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Retrieval of wind vectors from the Arktika-M MSU-GS/VE visible channel data /

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The study addresses a retrieval of wind vector fields from satellite data. An algorithm developed for the 0.7 μm channel of the MSU-GS/VE instrument aboard the Arktika-M series satellites is presented. The method is based on a modified differential optical flow algorithm (the Brox method) optimized for GPU-based computations. To ensure the product reliability, a quality control and filtering system was developed, incorporating tests for image contrast, minimum wind speed, and both vertical and spatial consistency of the vectors. Validation of the results for 2025–2026 demonstrated high agreement with reference data: the root-mean-square vector difference reached 5.22 m/s against radiosonde observations and 5.33 m/s as compared to the GFS model. While accuracy decreases at large satellite zenith angles and in the upper troposphere, the overall performance meets the standards set by the World Meteorological Organization. The resulting products feature high spatial density and are suitable for both the synoptic analysis of the Arctic atmosphere and subsequent assimilation into numerical weather prediction models.

Keywords: wind vectors, visible band, Arktika-M, MSU-GS, optical flow, Brox method

Tab. 3. Fig. 5. Ref. 8