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Extraction of seasonal surface ablation zone in DALK glacier based on Landsat-8

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Spatio-temporal variation of snowmelt affects the Earth's radiation budget hence serves as a proxy of climate change and global warming. Ablation zone including blue ice and wetsnow has a low surface albedo and melt water ponding ice shelf surface during summer that enhances crevasse propagation then poses a threat the stability of ice shelves. The lack of high spatial and temporal ablation product limits the in-depth exploration of the mechanism and spatio-temporal characteristics of ablation in Antarctica. Here an ablation area detection method based on the modified normalized difference water index adapted for ice ($MNDWI_{ice}$) is developed to determine and characterize ablation variationsbased on Landsat-8 images of the Dalk glacier, East Antarctica, between September 2016 and March 2017.. The results showed that the Landsat-8 reflectance data can be used to extract seasonal ablation using a uniform $MNDWI_{ice}$ threshold (0.136), and the average extraction accuracy is 81.5%, and varies between 67.7% and 94.2% in case of the thin cloud and fractional topographic shadow.The ablation area and the mean value of $MNDWI_{ice}$ in the ablation zone show obvious seasonal spatio-temporal variation characteristics. The ablation area in the Dalk glacier appears no later than the earliest time (early September) of the observation. The earliest appearance of ablation is mainly distributed at the eastern grounding line where the terrain changes drastically. Brightness temperature and air temperature of Zhongshan Station show a strong correlation, which can be used as a mechanism analysis of the ablation zone distribution.

Key words Antarctica, Dalk glacier, ablation, $MNDWI_{ice}$