A New Era for Observing Air Quality from Space

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Until recently, space-based observations of tropospheric air pollutants such as nitrogen dioxide, tropospheric ozone, sulfur dioxide, and formaldehyde have been made by instruments operating in the visible-ultraviolet spectral region on satellite platforms in low Earth orbit, which allows for only one observation per day of any particular location on the globe. A new era began 3 years ago with satellite missions led by South Korea and more recently by the United States that feature instruments measuring these same air pollutants from geostationary orbit, which affords continuous observations of a geographic region during daylit hours. The National Institute of Environmental Research of the Korean Ministry of Environment launched the Geostationary Environmental Monitoring Spectrometer (GEMS) mission onboard the GEO-KOMPSAT 2B in 2020, and the GEMS instrument has been collecting air quality observations over East Asia ever since. The Tropospheric Emissions: Monitoring of Pollution (TEMPO) instrument, NASA's first Earth Venture Instrument mission, was launched on Intelsat 40e in April of this year and will begin measuring air pollution over much of North America and the Caribbean later this summer. NOAA’s plans for its Geostationary Extended Observations mission (GeoXO) include the Atmospheric Composition Instrument (ACX) on GeoXO’s third spacecraft, scheduled for launch in 2036. Highlights of these missions and the applications of their observations to air quality understanding and prediction will be presented.