

**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Technical guideline for numerical forecasting of ambient air
quality**

环境空气质量数值预报技术规范

(English Translation)

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Foreword

To implement the Environmental Protection Law of the People's Republic of China and the Air Pollution Prevention and Control Law of the People's Republic of China to improve the environment, protect human health, standardize the forecast of ambient air quality, and formulate this standard.

This standard specifies the basic requirements, calculation processing, and effect evaluation methods of ambient air quality numerical forecast models.

This standard is applicable to guide the operational numerical forecast of ambient air quality by the national ecological environment department.

This standard is issued for the first time.

This standard was formulated by the Department of Ecological Environment Monitoring and the Department of Regulations and Standards of the Ministry of Ecology and Environment.

Drafting organizations of this standard. China Environmental Monitoring Center, Institute of Atmospheric Physics, Chinese Academy of Sciences, Nanjing University, Shanghai Environmental Monitoring Center, Guangdong Environmental Monitoring Center, Beijing Environmental Monitoring Center.

This standard was approved by the Ministry of Ecology and Environment on May 15, 2020.

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This standard is interpreted by the Ministry of Ecology and Environment.

1 Technical specifications for numerical prediction of ambient air quality

- 1 Scope of application this standard specifies the basic requirements, calculation

processing, and effect evaluation methods of ambient air quality numerical forecast models.

This standard is applicable to the operational numerical forecast of ambient air quality by the national ecological environment department, and is used to regulate and guide business the basic performance, composition and simulation effect of the numerical forecast model of ambient air quality for chemical application.

2 Normative references

This standard quotes the following documents or their clauses. For undated reference documents, their valid versions are applicable to this standard.

GB 3095 Ambient Air Quality Standard HJ 633 Technical Regulations for Ambient Air Quality Index (AQI)

3 Terms and definitions

The following terms and definitions apply to this standard.

Numerical forecasting model for ambient air quality Based on the basic physical and chemical principles in the formation of air pollutants, numerical calculation methods are used to simulate air pollutants A system that predicts the air quality through physical and chemical processes such as emissions, diffusion, transportation, chemical reactions, and removal.

Numerical forecasting of ambient air quality Use the numerical forecast model of ambient air quality to predict the concentration and temporal changes of the main pollutants in the atmosphere.

Measure the environmental air quality status and potential pollution process in cities and regions, and provide guidance for the daily life and production activities of the public and services to provide a scientific basis for management departments to take response measures.

Model-ready pollutant emission inventory Based on the air pollutant source emission inventory and source inventory processing mode, combined with geographic information data such as population and traffic road network, According to the time distribution and chemical composition of different types of emission sources, according to the temporal and spatial resolution of the numerical forecast model of ambient air quality and chemical mechanism requirements, processing the obtained gridded source emission data.

Atmospheric chemical data assimilation

2 Based on the optimal estimation theory, using the temporal and spatial evolution of model state variables and the continuous constraints of physical and chemical properties, the Multi-source atmospheric chemical composition observation information is continuously

integrated into the ambient air quality model system for more accurate estimation or prediction. Unknown variables, methods to reduce uncertainty.

4.1 Spatial scale range

4.1.1

The numerical forecast model of ambient air quality should objectively reflect the level and change of ambient air quality within a certain space. According to the law, the spatial scale range applied by the model can be divided into global scale, continental scale, regional scale and urban scale.

4.1.2

The continental scale covers East Asia, and the spatial extent is usually over 9 million square kilometers.

4.1.3

The regional scale covers urban agglomerations, and the spatial range is usually 1 to 9 million square kilometers.

4.1.4

The urban scale covers the city and its surrounding areas, and the spatial scope is usually less than 1 million square kilometers.

4.2 Spatial resolution

4.2.1

The horizontal resolution of the calculation area of the ambient air quality numerical forecast model, the global scale is not lower than longitude 1° x latitude 1° , the continental scale is not less than 50 kilometers x 50 kilometers, the regional scale is not less than 15 kilometers x 15 kilometers, and the urban scale is not less than 5 kilometers x 5 kilometers.

4.2.2

The number of vertical layers in the calculation area of the model shall not be less than 10, among which the number of vertical layers within 1 km near the ground shall not be less than 5.

4.2.3

The spatial resolution of the model pollution source inventory should be consistent with the spatial resolution of the calculation area of the numerical prediction model.

4.3 Forecast duration

4.3.1

The forecast duration calculated by global and continental scale models shall not be less than 7 days.

4.3.2

The forecast period calculated by the regional scale model shall not be less than 7 days.

4.3.3

The forecast period calculated by the city-scale model shall not be less than 5 days.

4.4 Forecast output time interval

The time interval between the output of two consecutive simulation results of the ambient air quality numerical forecast model should be within 1 hour (inclusive).

5.1 Pre-processing of model pollution source inventory

5.1.1

The main purpose is to convert the air pollutant source emission inventory into a gridded, hourly model pollution source inventory.

5.1.2

Input parameters include regional air pollutant source emission inventory, time and space distribution coefficient, chemical composition spectrum, etc.

5.1.3

The basic attributes of the air pollutant source emission inventory include the base year, coverage, types of pollutants emitted, and emission sources.

Source classification, temporal and spatial resolution, etc.

5.1.4

Emission source categories include power plants, industry, transportation, residents, agriculture, biomass combustion, dust, natural sources, etc.

5.1.5

The types of pollutants emitted include fine particulate matter (PM_{2.5}), inhalable particulate matter (PM₁₀), sulfur dioxide (SO₂), Nitrogen oxides (NO_x), carbon monoxide (CO), organic carbon (OC), black carbon (BC), ammonia (NH₃), volatile

3 Organic matter (VOCs), etc.

5.1.6

Based on time and space allocation coefficients, the air pollutant source emission inventory is allocated in time and space, including population Space allocation factors such as