

## Environmental Research, Technology Demonstration and Conference Project

<b>ECF Project:</b>	ECF 2020-123
<b>Project Title:</b>	Development and application of temporal source apportionment technique for PM <sub>2.5</sub> and O <sub>3</sub> in the Greater Bay Area
<b>Principal Investigator:</b>	Dr Lu Xingcheng, (replaced by Professor Fung Chi Hung, Jimmy w.e.f. 21 July 2021), Division of Environment and Sustainability, The Hong Kong University of Science and Technology
<b>Total Approved Grant:</b>	\$488,000
<b>Duration:</b>	1/3/2021 to 28/2/2023
<b>Project Status/Remarks:</b>	Completed
<b>Project Scope:</b>	<p>The purpose of this project is to develop a temporal source apportionment technique based on tagged species method in the 3D numerical model to track the contributions of the precursors emitted in different time periods to PM<sub>2.5</sub> and O<sub>3</sub>, the two most notorious ambient pollutants, in the Greater Bay Area (GBA). The current source apportionment method in the models can only track the source region (e.g., from Hong Kong or Guangzhou) and source category (e.g., mobile or power plant) of the precursors of PM<sub>2.5</sub> and O<sub>3</sub>. However, considering the lifetimes of these two pollutants, which reach up to over a week, understanding when to reduce the emissions in advance to control these two pollutants more effectively in different seasons is profoundly important for us. Results from the temporal source apportionment technique can show how many percentages of O<sub>3</sub> and PM<sub>2.5</sub> are formed from the precursors in the current or previous periods, which is useful to determine long-term pollutants control plans. Besides, this new technique also aims to provide scientific evidence for the government to design precise pollutants short-term “de-spiking” policy (削峰行動) in or outside the GBA to avoid the occurrence of episodic pollution cases.</p>
<b>Summary of the Findings/Outcomes:</b>	<p>Despite substantial efforts, PM<sub>2.5</sub> and O<sub>3</sub>, which can adversely influence human health and daily life, remain major ambient pollutants in the Greater Bay Area (GBA). Therefore, it's significant to control their emission sources further. A better emission control strategy should clarify the location of emissions (where) and the time of emissions (when). In this project, we developed a technique to investigate the influence of pollutants from different emitting periods on PM<sub>2.5</sub> and O<sub>3</sub> in the GBA. It will help to understand the formation of pollutants better and provide scientific references for effective and efficient policymaking. The result shows that PM<sub>2.5</sub> and O<sub>3</sub> over the GBA were generally influenced by pollutants emitted within two days. During the pollution episodes, the contribution of emissions from 2 days ago and even earlier periods increased. The major contributor to pollutants emitted in the current day came from the GBA region. The influence of pollutants emitted from earlier periods mainly came from neighboring provinces and northern China. Hence, cross-region collaboration in advance is necessary for pollution prevention in the GBA region.</p>