

Interactive comment on “Evaluation of alternative formulae for calculation of surface temperature in snowmelt models using frequency analysis of temperature observations” by C. H. Luce and D. G. Tarboton

Anonymous Referee #1

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General Comments:

Luce and Tarboton have compared several methods of calculating the surface temperature in the Utah Energy Balance (UEB) model and compared them with 8 days of observations. The paper is well-written, and the Fourier techniques for modeling snow temperature are useful and innovative. I think this is a solid step forward in snow modeling.

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However, the evaluation period (8 days at one location) seems very short to draw any conclusions that can be applied generally. I strongly recommend that the authors extend their analysis with observations over a longer period before the final publication. Given that each of the techniques evaluated has fitted parameters, it is essential to assess whether these methods are applicable to other times and places, particularly whether this will make a difference where there is no data to determine what the fitted parameters for that location should be.

Specific Comments:

- 1) It would be nice to see a more comprehensive review of methods for calculating snow temperature. I would like to see a table with a review of methods currently being used in different models and a direct comparison with at least one model that uses a finite difference method with multiple snow layers to calculate the temperature of each layer (such as Jordan's SNTHRM). This would help put the present work in context with what else has been done and is currently being done in the field.
- 2) Page 3878, lines 23-24: How well does the time evolution of snowpack energy content and surface heat fluxes described here compare with the net radiative and turbulent fluxes that would more typically be used to calculate the surface energy balance?
- 3) Figure 1: Please specify the elevation of the snow surface. It's important to know how far the 35 cm thermocouple is from the snow surface.

Technical corrections:

Abstract, line 7: "fluxed" should be "fluxes"

Page 3866, lines 15-25: Please clarify this section.

Page 3875, line 5: Delete "for" after z/d

Page 3875, line 26: Insert a semicolon after snowpack. You have two complete thoughts here.

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Page 3878: line 1: Insert units after 0.007.

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