# Using Satellite Data for Applications in Public Health Practice

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## INTRODUCTION

- Ambient and household air pollution, of natural and anthropogenic sources, is the leading environmental health risk to the ecosystem.
- An estimated 6.5 million annual premature deaths (1 in 9 deaths) occur globally, attributing to increased incidence of cardiovascular and respiratory diseases.
- Animals and ecosystems encounter changes in their physical environments, which can lead to species adaptation, reproduction abnormalities or lethality.
- NASA Earth observing satellites collect data that can address the complex factors of this global burden.

## NASA HEALTH AND AIR QUALITY APPLICATIONS

- Promote the use of Earth observations in air quality management and public health, particularly regarding infectious disease and environmental health issues.
- Examine toxic and pathogenic exposures and health-related hazards, including effects on risk characterization and mitigation.
- Support the application of Earth observing data and models in the implementation of air quality standards, policy, and regulations for economic and human welfare.
- Address effects of climate change on public health and air quality to support managers and policy makers in their planning and preparations.

## PURPOSE

- Describe the utility of Earth observation data and their application to public health practice.
- Highlight the scientific value of “One Health” collaborations with scientists and researchers in Earth sciences and health disciplines.

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## TEMPO (Tropospheric Emissions: Monitoring of Pollution)

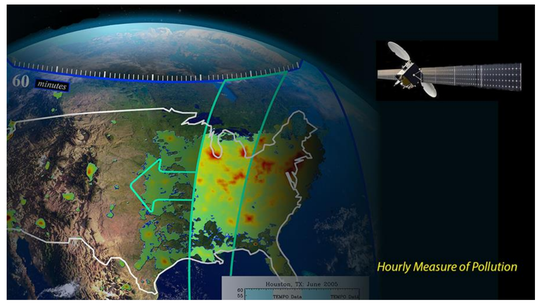

Photo credit: NASA

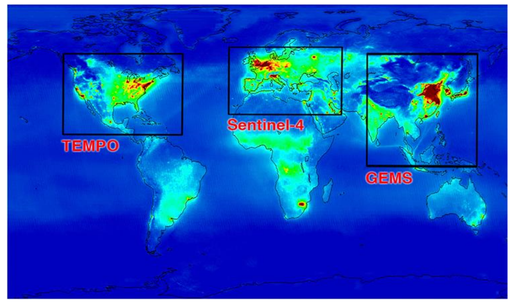

Photo credit: KNMI/IASB/ESA/SAO

- Represents the North American component, forming a global Air Quality constellation with Copernicus-Sentinel-4 (European Space Agency) and GEMS (Korea/Asia).
- Aims to enhance pollution emission inventories, record population exposure, and assess effective emission-control strategies.
- Includes science team members from EPA, NCAR, NOAA, SAO, and universities.
- Will make tropospheric pollution observations ($O_3$, $NO_2$, $H_2CO$) every daylight hour at high spatial resolution from the Geostationary Orbit.
- Instrument delivery scheduled for 2018. Launch NLT 2021.

## MAIA (Multi-Angle Imager for Aerosols)

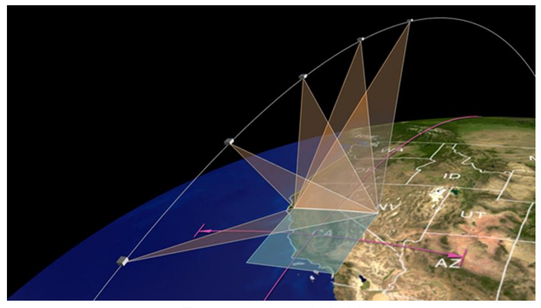
Photo credit: NASA

Photo credit: NASA

- Aims to examine the impacts of different size and compositional mixtures of airborne particulate matter (PM) on adverse birth outcomes, premature deaths, and cardiovascular and respiratory diseases.
- Includes science team members from CDC, EPA, NIH, NOAA, WHO, and universities.
- Will make radiometric and polarimetric observations (aerosol optical depth, total $PM_{10}$, total $PM_{2.5}$, and $PM_{2.5}$ for sulfates, nitrates, black carbon, organic carbon, dust).
- Launch scheduled for NET 2020.

## UTILITY OF SATELLITE DATA

- Data can be used in diverse applications, including modeling systems, forecasting infectious disease outbreaks, assessing air quality standards, and interpreting spatial and ecological relationships.
- Linking Earth observation data with health records can answer key scientific questions.
- Data can provide innovative ways to enhance public health initiatives and other interventions across the world.

## “ONE HEALTH” APPLICATIONS

- Transdisciplinary collaborations can lead scientists and community practitioners to identify risk factors and develop innovative approaches and interventions, linking human, animal, and environmental health.
- This holistic approach can foster collaborations, strengthen communication among stakeholders, coordinate disease surveillance, and increase public awareness through educational outreach programs.
- Satellite data can form part of the “One Health” toolkit for public health practitioners, scientists, educators, and decision-makers.

## CONCLUSIONS

- By strengthening transdisciplinary scientific collaborations and communication, we can identify challenges and mark future steps for enhanced integration of Earth observations into public health education, practice, and research.

## REFERENCE

- Liu Y, Diner DJ. Multi-angle imager for aerosols: a satellite investigation to benefit public health. *Public Health Rep*. 2017;132:14-17.
- Zoogman P et al. Tropospheric emissions: monitoring of pollution (TEMPO). *Journal of Quantitative Spectroscopy and Radiative Transfer*. 2017;186:17-39.