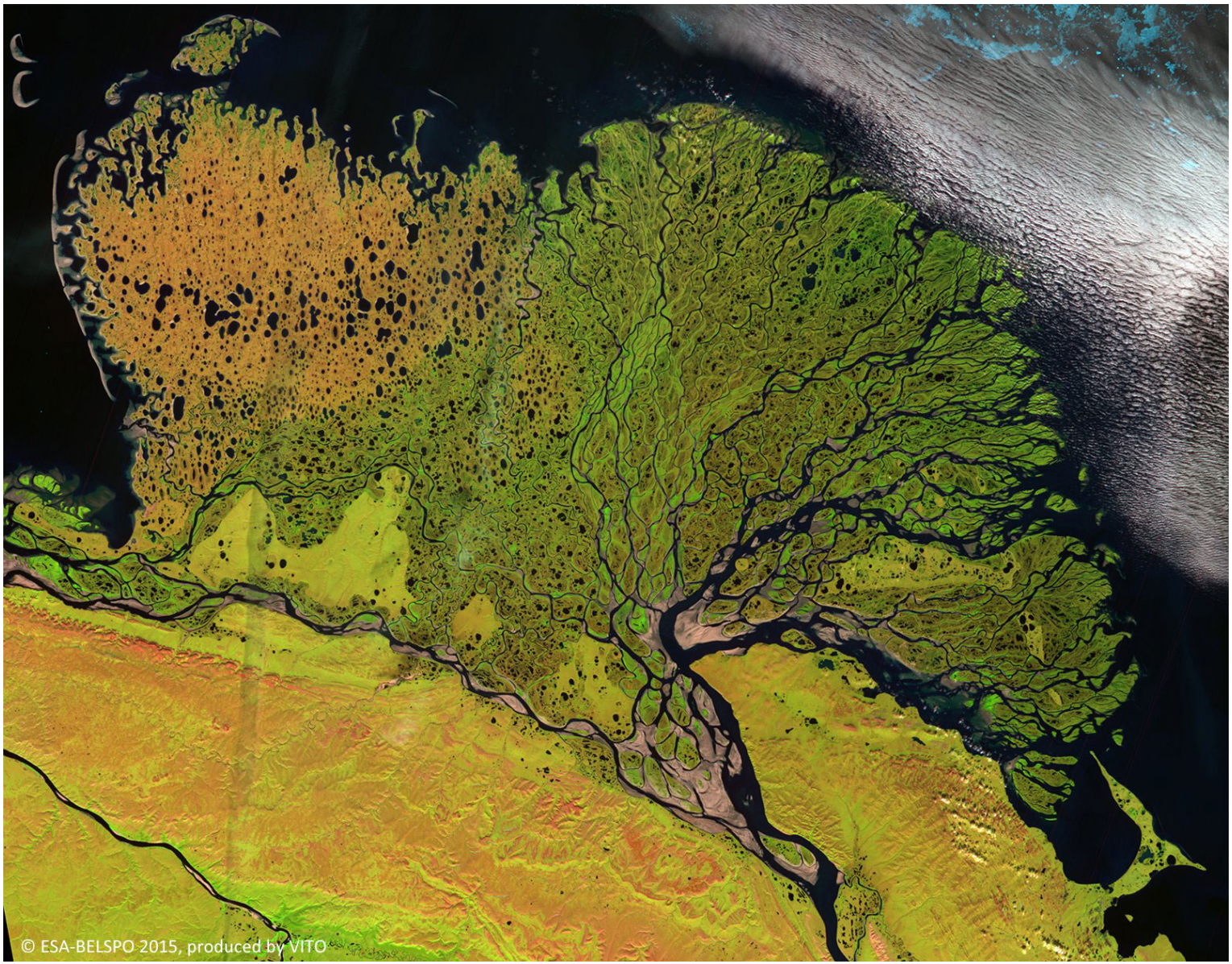
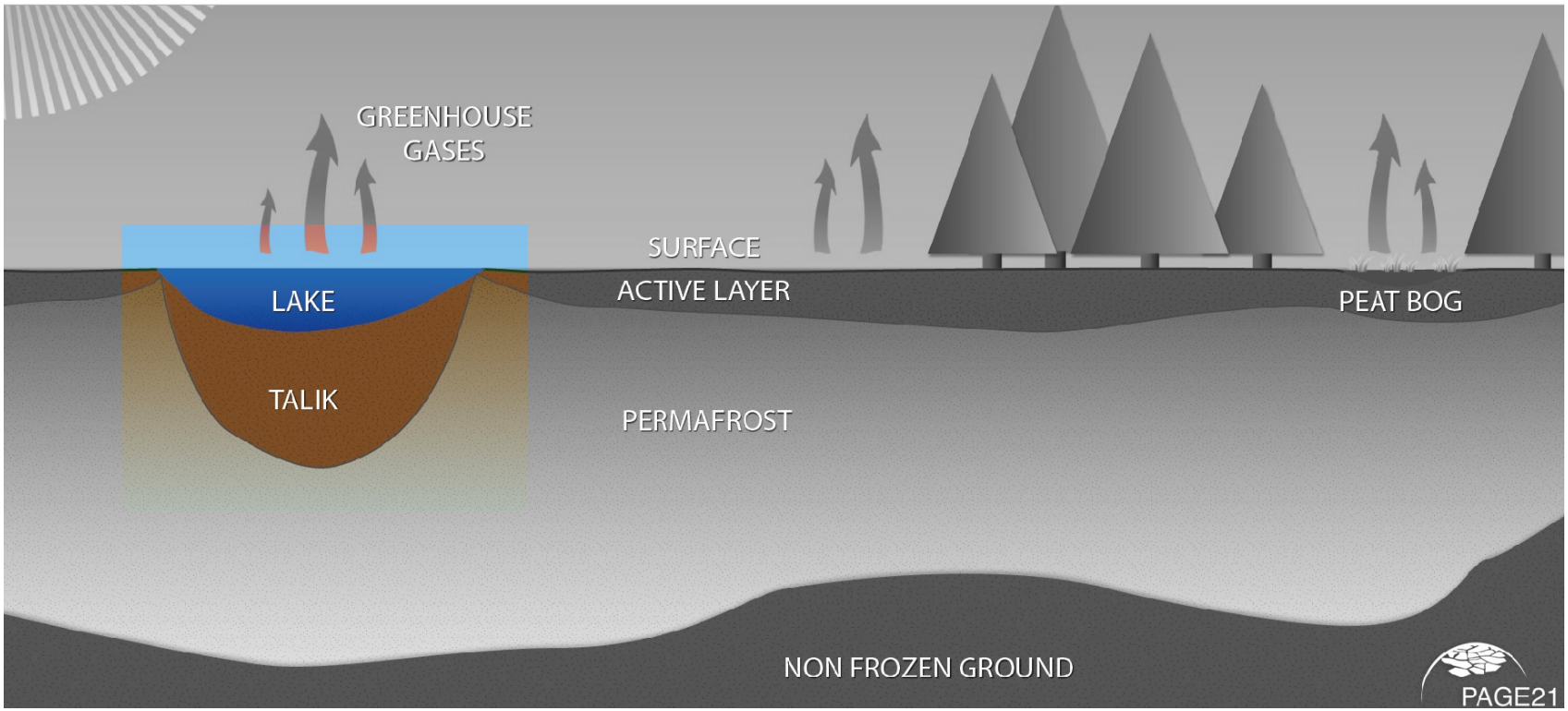
Berlin, October 16, 2017

- We want to understand thermal processes processes in lakes.
- Are these processes reproduceable with the data we gathered?
- Where are the limitations (of FLake) for these lakes?

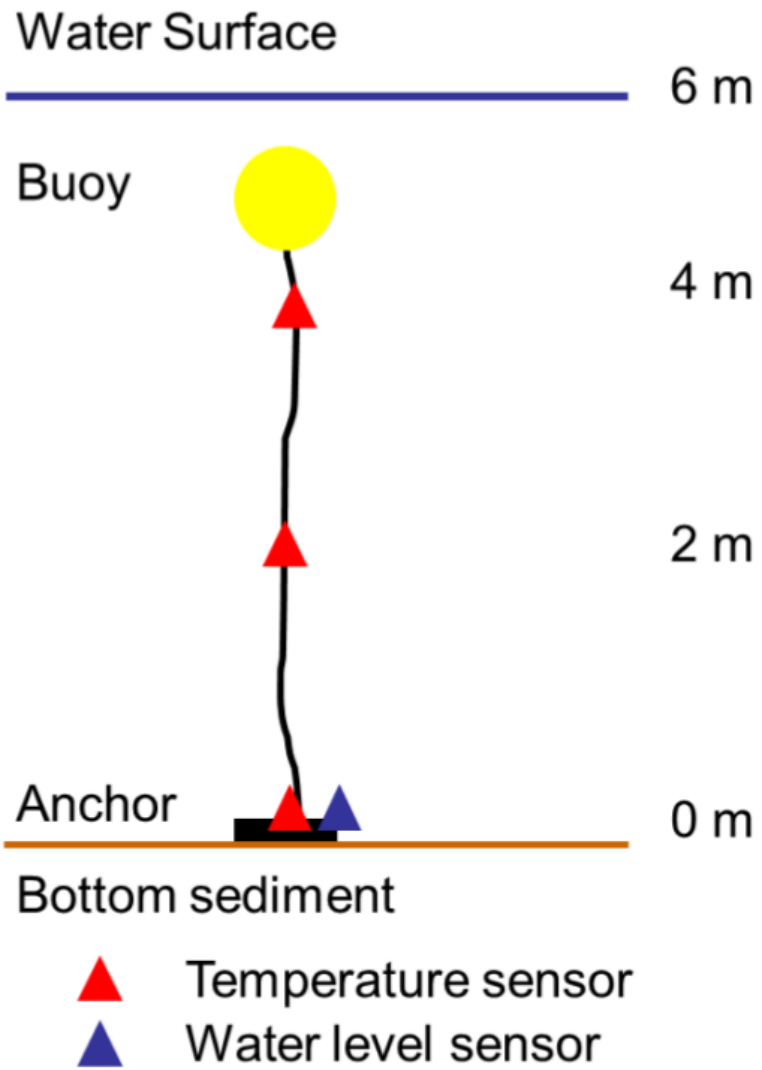
Site

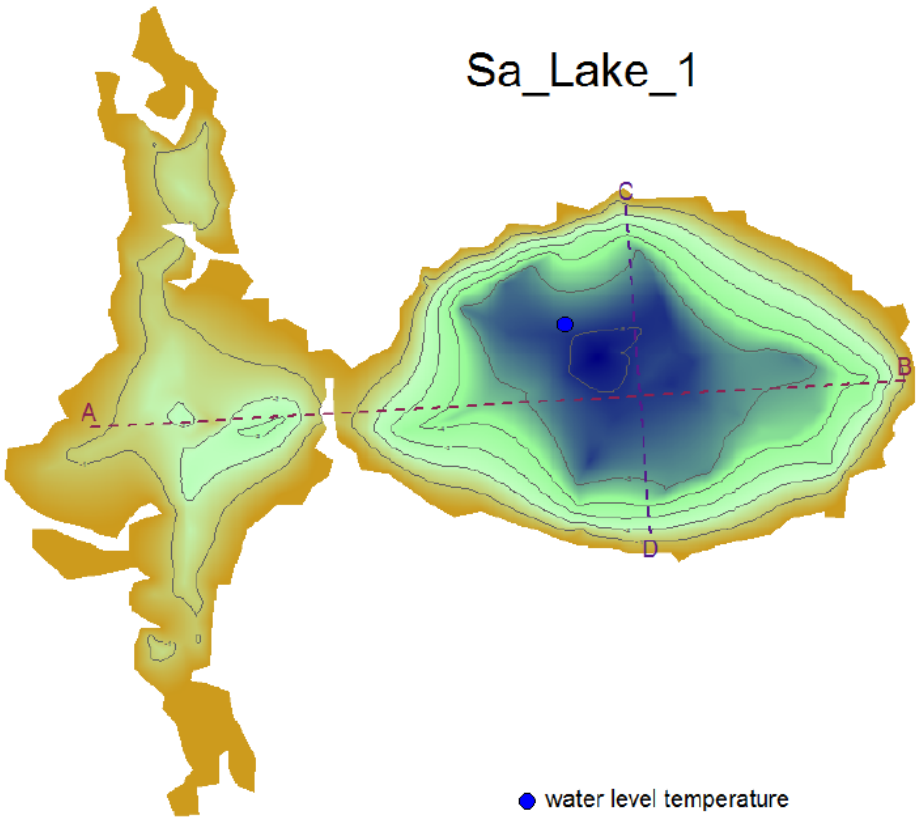


Talik

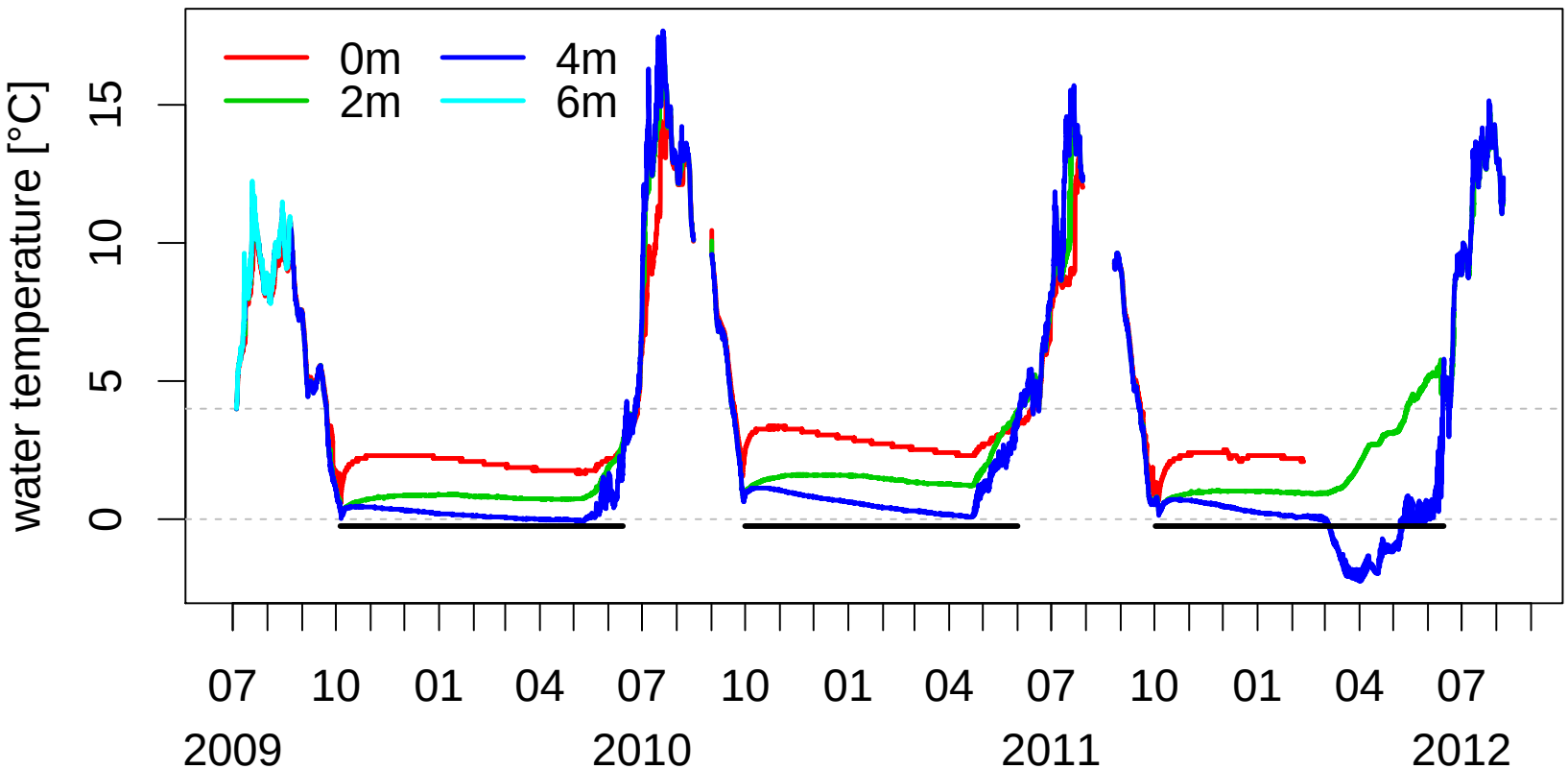

GREENHOUSE
GASES
SURFACE
ACTIVE LAYER
LAKE
PEAT BOG
TALIK
PERMAFROST
NON FROZEN GROUND
PAGE21

Temperature record



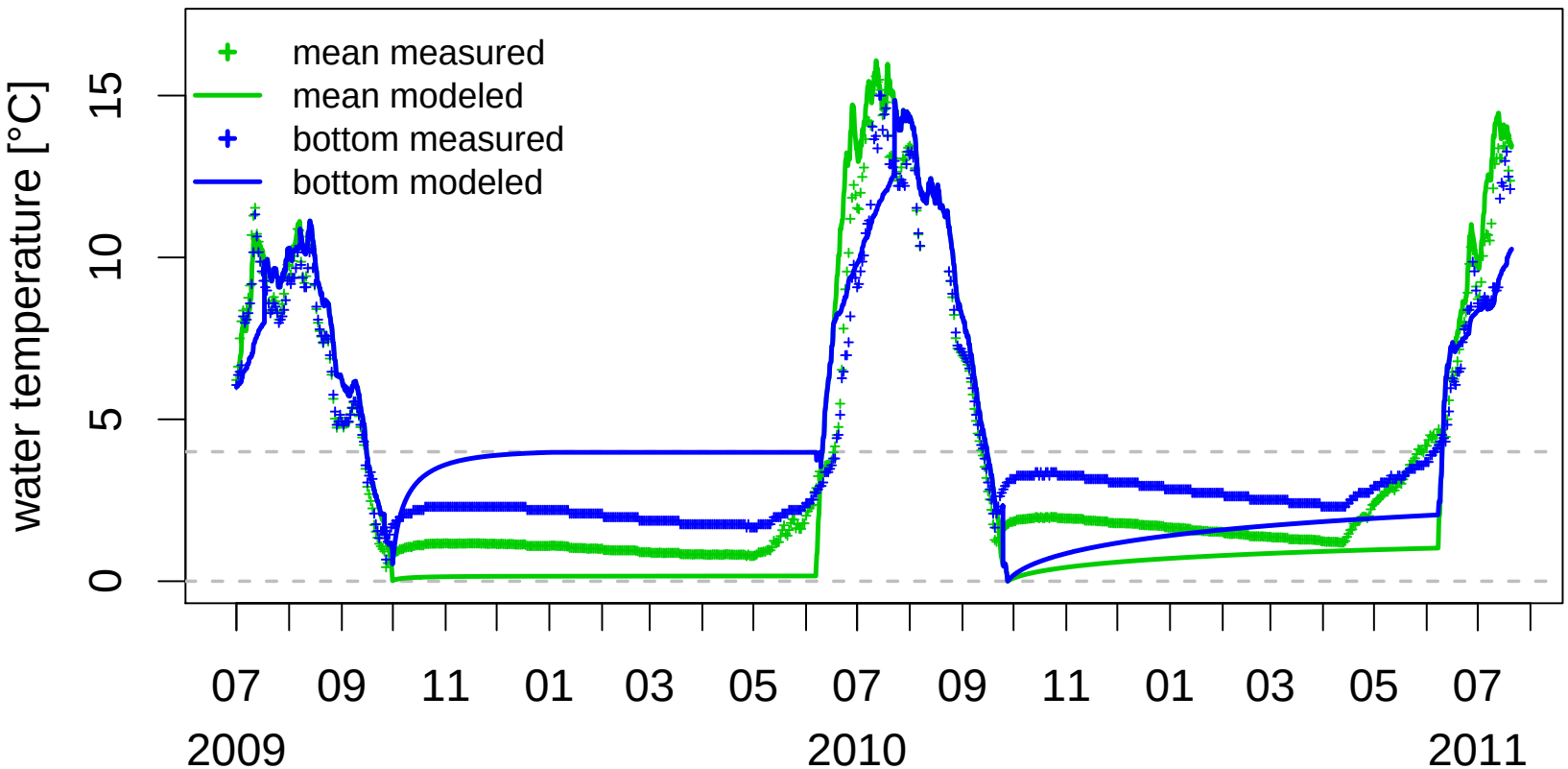


Temperature record

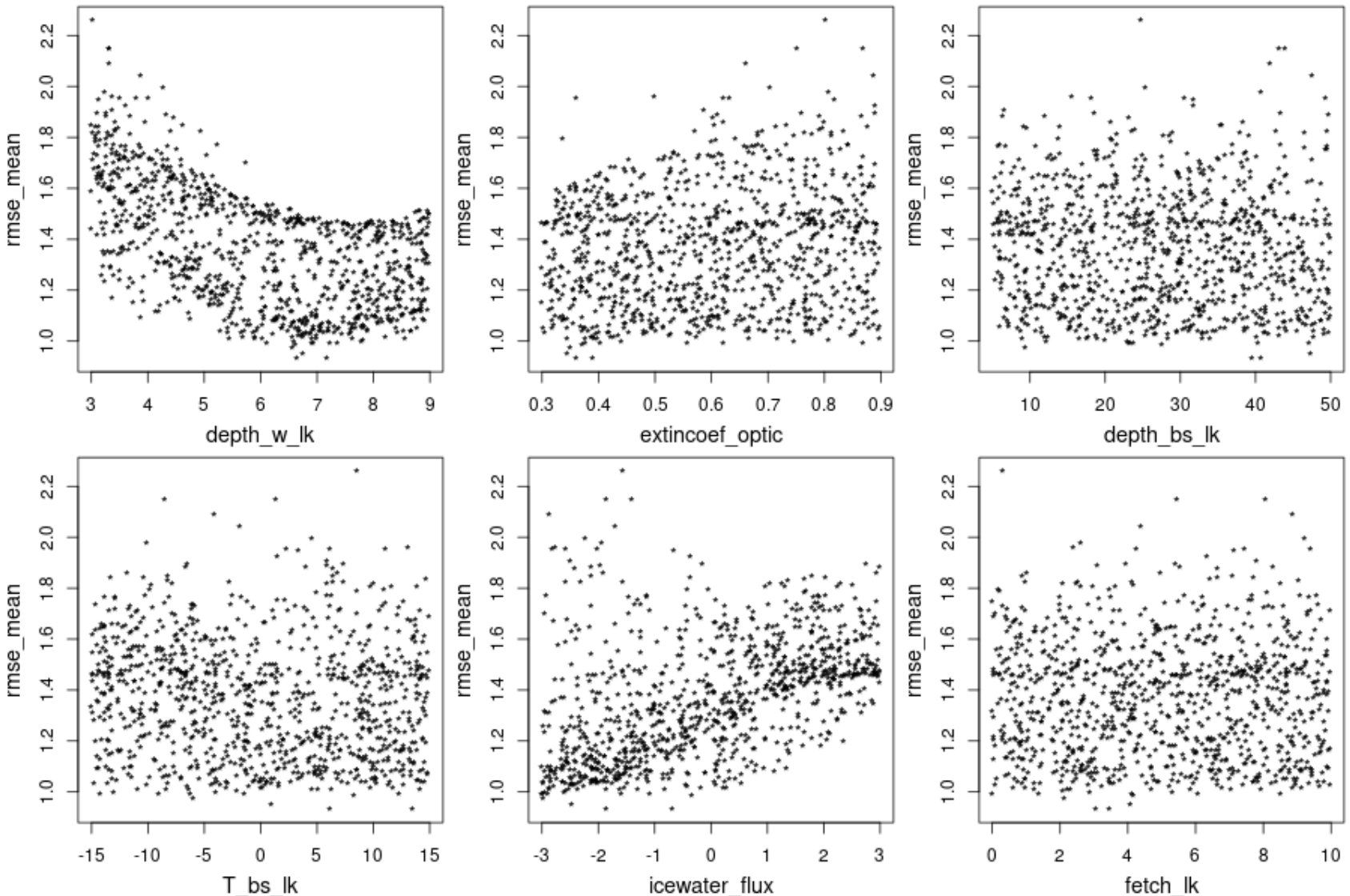


parameter	value	min	max
depth of water column (m)	5.5	3	9
extinction coefficient ($-$)	0.55	0.3	0.9
depth of thermally active sediment (m)	6	5	50
temperature at sediment layer base ($^{\circ}C$)	4	-15	15
ice-water heat flux (Wm^{-2})	0	-3	3
wind fetch (m)	5	0.01	10

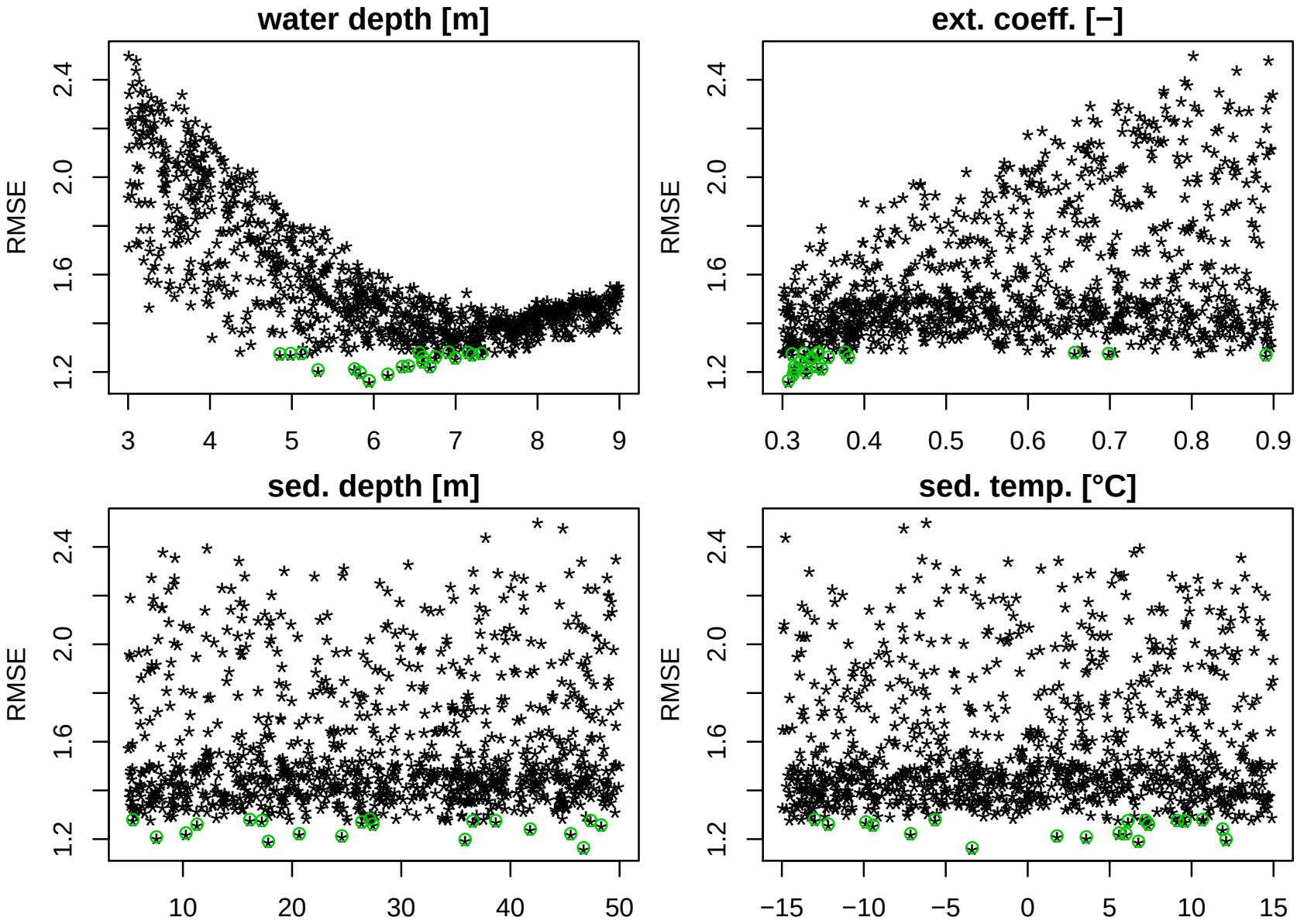
Model & data from educated guess



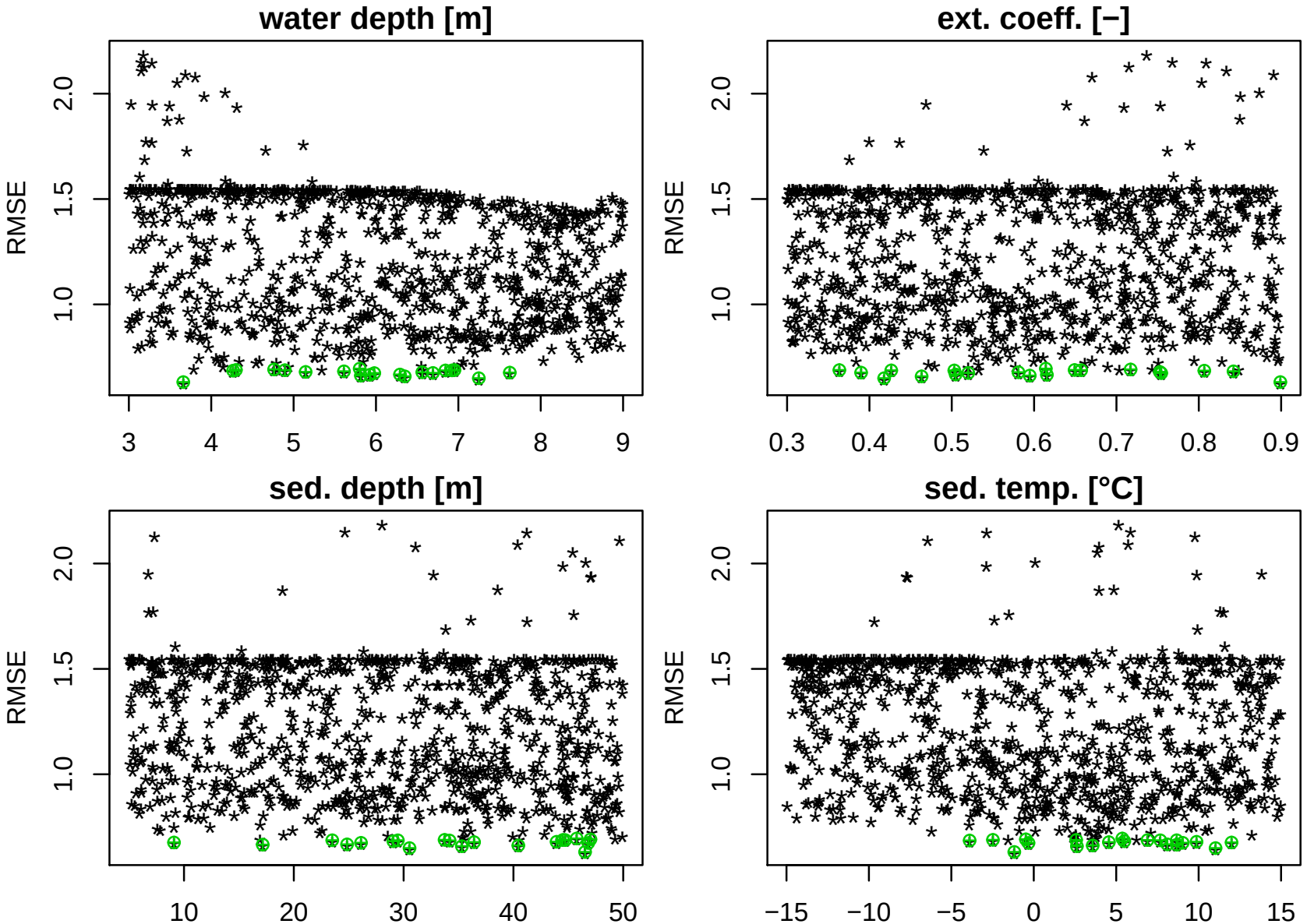
Monte Carlo simulation



Model split: ice-off period

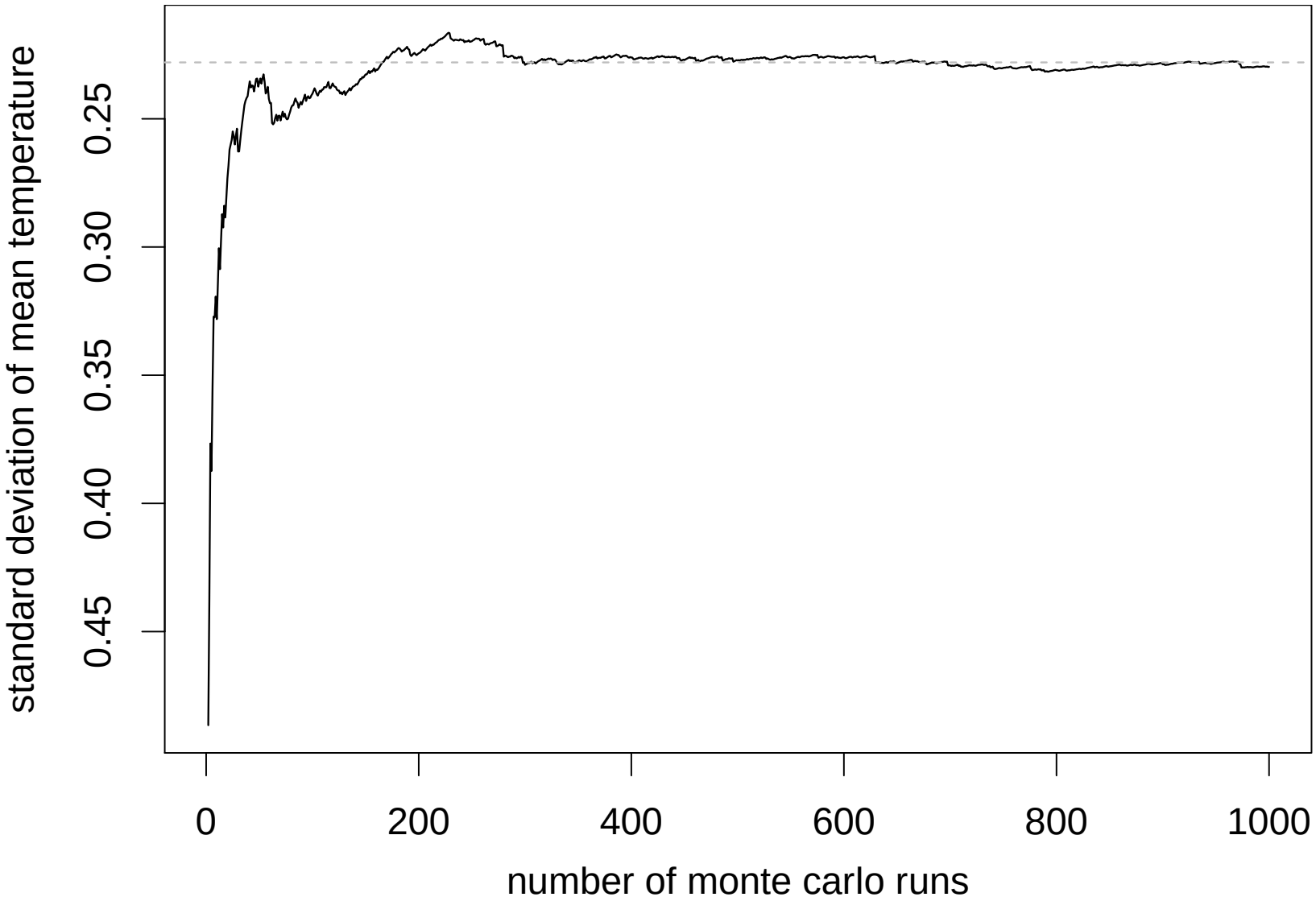


Model split: ice-on period



- Data collected via buoys can be used for validation
- Results suggest, FLake performs good for summer months and less well for ice-on periods.
- Depth of the water column & extinction coefficient are crucial parameters.
- Split analysis might give better fits.

Monte Carlo stability



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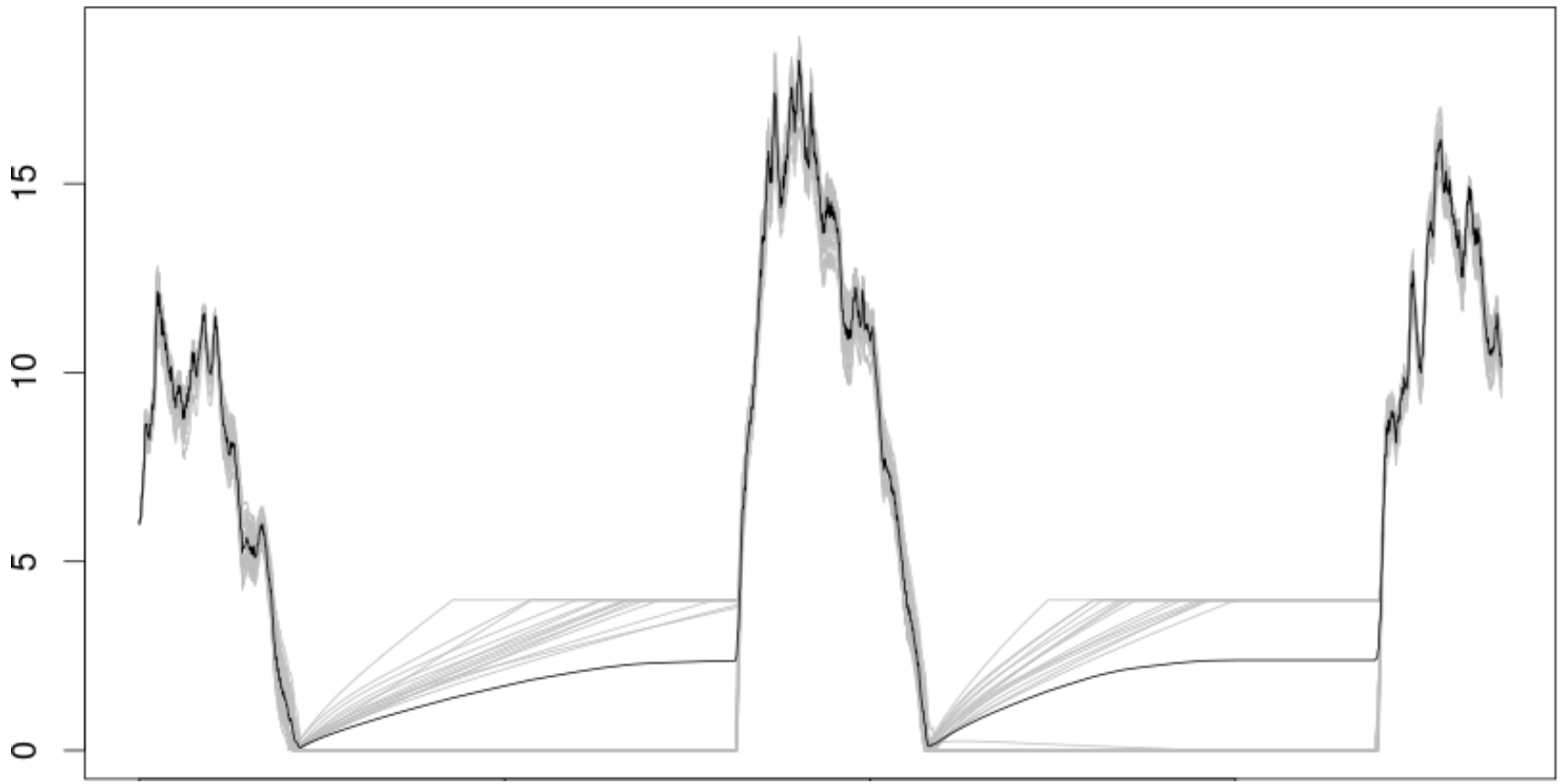
Best 5% runs from MC



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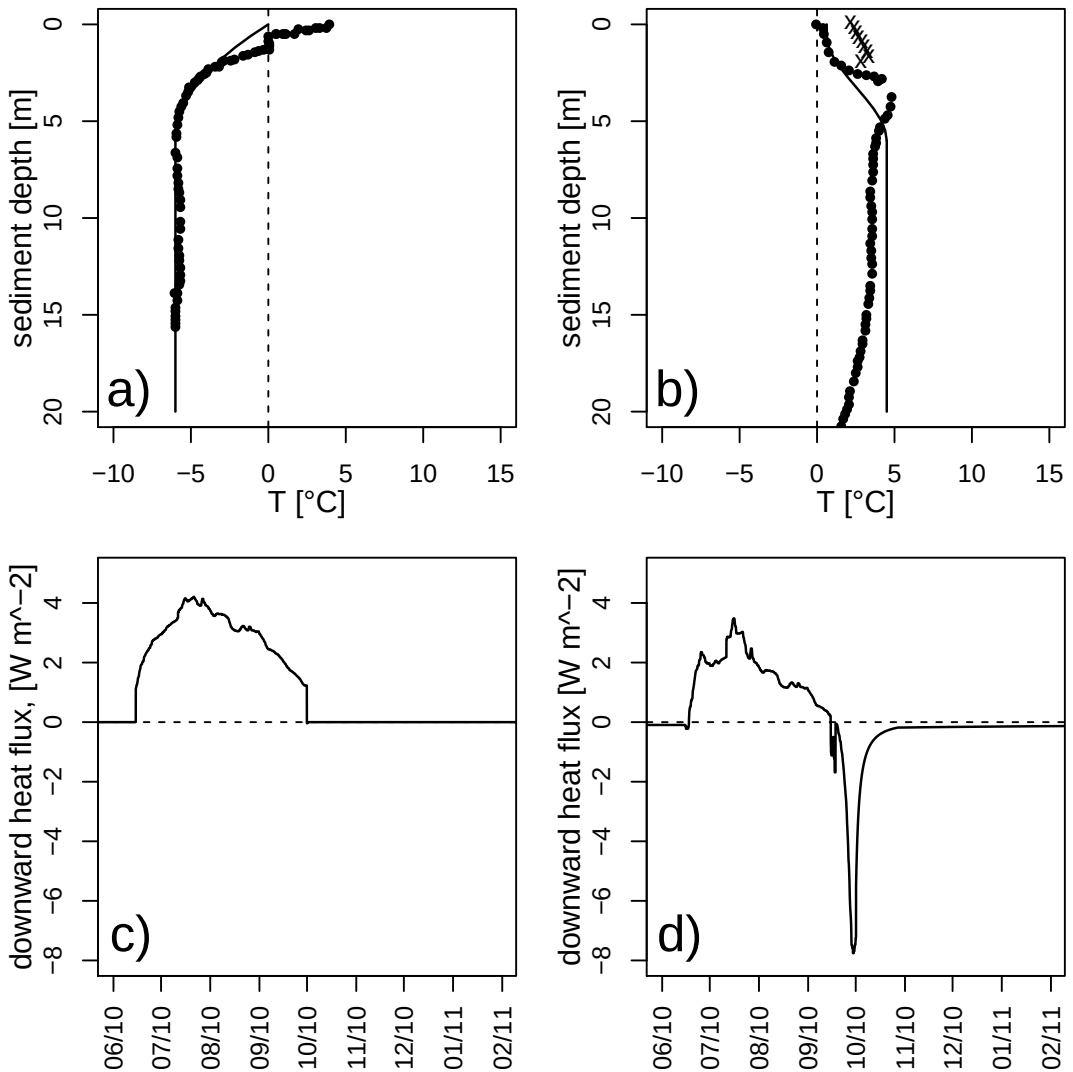
Sedimental properties



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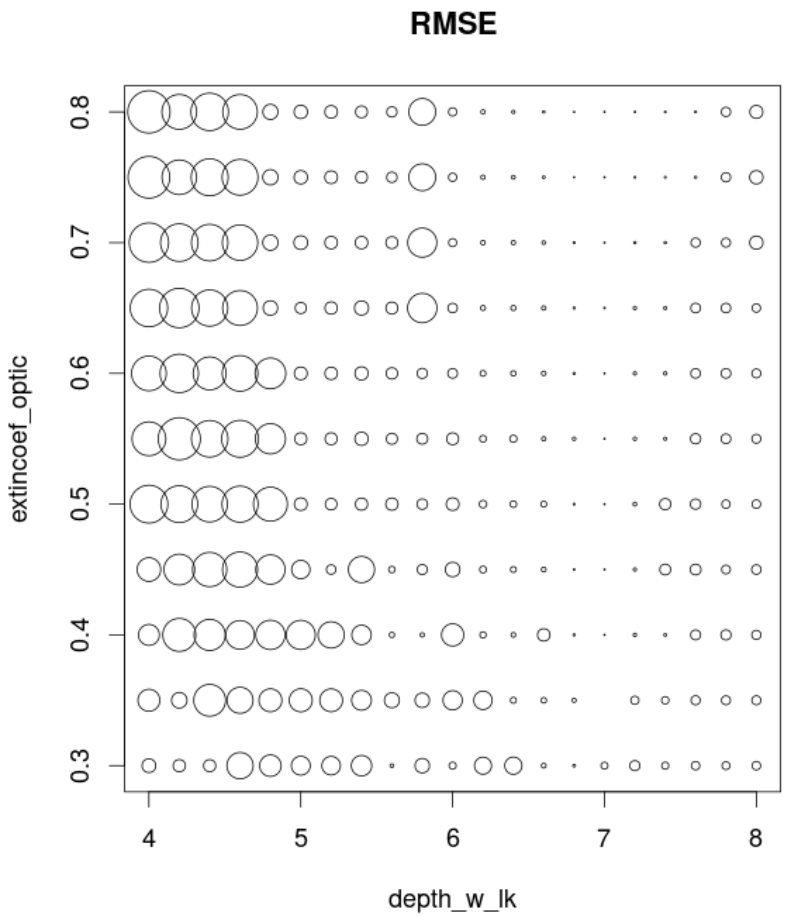
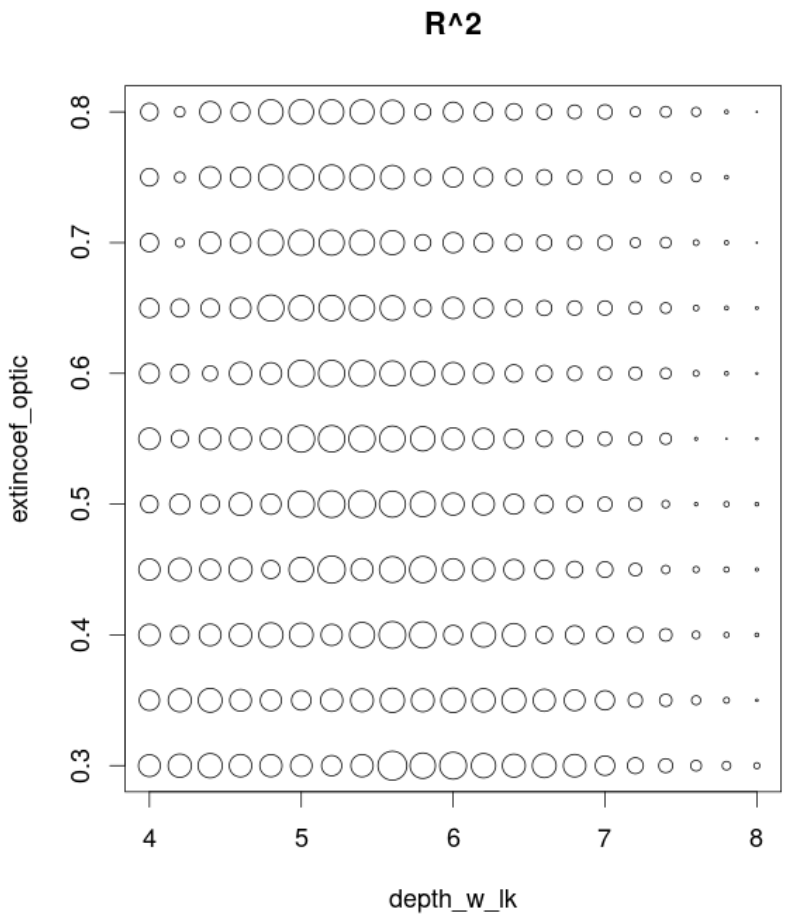
Monte Carlo two at once (depth & ext. coeff.)





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