

## ***Interactive comment on “The role of glaciers in stream flow from the Nepal Himalaya” by D. Alford and R. Armstrong***

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We thank Prof. Pelto for his comments on our paper "The role of glaciers in stream flow from the Nepal Himalaya". However, either we failed to communicate our purpose in writing this paper, or Prof. Pelto did not understand our purpose, as described in the text. At the time the studies described in this summary paper were undertaken, it was conventional wisdom, largely unchallenged by glaciologists or hydrologists, that the glaciers of the Himalaya could be gone as early as 2035, and, at that time, the major rivers of Asia would become intermittent streams. The credibility of this forecast was obviously of considerable interest to water resources planners and managers for south Asia. We were asked to evaluate this rather gloomy forecast. Our results are the basis of a report, now being prepared for publication (Alford, et.al, 2009). The paper under

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discussion here is a summary of that report.

We are very much interested in discussing our approach, and our results, as they are presented in this summary. We are not prepared to discuss the reasons why our simplifying assumptions may not be the ones Prof. Pelto would have us use. We do not feel anything is to be gained from a discussion of the fine points of glaciology, as they may, or may not, apply to the glaciers of Nepal, and to the volume of glacier melt produced annually. Prof. Pelto is quite correct in stating that we interpreted some characteristics of the Himalayan glaciers in ways not necessarily consistent with these characteristics as they have been defined for low altitude glaciers in Europe or North America, and ignored many, for which there were no, or ambiguous, data. Prof. Pelto makes a number of assumptions that we did not feel it was necessary to make in support of our methods, and justifies his assumptions from the rather thin literature of glacier studies in the Himalaya, or from features in other mountain regions. Many of our procedures and assumptions are not in keeping with those Prof. Pelto would have us use, but we were working at a scale very different from the conventional glacier mass balance study – the scale of the catchment basin, not that of the individual glacier. As we stated in the paper, our concern was primarily hydrology, and not glaciology. Our concerns relating to the study of glaciers in the mountains of south and central Asia are summed up in the Abstract of the paper :

“Recent concerns related to the potential impacts of the retreat of Himalayan glaciers on the hydrology of rivers originating in the catchment basins of the Himalaya have been accompanied by few analyses describing the role of glaciers in the hydrologic regime of these mountains. This is, at least in part, a result of the relative inaccessibility of the glaciers of the Himalaya, at altitudes generally between 4000–7000 m, and the extreme logistical difficulties of: 1) reaching the glaciers, and 2) conducting meaningful research once they have been reached. It is apparent that an alternative to traditional “Alpine” glaciology is required in the mountains of the Hindu Kush-Himalaya region”.

Our findings – that glacier melt contributes only minimally to the annual volume of

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stream flow from Nepal into the Ganges Basin – seems now to be generally accepted, following, among other events, the admission of the Intergovernmental Panel on Climate Change that they were wrong in their general assessment of the hydrologic importance and probable persistence of glaciers in the Himalaya. It is our position that there is a possibility that other aspects of the conventional wisdom concerning Himalaya glaciers and rivers may be equally in error.

#### Reference Cited

Alford, D., Armstrong, R and Racoviteanu, A. .Glaciers of the Nepal Himalaya: An Assessment of the Role of Glaciers in the Hydrologic Regime of the Nepal Himalaya, The World Bank, April 2009, 88 pp., in press.

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