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Research of surface-based temperature inversions in Nadym (YNAO) according direct measurement and simulation

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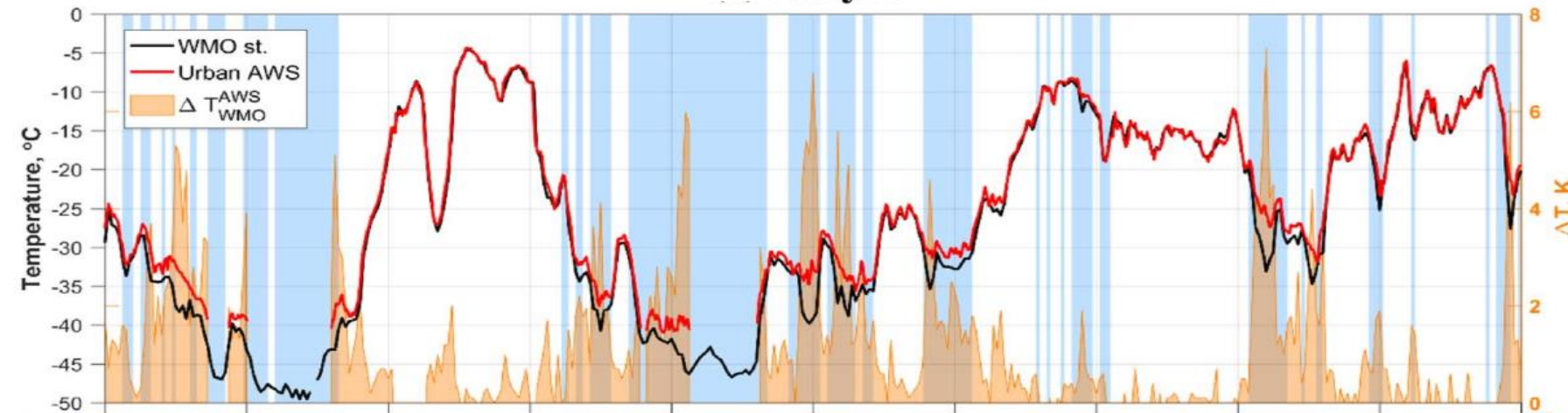
Motivation

Phenomenon's dangers and its intensity at urban zone



Temperature inversion and air pollution
Fairbanks, Alaska

Nadym



Intensity of the Nadym's Urban Heat Island (shown by orange shading)

[Konstantinov et al., 2018]

Main issue of the research

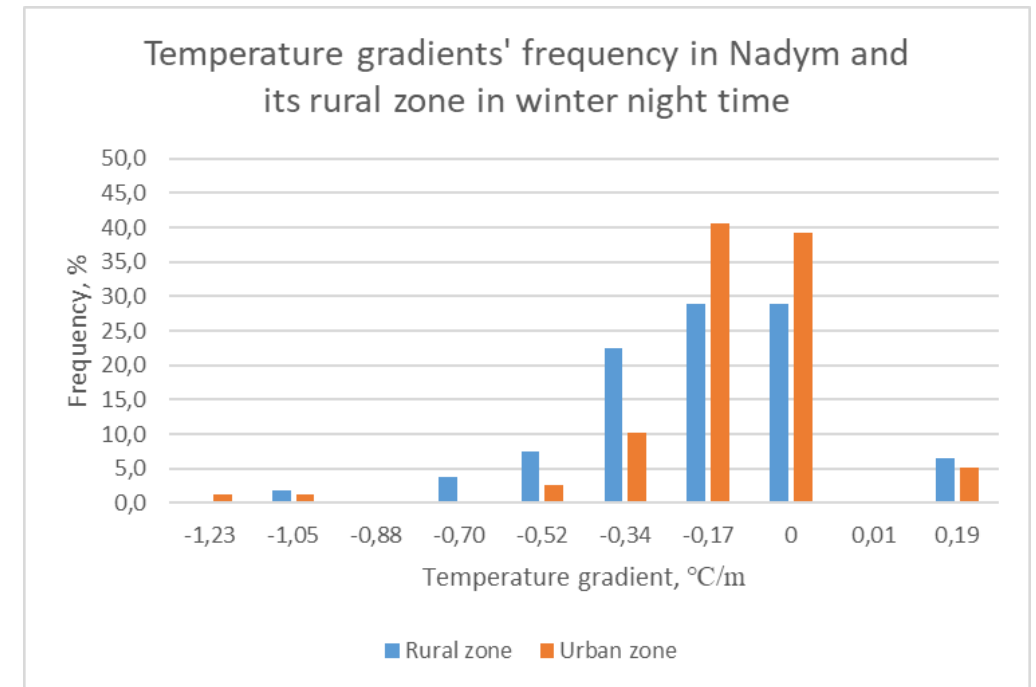
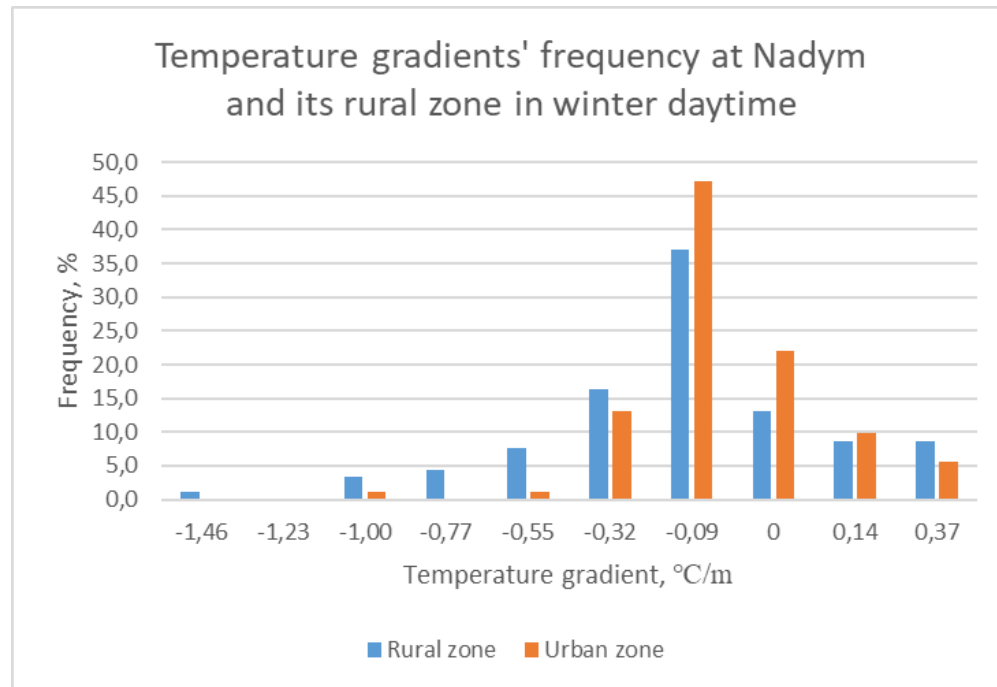
Main issue: estimation of surface-based inversions' frequency and spatial distribution in Nadym (Yamalo-Nenetsky Avtonomny Okrug) according direct measurement and simulation.

Objectives:

- To install gradient observation complexes with HOBO MX2303 Two External Temperature Sensors Data Logger at urban and rural zones
- To analyze observations' results and to estimate surface-based inversions' frequency and spatial distribution in Nadym
- To realize numerical experiment with WRF ARW 4.0 and to compare results for rural zone with measurements of microwave temperature profiler MTP-5

Results

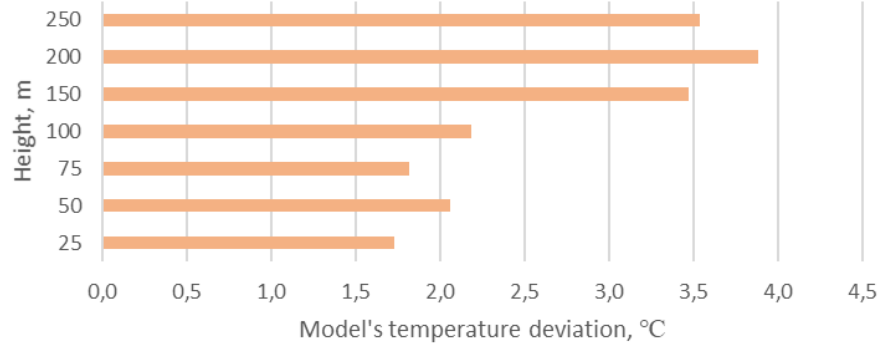
Gradient measurements



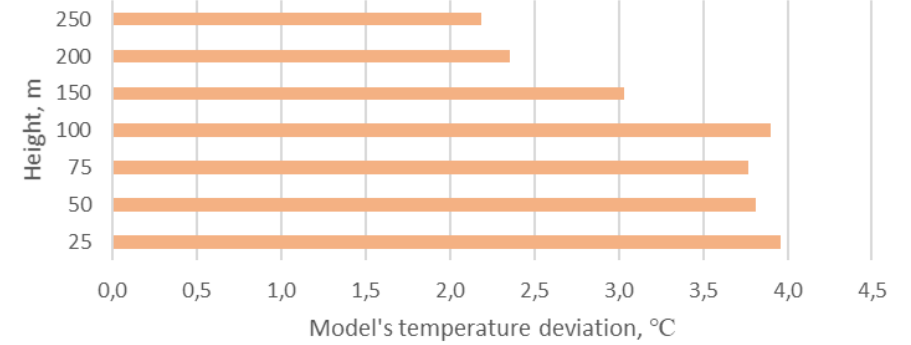
Results

Numerical experiment

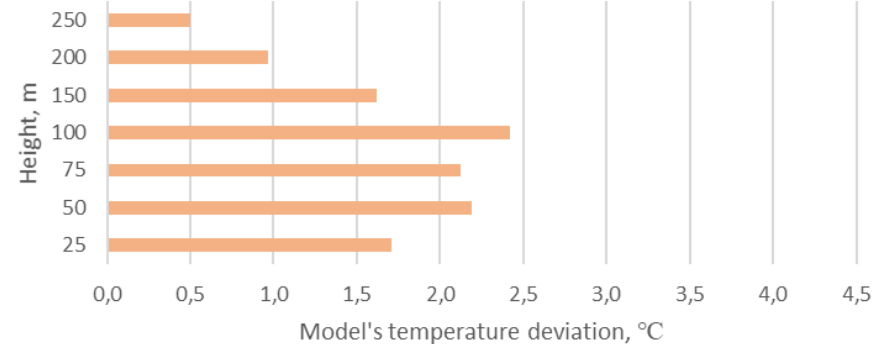
Comparison results of WRF ARW 4.0 numerical experiment with MTP-5's measurements for Nadym's rural zone at 08:00 22.12.2018



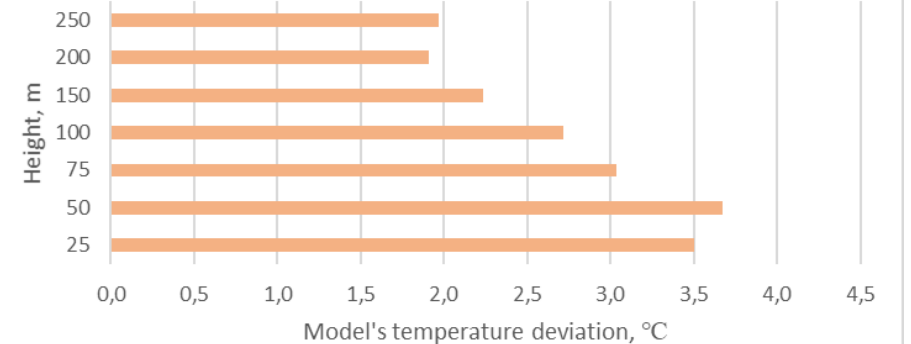
Comparison results of WRF ARW 4.0 numerical experiment with MTP-5's measurements for Nadym's rural zone at 20:00 22.12.2018



Comparison results of WRF ARW 4.0 numerical experiment with MTP-5's measurements for Nadym's rural zone at 14:00 22.12.2018



Comparison results of WRF ARW 4.0 numerical experiment with MTP-5's measurements for Nadym's rural zone at 23:00 22.12.2018



Conclusions

- Frequency of surface-based temperature inversions at the rural and urban areas are almost no different (the difference isn't more than 1-2%).
- Frequency of surface-based temperature inversions at night time is more than **90%**, frequency at day time is more than **80%**.
- The average temperature gradient of the inversion in the city of Nadym is **-0.28°C/m** for the rural area and **-0.30°C/m** for the urban area.
- Maximum deviations of model values is observed in stable stratification cases.

Thanks for your attention!