

## Wintertime urban heat islands of the medium-sized Russian Arctic cities: the first quasi-climatological estimates

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The Urban Heat Island (UHI) effect is well studied for moderate and low latitudes. However, the knowledge about the UHIs in the Arctic was extremely poor until the nowadays and was limited by only a few studies for Alaskan towns, while the biggest Arctic cities located in Russia remained the terra incognita of urban climatology.

In this study, we present the first estimates of wintertime UHI intensity for the medium-sized cities of Russian Arctic. They are based on the UHIARC (Urban Heat Island Arctic Research Campaign) seasonal-scale experimental meteorological observations in the five cities: Apatity, Vorkuta, Nadym, Novy Urengoy and Salekhard. Observations were made by the automatic weather stations and low-cost temperature loggers.

The measurements in Vorkuta, Nadym, Novy Urengoy and Salekhard have shown quite similar values of the UHI intensity and patterns of its temporal variation. The average winter UHI intensity is 1-1.5 K, while extremes up to 6-7 K are observed in frosty anticyclonic weather [1]. Such results proof the existence of the UHI effect during the Arctic winter and polar night and could be considered as the first quasi-climatological seasonal estimates of its intensity for typical medium-sized cities in the considered region.

The Arctic UHIs could be strongly amplified by local relief features. For Apatity town, located in a more complex terrain, the extremely high urban-rural temperature differences up to 12 K were found between the city, located at the top of the hill, and local WMO weather station located at the lowland [2]. The complex analysis with application of remote sensing data and regional mesoscale modeling revealed that anthropogenic contribution to the observed urban-rural contrasts is about 50% [3], which is approximately similar to the estimates of UHI intensity for the four other cities.

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