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Aufeis resources and their role in water balance of North-Eastern Eurasia

Nataliia Nesterova^{1,2,3}, Olga Makarieva^{2,4}, Andrey Shikhov⁵, Andrey Ostashov^{1,2}, Anastasiya Zemlyanskova^{1,2}, and Vladimir Alexeev⁴

¹North-Eastern Permafrost Station, Melnikov Permafrost Institute, Magadan, Russian Federation (nnesterova1994@gmail.com)

²St. Petersburg State University, Institute of Earth Sciences, Hydrology, St.Petersburg, Russian Federation (nnesterova1994@gmail.com)

³State Hydrological Institute, St. Petersburg, Russian Federation

⁴Melnikov Permafrost Institute, Yakutsk, Russian Federation

⁵Perm State University, Perm, Russian Federation

Aufeis are widespread in the territory of the North-East of Eurasia (including the basins of large rivers in permafrost, such as the Yana, Indigirka, Kolyma, Anadyr, Penzhina Rivers and rivers of the Chukchi Peninsula. They comprise an important water resource of the study region. Based on the analysis of Landsat satellite images for the period 2013-2019 the number and characteristics giant aufeis (area $\geq 0.1 \text{ km}^2$) were estimated. As Landsat images do not always allow correctly assess the maximum area of aufeis, it was adjusted to get the maximum value before the beginning of ablation period for the assessment of aufeis resources.

After correction total maximum area of aufeis formed by groundwater reaches 4529 km^2 . The aufeis resources of the North-East and of the large river basins were assessed. The aufeis resources vary from 0.4 to 4.25 km^3 (or $3.7 - 11 \text{ mm}$) for individual basins of large rivers. They are at least 10.6 km^3 in total or 5 mm of water depth in average for the study area.

The contribution of aufeis runoff to streamflow in different seasons was calculated for 58 hydrological gauges (area $523 - 526000 \text{ km}^2$). Aufeis annual runoff varies from 0.3 to 29 mm ($0.1 - 22\%$, average 3.8%) with the share in winter runoff amount about $6 - 712 \%$ (average 112%) and the spring freshet $0.2 - 43\%$ (average 7.1%).

The influence of aufeis and glaciers on the water balance is compared – in general, the aufeis runoff exceeds the glacial runoff. The response of aufeis to climate change depends on different factors of the natural system.

The dynamics of aufeis formation is directly related to winter runoff, which changes are observed in different parts of the cryolithozone. The presented results are relevant for studying the impact of climate change on the hydrological cycle and its components in the permafrost regions of the Northern Hemisphere.

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