



**Jet Propulsion Laboratory**  
California Institute of Technology

# NASA's Multi-Angle Imager for Aerosols: Addressing the Societal Impacts of Particulate Air Pollution

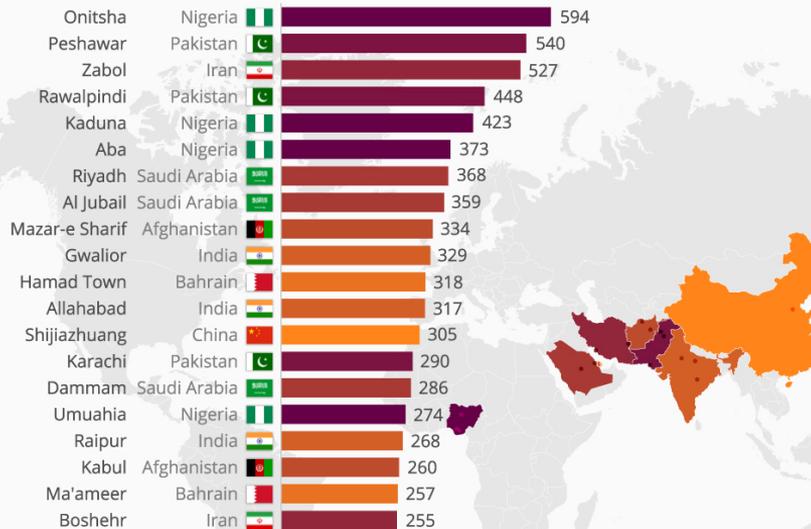
Abigail Nastan, David J. Diner, and the MAIA Team  
AGU Fall Meeting, December 13, 2017

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Government sponsorship acknowledged.

# 80% of the world's urban population lives in areas exceeding WHO's air quality guidelines

## The 20 Worst Cities Worldwide For Air Pollution

Annual mean micrograms per cubic metre of PM10 in cities worldwide



@StatistaCharts Source: WHO

statista

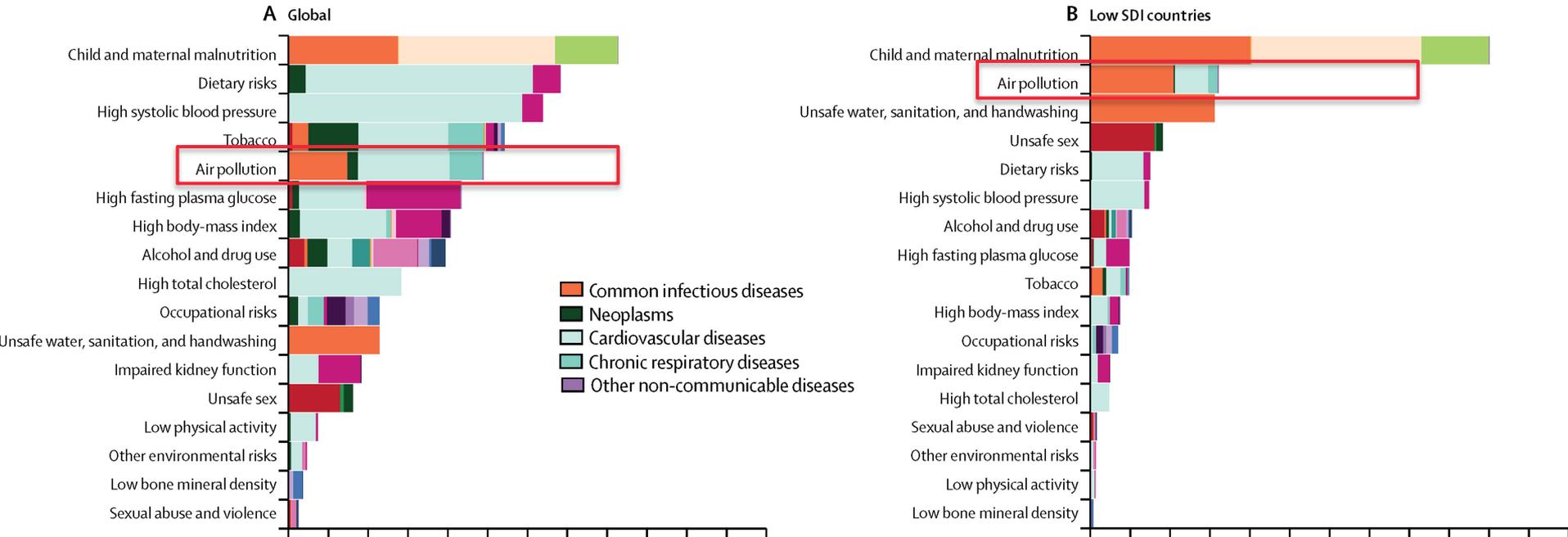
Niall McCarthy



Bobak, CC BY-SA 2.5



# Particulate matter (PM) air pollution is the **top environmental risk factor** for disease:



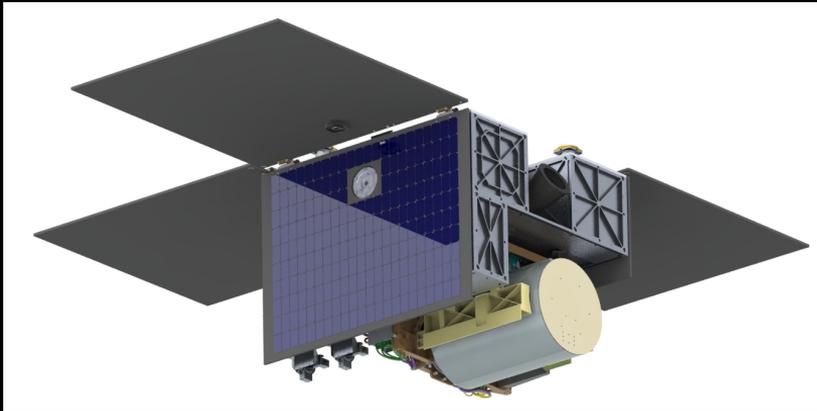
Global Burden of Disease 2016 Risk Factor Collaborators, 2017

# Open question: Which **types** of PM increase risks of which diseases?



# Multi-Angle Imager for Aerosols (MAIA)

MAIA was selected in March 2016 as part of NASA's Earth Venture Instrument program.



General Atomics

MAIA's science objectives are to study the effects of various **types** of PM on:

- ✓ Acute illness and premature death
- ✓ Adverse birth outcomes
- ✓ Chronic disease

# MAIA health studies are planned on PM types for 10-plus **Primary Target Areas (PTAs)**

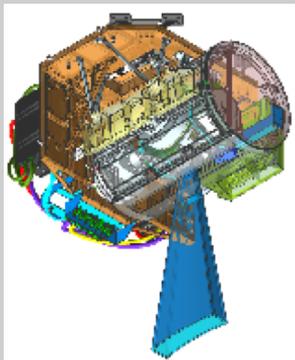
The PTA candidates have been chosen\* based on:

- ✓ Population
- ✓ PM characteristics
- ✓ Surface monitor data
- ✓ Health data
- ✓ Remote sensing considerations

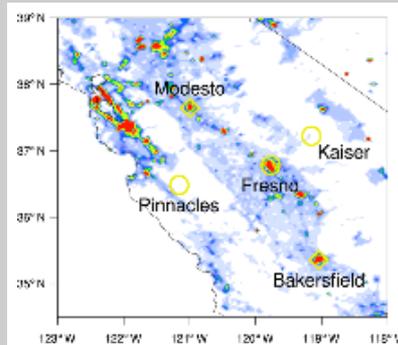


\*Please visit my poster for more details

# The MAIA investigation concept



L. Tsutsui, KVPR



## MAIA instrument

- Calibrated, georectified image data for retrieval of column-integrated AOD, fractional AOD, particle size.

## Surface PM monitors

- Used to calibrate the aerosol-PM relationships.
- MAIA will use existing PM networks and deploy additional speciation monitors.

## WRF-Chem

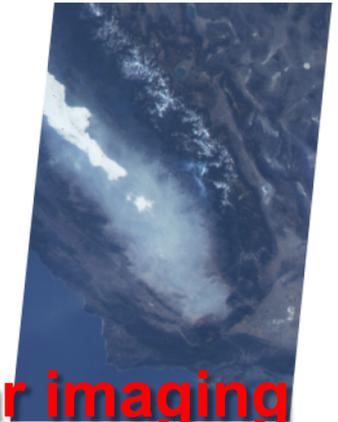
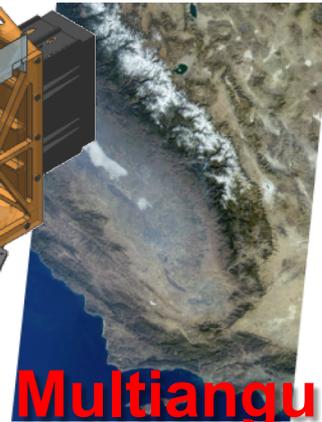
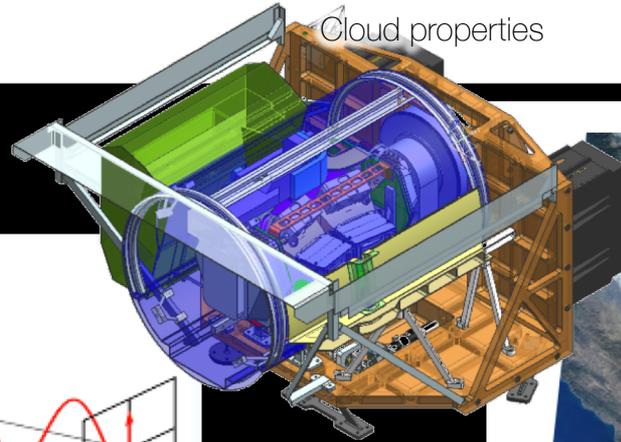
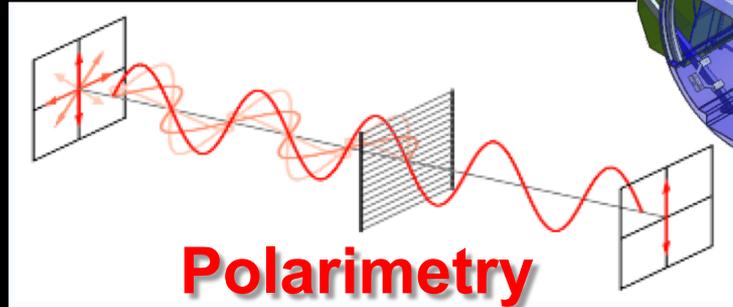
- Constrains aerosol vertical distribution.
- Assists spatial/temporal gap-filling.

## Health records

- Obtained from Vital Statistics, hospitals, HMOs, administrative records, cohorts.
- Used to associate PM exposure with health effects.

# The MAIA satellite instrument approach combines several remote sensing technologies:

## Multispectral imaging



## Multiangular imaging

# MAIA's Science Team combines data creators, data users, air quality and public health specialists

Principal Investigator	
David Diner	JPL

Co-Investigators: Instrument Characterization	
Carol Bruegge	JPL
Russell Chipman	Univ. of Arizona
Veljko Jovanovic	JPL

Co-Investigators: Aerosol Remote Sensing, Modeling, Validation	
Larry Di Girolamo	University of Illinois
Michael Garay	JPL
Edward Hyer	Naval Research Lab.
Olga Kalashnikova	JPL
Alexei Lyapustin	GSFC
Randall Martin	Dalhousie University
Jun Wang	University of Iowa
Feng Xu	JPL

Co-Investigators: PM Exposure, Epidemiology	
Michael Brauer	Univ. of British Columbia
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Yang Liu	Emory University
Bart Ostro	UC Davis
Beate Ritz	UCLA
Joel Schwartz	Harvard University

Collaborators: Air Quality and Public Health	
Sagnik Dey	IIT Delhi
Sina Hashimenassab	SCAQMD
Kembra Howdeshell	NIH
John Langstaff	EPA
Pius Lee	NOAA
Fuyuen Yip	CDC

## Next steps...

- Finalize PTA selections
- Begin secondary target selection

**Questions?**

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