Increasing meltwater discharge from the Nuuk region of the Greenland ice sheet and implications for mass balance (1960-2012)

We assess the runoff and surface mass balance (SMB) of the Greenland ice sheet in the Nuuk region (southwest) using output of two regional climate models (RCMs) evaluated by observations. The region encompasses six glaciers that drain into Godthåbsfjord. RCM data (1960-2012) are resampled to a high spatial resolution to include the narrow (relative to the native grid spacing) glacier trunks in the ice mask. Comparing RCM gridded results with automatic weather station (AWS) point measurements reveals that locally models can underestimate ablation and overestimate accumulation by up to tens of per cent. However, comparison with lake discharge indicates that modelled regional runoff totals are more accurate. Model results show that melt and runoff in the Nuuk region have doubled over the past two decades. Regional SMB attained negative values in recent high-melt years. Taking into account frontal ablation of the marine-terminating glaciers, the region lost 10-20 km³ of ice per year in 2010-12. If 2010 melting prevails during the remainder of this century, a low-end estimate of sea-level rise of 5 mm is expected by 2100 from this relatively small section (2.6%) of the ice sheet alone.