

Chemical histories of pollutant plumes in East Asia: Use of HYSPLIT-CMAQ tracking tool during the 2015 MAPS-Seoul campaign

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Regional transport pathways and physical/chemical processes of pollutant plumes and their precursors in East Asia were investigated using a Lagrangian and Eulerian analyzing system with in-situ and remote sensing measurements. Continued rapid industrialization in East Asian countries has made this region a very complicated source of anthropogenic emissions, including large industrial complexes and multiple megacities. Air quality in the Seoul Metropolitan Area (SMA), South Korea is manifold because this region's air quality is affected not only by its own emissions sources but also by transported pollutants and their precursors from even stronger emissions sources (e.g. northern China). Understanding formation process of pollutants and quantifying contributions from local and remote emission sources, especially during the transport across the Yellow Sea, are crucial to explain the SMA region's air quality and to set a direction of emission regulation policy. A hybrid tool to efficiently track pollutant plumes' movement and to analyze physical and chemical processes within the plume was developed using NOAA ARL HYSPLIT model and EPA CMAQ chemical transport model. We set the HYSPLIT to launch multi- thousand particles to demonstrate realistic movement and dispersion of pollutant plumes. Each particle movement is linked to a CMAQ diagnostic tool, the Integrated Process Rate Process Analysis (IPR PA), to provide detailed information of the pollutants' formation and removal. For each in-situ measurements during the Megacity Air Pollution Studies – Seoul (MAPS-Seoul) 2015 campaign, the newly developed tool could provide chemical histories of each pollutant plumes based on the CMAQ PA analysis and satellite observations. Preliminary results show that particulate matter formation process during the transboundary transport differs for each component, implying that emission regulation policy in South Korea may need more attention for specific regulation target.