



Global glacier mass losses and mass balance sensitivities assessed from observations and gridded climate data

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Glaciers have generally experienced mass loss in the last couple of decades with strongly accelerated ice wastage during the last decade. We study regional differences in mass balance sensitivities in response to climate warming and present a methodology for global assessment of glacier mass loss of all glaciers outside the ice sheets in Greenland and Antarctica during the last decades. Annual and seasonal mass balance sensitivities are computed for a large number of glaciers based on calibration of a simple temperature-index regression model to observations of seasonal mass balances using ERA-40 re-analysis data as climate input. The mass balance sensitivities are then regionalized by means of a continentality index and annual precipitation as derived for each grid cell of the ERA-40 grid. Regional estimates of glacier mass loss are computed from regionalized mass balance sensitivities, observed temperature trends and glacier area. Results indicate that previous global assessments based on extrapolation of measured mass balances may have underestimated glacier mass loss during the last 40 years due to underestimation of high sensitivities in areas where measurements are scarce.