Hydrological Research Letters
Japan Society of Hydrology and Water Resources

ONLINE ISSN: 1882-3416

(As of October 19, 2013) Registered articles: 101

Hydrological Research Letters
Vol. 7 (2013) No. 3 p. 73-78

Doi

http://dx.doi.org/10.3178/hrl.7.73

Joi

DN/JST.JSTAGE/hrl/7.73

A monitoring system for mountain glaciers and ice caps using 30 meter resolution satellite data

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Released on J-STAGE 2013/09/20
Received 2013/05/29 Accepted 2013/08/13

We developed a monitoring system for deriving outlines of mountain glaciers and ice caps (MG&IC) at a 30 m horizontal resolution from Landsat Thematic Mapper (TM) and Landsat Enhanced Thematic Mapper plus (ETM+). Location and area information at 30 m resolution was obtained using a band ratio (TM4/TM5) and a threshold value of TM3 with a 9 by 9 pixel average filter. The total area and number of MG&IC were 449482 km^2 and 414258, respectively. The glacier outlines were similar to previous satellite-derived products for different regions. Although the derived glacier area was similar to previous estimates at regional scales, it was overestimated in some parts of Scandinavia where available satellite images are limited and only snowy season images can be used, and was underestimated in the western Himalayas and Caucasus where the glacier outlines are derived with difficulty from satellite images because of the effect of debris cover. Our system to monitor MG&IC has potential application in global hydrological and land-surface models and estimates of global sea-level rise.

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Edited and published by : Japan Society of Hydrology and Water Resources Produced and listed by : Nakanishi Printing Co.,Ltd.(Vol. 4 (2010)) Gakujutsu-tosho Printing Co. Ltd.(Vol. 2 (2008) - Vol. 4 (2010))