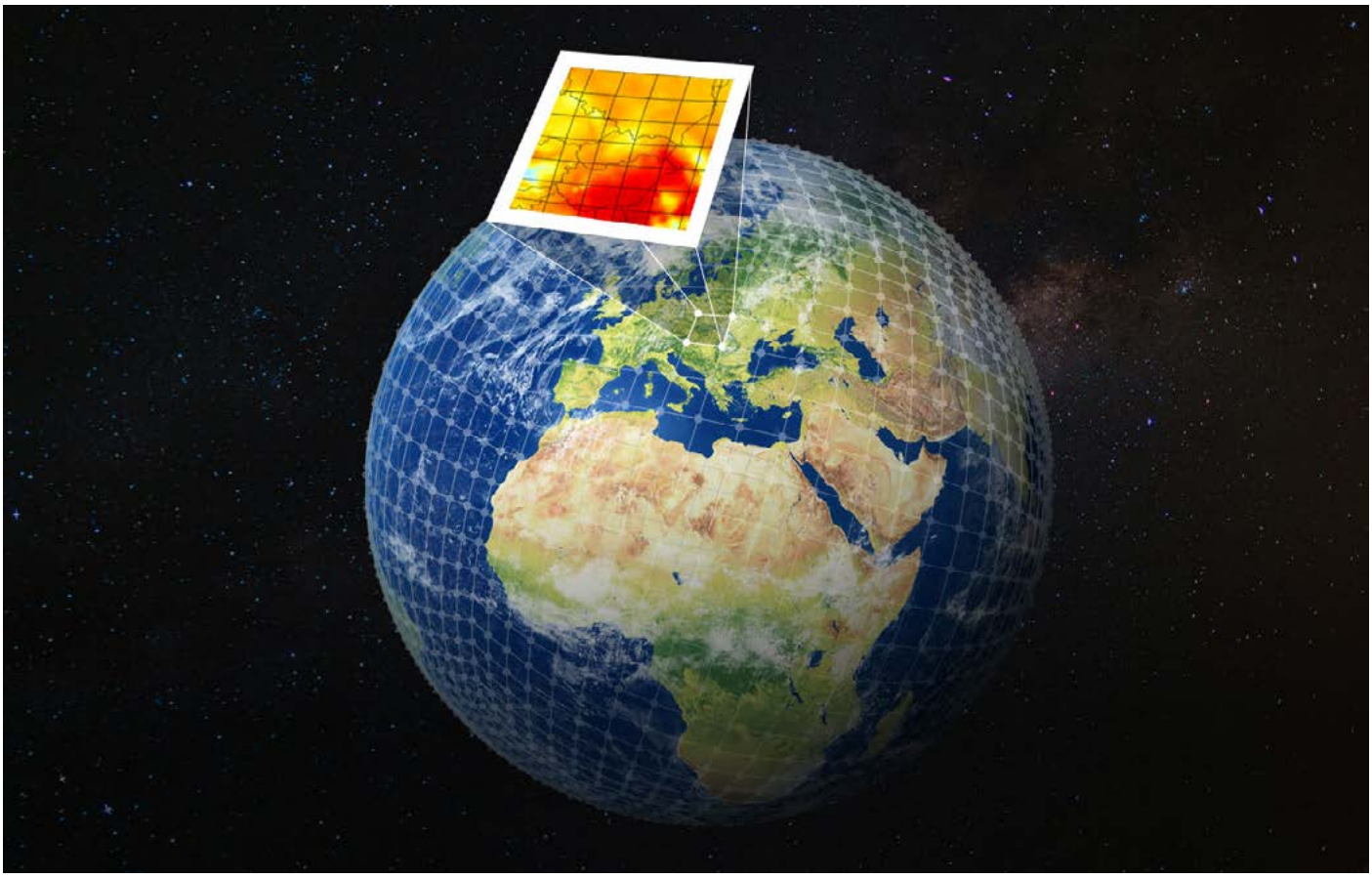
Local Reanalysis

The climate is always changing, however, such an unprecedented increase in the rate of changes in climatic characteristics over the past 50 - 60 years has not been observed in the entire history of observations. Climate change brings new challenges to humanity, so the relevance of accounting for weather and climate factors is growing every day.



Weather and climate studies require long time series of observational data. However, in practice, the observations do not cover the study region regularly and often contain gaps for one reason or another. Reanalyses are used to obtain reliable and consistent data on past weather and climate.

Reanalysis is the result of the work of a numerical model or a group of models combined into a single multi-model system with the assimilation of a wide range of observational network data, including satellite information, measurements from aircraft and probes, ships and buoys, as well as radar data. The resulting hydrometeorological parameters are presented on a regular grid as consistent data fields based on a long period of observations. Reanalysis data can be used to obtain statistics on the intensity and frequency of extreme weather events in the past. This information is very valuable and could be used, for example, to update the standard values (considered as extreme) for the selected atmospheric parameters.

Depending on the requirements for spatial resolution, both global and regional reanalyses are applied. The use of global reanalyses for applied studies of regional climate has a number of limitations associated with the insufficient spatial resolution of modern global models. On a global scale, reanalyses have a spatial resolution of no more than 25 km, but the scope of economic activity may require taking into account weather and climate factors on a much smaller scale: several kilometers or less.

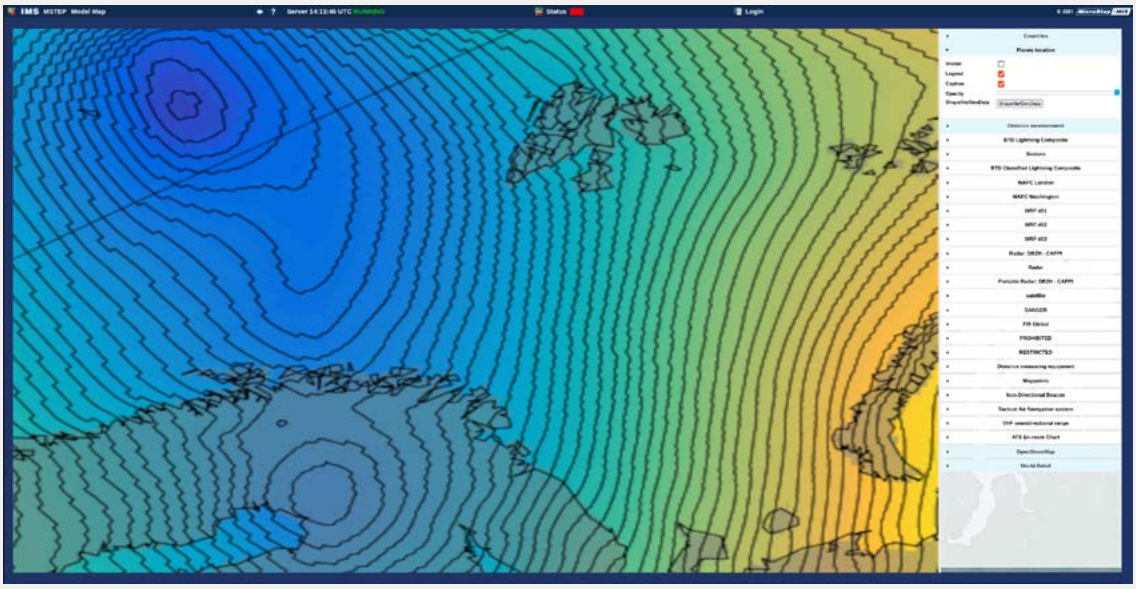
An indispensable tool for obtaining detailed information about regional climate features is regional reanalyses based on principles common to global models, but with a higher spatial resolution, including numerous assimilation tools for various datasets: from satellite to station ones.

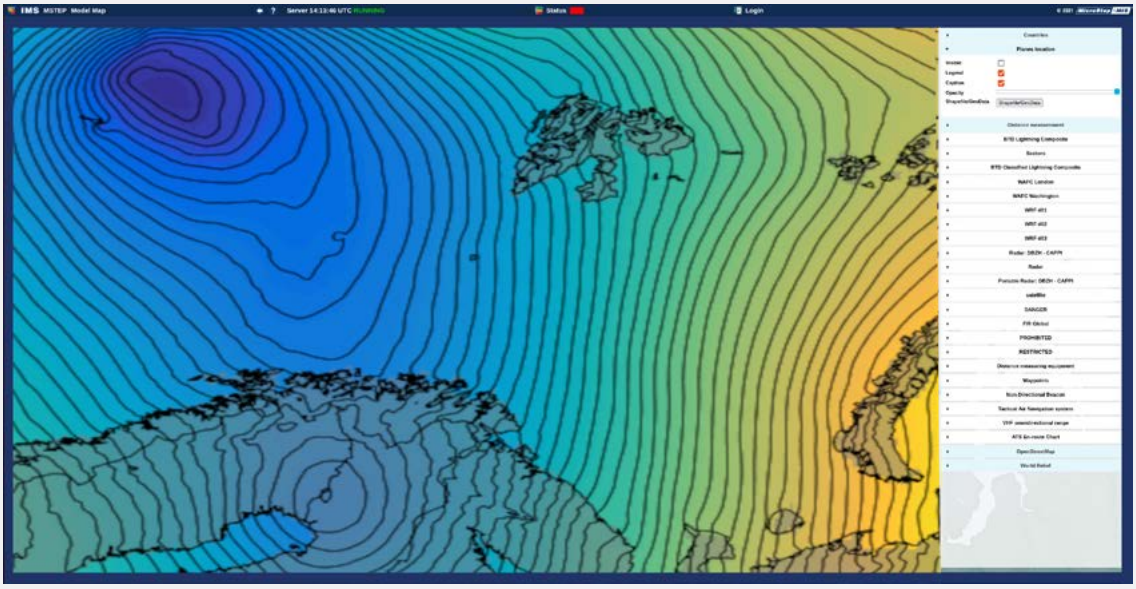
In MicroStep-MIS, the product of regional reanalysis is developed on the basis of modern regional numerical models of the

atmosphere and/or ocean. The result is presented as a database of meteorological or hydrometeorological parameters, covering at least 30 years period. The time resolution of reanalysis reaches 1 hour. A wide range of parameters can be included in the regional reanalysis database: standard (temperature, humidity, precipitation, etc.) characteristics, specialized indices, and parameters required by the customer.

If the amount of observational data for the reanalysis period is small, MicroStep-MIS offers a simplified version of reanalysis, a local (or refined) analysis, for implementation. It is based on the same regional models of the atmosphere (ocean) but without full-scale involvement of assimilation. Unlike global models, regional models allow explicitly calculating small-scale physical atmospheric and/or marine processes and implicitly calculating short-lived turbulent processes in several ways. Due to these features, the result of local analysis has higher quality than the product of global reanalysis.

The calculation results of both global and local analysis/ reanalysis are decoded, structured, and tested for actual data compliance in IMS4. The user is provided with convenient and quick access to the processed results, which are displayed in the form of maps, graphs, and tables.





Rough pressure field of global reanalysis (upper screenshot) and detailed pressure field of local arctic reanalysis (below screenshot)