Geophysical Research Abstracts
Vol. 14, EGU2012-11222, 2012
EGU General Assembly 2012

The first glacier inventory for entire Greenland

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Detailed glacier data is becoming more and more important in the last decades to solve several research issues. One of the most prominent questions in this regard is the potential contribution of glaciers and icecaps (GIC) to global sea-level rise. Primarily, estimates are uncertain due to the globally still incomplete information about glacier location and size, as well as large uncertainties in future climate scenarios. Recent studies that calculate global sea-level rise from GIC have developed simplified approaches using information from glacier inventories or gridded data sets and a range of different global climate models and emission scenarios. However, for several strongly glacierized regions very rough assumptions about the ice distribution have to be made and an urgent demand for a globally complete glacier inventory is expressed.

The GIC on Greenland are one of the regions with lacking information. Within the EU FP7 project ice2sea we mapped the GIC on Greenland using Landsat TM/ETM+ imagery acquired around the year 2000, along with an additional dataset in the North (DCW - Digital Chart of the World). A digital elevation model (DEM) with 90 m resolution (GIMP DEM) was used to derive drainage divides and henceforth topographic parameters for each entity. A major challenge in this regard is the application of a consistent strategy to separate the local GIC from the ice sheet. For this purpose we have defined different levels of connectivity (CL) of the local GIC with the ice sheet:
CL0: Not connected.
CL1: Connected but separable (either with drainage divides in the accumulation region or in touch only - and thus separable - in the ablation region).
CL2: Connected but non-separable (the local GIC contribute to the flow of an ice sheet outlet in the ablation area).

Up to now close to 12’000 GIC (only CL0 and CL1) with a total area of about 129’000 km^2 have been mapped considering only entities larger than 0.1 km^2. The area of the ice sheet itself is approximately 1’684’000 km^2. The entire ice-covered area on Greenland is thus 1’813’000 km^2. We will present the results of the GIC mapping along with an analysis of glacier inventory statistics.