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Development of a 30m global database of small glaciers and ice caps using Landsat TM

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Volume loss of small glaciers and ice caps has been obvious in many parts of the world. In order to adequately project future volume change of glacier volume and its impact on world water resources, location and area information of small glaciers and ice caps are indispensable. Since the World Glacier Inventory (WGI) has started in the International Hydrological Decade (1965-1974), inventory of small glaciers and ice caps worldwide has been developed. Due to the limited information of photographs and local survey, however, the glacier inventory is still incomplete especially over the steep mountainous regions and for glaciers in developing countries. In this study, we developed a method to extract location and area information of small glaciers and ice caps from Landsat TM. Using combination of ratio of band4 and band5 and band3 of the Landsat TM with 9x9 average filter, we obtained location and area of small glaciers and ice caps at 30m horizontal resolution. The method was then applied to whole global and 30m global glacier outline data was completed. The developed product is consistent with glacier area estimations by previous researches at regional scale. Glacier outlines are also very similar to the satellite derived product such as GLIMS data base at many regions. Glacier area is overestimated at some parts of Scandinavian glaciers where number of available Landsat TM images is limited and we could only use images in snowy season. Our product will be improved when better image is available in future in these regions. Glacier area is underestimated at debris covered glacier such as in western Himalaya and Caucasus because glacier outline is difficult to extract only from the reflecting characters of Landsat TM. Combination of local survey inventory and/or development of different extracting algorithm using other data are required for improving our data set over these regions. The created global glacier information in 30m resolution can be used for global hydrological and land surface models for estimating future projection of glacier volume and its impact on world water resources.