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The Cryosphere Discussions

Interactive comment on "A model study of the energy and mass balance of Chhota Shigri glacier in the Western Himalaya, India" *by* F. Pithan

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Pithan (2010) constructs an energy balance model to assess mass balance and compare to field measurements on Chhota Shigri Glacier. This study can provide valuable input to our understanding of the energy balance of the many glaciers in this unique climate setting, where the summer monsoon is important, but not dominant. A better sense of the behavior of the regions glacier and this glacier must be provided from the previous work largely of Kulkarni. There is inadequate reference to the considerable work in the area that precedes Wagnon et al (2007). The variation in model output in terms of energy balance components from year to year such as displayed in Figure 6 for the average would be important. A key question that needs to be better documented from model output is the elevation distribution of the summer accumulation

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from the monsoon.

97-4: Kulkarni et al (2007) have an important summary of glacier retreat in the Chhota Shigri region, including the specific 800 m of retreat of the glacier from 1988-2003. This would be a valuable reference for the specific response of the regions glaciers from the Chenab, Baspa and Parbati basins. “Areal extent of 466 glaciers was estimated. It was 2077 sq. km in 1962 and 1628 km2 in 2001–04, an overall 21% deglaciation.”

99-22: Should mention earlier work by Kulkarni (1992 and 2001) on mass balance.

99-28: Compare the mass balance gradient to other Himalyan glaciers such as Dokriani Glacier and AX10.

107-2: At what elevation in the model did summer monsoon precipitation accumulate? This is an important question to address more fully.

107-12: I am uncertain where best to reference the paper of Wulf et al (2010), however, the following line seems particularly germane since it is dealing with the same region of the Himalaya. “Precipitation data from 80 weather stations from the western Himalaya reveal that summer precipitation from May to October accounts for 80% of the mean annual precipitation at the orogenic front, whereas winter precipitation from November to April accounts for 60% of the annual budget in the orogenic interior.”

107-22: Thayyen et al (2007) noted quite substantial variation in flow generated from snow and glacier melt from Dokriani Glacier and from the Din Gad catchment from year to year. How substantial were the seasonal and annual variations in energy balance variables during the study period?

108-5: This implies that summer monsoon precipitation is all accumulation. Given the large amount of summer precipitation this provides what percent of the accumulation above 5500 meters.

109-14: The duration of exposure of bare ice at various elevation is a key control of annual ablation. What is the model output for the rise of the transient snowline through

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the ablation season. What is the duration of the bare ice ablation season for the various elevations? Kulkarni et al (2001) noted melt events and bare ice exposed in December and January even during the 1998-2000 period.

Figure 2: the mottled glacier is not a good visual. No labels for contours.

New Figure: Figure 2 In Wagnon et al (2007) indicates the variation by month of temperature and precipitation something similar would be most useful.

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