Development of a Guide on Training and Best Practices for Chemical Weather/Air Quality Forecasting (CW-AQF) Using 3-D Numerical Models

Yang Zhang (1), Yinka Adebayo (2), Alexander Baklanov (2), and GAW APP and GURME science advisory groups (2)

(1) North Carolina State University, Raleigh, North Carolina, USA, (2) World Meteorological Organization (WMO), Geneva, Switzerland

Chemical weather and air quality forecasting (CW-AQF) has attracted increasing attentions from research communities and governments worldwide for several reasons. These include (1) increasing numbers of reported human mortality rates due to ambient and indoor air pollution and associated human exposure in many regions where air quality remains poor; (2) recent scientific advancements in CW-AQF using 3-D integrated meteorology-chemistry modeling systems and advanced data assimilation techniques combined with near-real time observations; (3) increasing needs for governments to utilize information from CW-AQF to issue health alerts to protect human health to take preventative actions to reduce pollutant emissions; and (4) increasing involvements of all National Meteorological Services (NMHSs) and other federal and state-level environmental protection agencies in CW-AQF. As a result, there have been increasing numbers of forecasters who use 3-D numerical models worldwide for CW-AQF. On the other hands, those models become increasingly complex and may not be operated easily for real-time deployment of CW-AQF without adequate training and guiding materials.

Recognizing the needs for successful implementation and application of 3-D numerical models for CW-AQF, World Meteorological Organization (WMO) and its Global Atmosphere Watch Scientific Advisory Group on Applications (GAW SAG APP) initiated the development of a guide on Training and Best Practices for CW-AQF Using 3-D Numerical Models in late 2017 (referred to the Guide for simplicity hereafter). The objectives of the Guide are to (1) help forecasters worldwide, especially those in developing countries, on using 3-D CW-AQF models in the most appropriate and efficient way; (2) provide practical information about the best CW-AQF practices and standardized procedures for the successful deployment and application, and (3) prepare materials that could be adapted for training by NMHSs and other users. The Guide is being developed by a group of experts in various aspects of CW-AQF through reviewing existing world-wide research and development experience and real-time CW-AQF advancements reported in relevant literature and WMO publications, incorporating existing education materials, recommendations and best practice in recognized meteorological training institutions, and identifying the most urgent needs for management competence enhancement in CW-AQF. The guide will describe basic principles, effective methods, and best practices important in the deployment and application of a 3-D model for CW-AQF; summarize the current status, the state-of-the science CW-AQF models and their application and evaluation, special considerations for urban applications and extreme events, as well as advanced techniques for improved CW-AQF and uncertainty quantifications; and provide demonstration cases for WMO regions in six major continents. The Guide will be produced by the end of 2018 in a user-friendly form as a live document on WMO wiki and a report in series to reflect the state-of-the-science development and advancement of CW-AQF, featuring with simplification, practicability, amenability and easy of use.