A. Pollutant composition and Air Pollution and Quality Index (AQI)

In order to protect human health and the environment, the World Health Organization (WHO) has issued guidelines, and several countries and states have also issued regulations. The United States Environmental Protection Agency (EPA) has established National Environmental Air Quality Standards (NAAQS) for six air pollutants to protect human health.[1] These pollutants include sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), ozone (O3), lead (Pb) and aerodynamic diameter less than or equal to 2.5 μM (PM2.5) and 10 μM particles (PM10).

These gases and particles have significant impacts on climate change, ecosystems, human health, cultural heritage, and the economy.[2] Therefore, analyzing the concentration of polluting gases is important for protecting human health.

The Air Quality Index (AQI) is an indicator of daily air quality. It is calculated based on the concentration of major pollutant gases and divided into six health problem levels.[3]

The first level: AQI 0-50, representing Good for health, usually represented in green.

Second level: AQI 51-100, Modify for health, indicated in yellow.

The third level: AQI 101-150, Unhealthy for sensitive groups, represented in orange.

Fourth level: AQI151-200, Unheathy, indicated in red.

Fifth level: AQI 201-300, very unhealthy, represented in purple.

The sixth level: AQI 301-500, hazardous, represented in maroon.

B.Real-time air quality forecasting(RT-AQF)

For protecting people from the negative impact of unhealthy air, many countries have developed real-time air quality prediction (RT-AQF) programs to predict the concentrations of special health related pollutants such as O3, NO2, PM2.5, and PM10.[4] This information has been used to issue early air quality warnings, enabling governments and people to take preventive measures, avoid or limit their exposure to unhealthy levels of air pollution.[5]

RT-AQF is a newly emerging Applied science discipline in 1970s. It combines a variety of physical sciences, mathematical/statistical tools and computer technology, represents a unique Applied science that affects human daily activities. Because of the deterioration of global air quality, the increase of social/human demand and the rapid progress of science and technology, many RT-AQF tools and models have been developed. These tools and models have different degrees of complexity and prediction abilities, from the simplest Rule of thumb to the most advanced three-dimensional online coupled meteorological chemical models.

Important extensions of the RT-AQF model include its coupling with urban models (such as traffic and/or local pollutant diffusion) or CFD models, for urban/local scale applications with spatial resolution of 1 kilometer or less, and coupling with exposure models that provide real-

time public health assessment and exposure prediction, as well as urban emergency preparedness.[6]

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