Geophysical Research Abstracts, Vol. 9, 04485, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04485

Surface-temperature variability in the major drainage basins of the Greenland ice sheet using MODIS data, 2000 – 2006

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Detailed mapping of the surface temperature, T_s, of the Greenland Ice Sheet (GIS) using the Moderate-Resolution Imaging Spectroradiometer (MODIS) land-surface temperature (LST) standard 1-km resolution, daily product from 2000 – 2006 shows that T_s is a sensitive indicator of surface melt frequency, timing and duration. Modeling results by other researchers show that an annual or summer temperature rise of only 1˚C can increase ablation by 20 – 50% thus it is of critical importance to study the T_s and melt trends of the GIS. We show that each of the GIS six major drainage basins reacts more-or-less independently to internal and external forcings. Each of the six major drainage basins of the GIS exhibits a unique mean T_s, trends in T_s, and melt characteristics though all the trends are not statistically significant at least in part due to the brevity of the study period. All six major drainage basins show a trend toward higher mean T_s over the 7-year study period, and most show a trend toward a longer melt season, however some of the "trends" are very weak. Drainage basin 4, in southeast Greenland, and Basin 5 in southwest Greenland, have the highest mean T_s, and show pronounced trends toward an earlier start and end of the melt season, while the other basins show weak trends toward a later start and end of the melt season. In basins 4 and 5, increased outlet-glacier acceleration and associated seismic events have been reported by other researchers, and Basin 4 has been reported to have experienced the greatest mass loss of all of the basins.