

The Cryosphere Discuss., referee comment RC3  
<https://doi.org/10.5194/tc-2021-54-RC3>, 2021  
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## **Comment on tc-2021-54**

Anonymous Referee #3

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Referee comment on "Brief communication: Growth and decay of an ice stupa in alpine conditions – a simple model driven by energy-flux observations over a glacier surface" by Johannes Oerlemans et al., The Cryosphere Discuss.,  
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This is an elegant and simple model description of stupa growth and decay based on a cone shape and standard energy balance terms. The stated goal is to estimate the speed of growth and melt of such features, while evaluating factors responsible. The model is described, and then applied to a region in Switzerland where continuous measurements allow for energy balance terms to be generated. Overall, the note is a nice contribution, and alludes to a more complete model that is in consideration for publication that takes variable surface temperature into account (Balasubramanian et al., submitted).

The study stops short of comparing the model output with actual stupa mass evolution apart from noting a similar 12 m height. The provided photos are nice in describing the stupas, but were there not any additional photos to show the evolution of the ice (accumulation, and decay) to qualitatively validate the model? In particular, the assumed constancy of the 'shape parameter', ie ratio of cone height  $h$  to base radius  $r$ ), and the evolving albedo, could be substantiated or perhaps not with a time series of photos.

Moreover, the further value of the model beyond rates of growth/decay might be more fully demonstrated, given the compelling context: ultimately testing the effectiveness of stupas as seasonal water storage.

line edits:

L23: should be "are grown"

L24: they yield water, not deliver

L28: used to make

L29: the more effectively; delete second 'effective'

L30: insert comma after summer

L31: Start new paragraph at, "In this note..."

L34: use "elevation" or "altitude" rather than "height"

L35: end: most important for what?

L55: Is there empirical evidence or physical properties to justify the assumption that the shape parameter stays constant?

L89: insert colon at end

L132: was eq. 5a used or should that be 5b for the explicit albedo?

L133: faster "now" is not clear; delete it.

L178: "solid" is awkward; actual?