

Satellite-Derived Volume Loss Rates and Glacier Speeds for the Cordillera Darwin Icefield, Chile

A. K. Melkonian, M. J. Willis, M. E. Pritchard, A. Rivera, F. Brown and S. A. Bernstein

Summary:

This paper gives a nice overview of observational changes occurring in the Cordillera Darwin Icefield, Chile. The authors use a suite of remote sensing platforms to quantify ice velocity, elevation change, and volume loss from 2000-2011. The authors have compiled an impressive data set of ice velocity and elevation change in the CDI. They display the results clearly and with the thoughtful consideration of uncertainties and biases. The figures are, for the most part, easy to follow and impressively displayed. I recommend publishing, but with some major revisions.

Major concerns:

- My major complaint about this paper is that it is a bit skimpy on the glaciological analysis. The bulk of the paper describes the setting, methodology and results, with very little interpretation. The methodology is similar to previous papers by the same authors, and lacks a clear science focus. While the dataset is valuable in and of itself, the paper could be strengthened with additional glaciological or climatological analyses.
- I also recommend the authors revisit the organization of the paper/sections. For example, volume change is discussed in the elevation change rate section (which makes it a bit confusing, especially since the topics jump around a lot); results and interpretations of individual glaciers are discussed in a number of places, which makes an overall analysis hard to follow. A stronger interpretation of the data can be achieved by discussing the interconnectedness of velocity and elevation changes for individual glaciers.
- The title implies that the paper is about volume loss rates, but in fact volume is the least discussed and most poorly measured variable here. I'm also not clear on the methodology for calculating the flux (p3518, line 6). Is the ice thickness adjusted for the observed thinning? What's the basis for the average front wall height and total glacier thickness? How were the errors estimated?

Additional concerns:

- I had trouble following the description of sub-aqueous volume calculations. Perhaps simply rewording this paragraph, and/or the organization of the section will help. It seems out of place and the methodology here is hard to follow.
- I understand the rationale for adding 2m to the C-band derived SRTM elevations for CDI, but I'm not entirely sure it's valid. Especially since, based on the blue dv/dt trends in Figure 10, that first SRTM data point really dictates the trend in some areas.
- Some of the figure captions are misleading, or need to be better described in the text. For example, Figures 5 and 6 show maximum dh/dt at ~ 2 km from

the terminus. This is merely a function of the terminus retreat, not that thinning really is maximal at this odd distance up-stream. This should be pointed out somewhere.