A new glacier inventory on southern Baffin Island, Canada, from ASTER data: I. Methods, challenges and solutions

F. Svoboda and F. Paul

University of Zurich, Department of Geography, Zurich, Switzerland (frank.paul@geo.uzh.ch)

According to recent climate scenarios, the Arctic regions will experience a particular strong increase in temperature in the coming decades. Thus, the strongly glacierized Canadian Arctic could then greatly contribute to global sea level rise. For a quantitative assessment of overall changes a glacier inventory based on vector outlines is required. This is lacking in many remote areas, or, in the case of Baffin Island, it has been made but the data have not been forwarded to the world data centres. Within the framework of the GLIMS initiative and the GlobGlacier project we used multispectral satellite data in combination with DEM information to map and inventory glaciers and icecaps for the southern part of Cumberland Peninsula, Baffin Island (Canada), with automated techniques.

In this study two ASTER scenes from August 2000 are used for DEM generation and mapping of recent glacier outlines and LIA trimlines to generate detailed glacier inventory data. Additionally a change assessment with the freely available Landsat MSS (1975) and TM (1990) scenes from the GLCF has been made. The study is separated in two parts: In the first part the applied methods and the encountered challenges are described and discussed. The results of the new inventory, the change assessment and application of the obtained data are presented in part II. A major aim of both contributions is also to discuss common standards for glacier mapping and inventory data creation.

In part I the extraction of the DEM from ASTER, its accuracy, regions of error, fields of application and possible corrections are discussed. We further describe the mapping of glacier outlines from MSS, TM and ASTER which have varying resolution and spectral bands. The required manual correction of the generated glacier outlines (debris, water, snow and shadow) and the challenges that have to be considered in this region are presented as well. A major and at the same time critical part is the delineation of glacier basins. These are digitized to define each glacier entity, remove misclassification (attached snow fields and glacier lakes), allow to select glaciers from a larger sample and to perform an area-consistent calculation of changes. Although the ASTER DEM has been used to derive a flow direction grid, the decision whether an ice-divide has to be digitized or not is often difficult.