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“Assessment of the current state of atmospheric air in the Atyrau region (Republic Kazakhstan) in the sustainable development context”

Studying atmospheric pollution in the Republic of Kazakhstan is important, multicomponent and interdisciplinary task (Assanov et al., 2021; Tursumbayeva et al., 2023). It is due to complexity of natural and anthropogenic factors, atmospheric and air pollution processes and interactions (Mukhtarov et al., 2023). In some Kazakhstan cities concentrations of pollutants are exceeded air quality standards (recommended by WHO) (Baimatova et al., 2022). Therefore, studying meteorological factors (such as wind characteristics, temperature inversions, limited precipitation, fogs, etc. contribute to the accumulation and increase in pollution levels). In large and populated cities, industrial facilities, factories, local transport, private houses heating, etc. lead to situation when the lowest layers of the atmosphere are highly polluted with various chemical species (Kerimray et al., 2020abc). All these worsen the human living conditions and could have a negatively effect on population and environment. Thus, it is important to obtain knowledge about meteorological conditions that contribute to the atmospheric transport, accumulation, dispersion and deposition of pollutants in the study region (in particular, the Atyrau region of Kazakhstan). Finally, it is necessary for climate-ecological characterization of atmospheric conditions in the studied region, and it is needed for development of forecasts of air basin pollution degree, making knowledge-based economic and policy decisions.

The main aims are: (i) to carry out a comprehensive research of the air basin quality in the Atyrau region by collecting, processing, visualising, analysing and interpreting the meteorology and air quality monitoring related observational data; (ii) to simulate meteorology and atmospheric composition (with focus on aerosols) in the studied region employing seamless modelling approach; and (iii) to develop a set of recommendations for improving air quality management on a basis of scenario assessments and advance diagnostics of air environment parameters. Research methods include using of a set of modern methods and tools for statistics, spatiotemporal analysis, statistical processing of initial information and geoinformation mapping, regional scale modelling.

For our research, we combine various types of atmospheric and chemistry modelling tools, e.g., Enviro-HIRLAM (High Resolution Limited Area Model; Baklanov et al., 2017), to conduct short-term simulations, where the modeling platform provided by The Pan-Eurasian Experiment Modelling Platform (PEEX-MP; Mahura et al., 2024) as well as the services from CSC is essential and highly required.

References:

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