Climate and glacier variability in western North America

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ABSTRACT. A simple model using once-daily upper air values in the NCEP-NCAR Reanalysis database estimates seasonal mass balance at two glaciers in southern Alaska, one in western Canada, and one in Washington substantially better than any of several seasonallyaveraged, large-scale climate indices commonly used. Whereas sea level pressure and sea surface temperature in the Pacific exert a strong influence on the climate in the region, temperature and moisture flux at 850-mb have a more direct effect on mass balance processes — accumulation and ablation — because their temporal variability better matches that of those processes. The 40-year record of 850-mb temperature shows 1976-77 winter warming and 1988-89 summer warming throughout the region; mass balance records reflect the summer warming at all four glaciers but winter warming only at the southern two. The only pronounced long-term change in the moisture regime is a decrease of precipitation in the south and an increase in the north. Interannual variations in the location of the moisture flux, however, apparently account for the strong negative correlation between the Alaska glaciers and the other two.