Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region
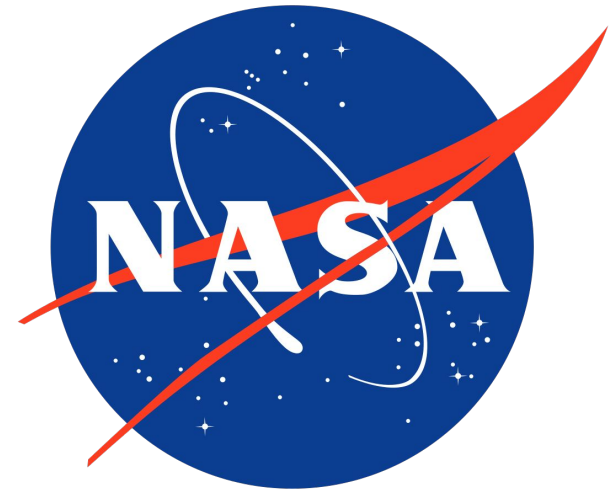
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Climate change, heat, and mortality in the tropical urban area of San Juan, Puerto Rico

Pablo A. Méndez-Lázaro[1] · Cynthia M. Pérez-Cardona[2] · Ernesto Rodríguez[3] ·
Odalys Martínez[3] · Mariela Taboas[1] · Arelis Bocanegra[1] · Rafael Méndez-Tejeda[4]

A heat vulnerability index to improve urban public health management in San Juan, Puerto Rico

Pablo Méndez-Lázaro[1] · Frank E. Muller-Karger[2] · Daniel Otis[2] ·
Matthew J. McCarthy[2] · Ernesto Rodríguez[3]

*Tropical Medicine and
Infectious Disease*

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Article

Application of Artificial Neural Networks for Dengue Fever Outbreak Predictions in the Northwest Coast of Yucatan, Mexico and San Juan, Puerto Rico

Abdiel E. Laureano-Rosario [1,*] iD, Andrew P. Duncan[2], Pablo A. Mendez-Lazaro[3],
Julian E. Garcia-Rejon[4], Salvador Gomez-Carro[5] iD, Jose Farfan-Ale[4], Dragan A. Savic[2] iD
and Frank E. Muller-Karger[1]

Article

Assessing Climate Variability Effects on Dengue Incidence in San Juan, Puerto Rico

Pablo Méndez-Lázaro [1,*], Frank E. Muller-Karger[2], Daniel Otis[2], Matthew J. McCarthy[2]

Linking Wetland Ecosystem Services to Vector-borne Disease: Dengue Fever in the San Juan Bay Estuary, Puerto Rico

Rebeca de Jesús Crespo[1] iD · Pablo Méndez Lázaro[2] · Susan H. Yee[1]

Using Earth Observation Data to Improve Health in the United States

ACCOMPLISHMENTS AND FUTURE CHALLENGES

Author
Lyn D. Wigbels

WRF prediction of two winter season Saharan dust events using PM_{10} concentrations: Boundary versus initial conditions

Gregory S. Jenkins [a, c] ✉, Aminita Mbow Diokhane [b]

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Research

The Association between Dust Storms and Daily Non-Accidental Mortality in the United States, 1993–2005

James Lewis Crooks,[1,2] Wayne E. Cascio,[1] Madelyn S. Percy,[3] Jeanette Reyes,[4] Lucas M. Neas,[1] and Elizabeth D. Hilborn[1]

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Air Quality Management Using Modern Remote Sensing and Sp Technologies and Associated Societal Costs

Waheed Uddin[1]*

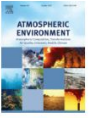[1]Director, Center for Advanced Infrastructure Technology (CAIT), Carrier Hall 203, The University of Missi MS 38677-1848, USA
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Using satellite remote sensing data to estimate the high-resolution distribution of ground-level $PM_{2.5}$

Changqing Lin [a], Ying Li [b,*], Zibing Yuan [b], Alexis K.H. Lau [a,b,c], Chengcai Li [d], Jimmy C.H. Fung [b,c,e]

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Saharan dust intrusions in Spain: Health impacts and associated synoptic conditions

Julio Díaz[a,*], Cristina Linares[a], Rocío Carmona[a], Ana Russo[b], Cristina Ortiz[a], Pedro Salvador[c], Ricardo Machado Trigo[b]

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Original article

Saharan dust and daily mortality in Emilia-Romagna (Italy)

Stefano Zauli Sajani,[1] Rossella Miglio,[2] Paolo Bonasoni,[3] Paolo Cristofanelli,[3] Angela Marinoni,[3] Claudio Sartini,[1] Carlo Alberto Goldoni,[4] Gianfranco De Girolamo,[4] Paolo Lauriola[1]

Review

Desert dust and human health disorders

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Atmospheric Environment

INVITED REVIEW SERIES: AIR POLLUTION AND LUNG HEALTH
SERIES EDITORS: IAN YANG AND STEPHEN HOLGATE

Monitoring air pollution: Use of early warning systems for public health

FRANK J. KELLY, GARY W. FULLER, HEATHER A. WALTON AND JULIA C. FUSSELL

MRC-HPA Centre for Environment and Health, School of Biomedical Sciences, King's College London, London, UK
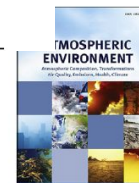
Back-trajectory analysis of African dust outbreaks at a coastal city in southern Spain: Selection of starting heights and assessment of African and concurrent Mediterranean contributions

M. Cabello [a,*], J.A.G. Orza [b], C. Dueñas [a], E. Liger [c], E. Gordo [a], S. Cañete [a]

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Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region

- (17-HAQ17-0064), submitted to the Science Mission Directorate's Earth Science Division, in response to NASA Research Announcement (NRA) NNH17ZDA001N, Research Opportunities in Space and Earth Science (ROSES-2017), Program Element A.39: Earth Science Applications: Health and Air Quality.

Nasa's Public Health Program: How We Can Use NASA Satellite Data To Study Global Public Health Issues

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Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region

- **Investigators**: (5) Pablo Méndez-Lázaro (PI), Olga L. Mayol-Bracero (Co-I), Frank Muller-Karger (Co-I), Aluisio Pimenta (Co-I), Jessica Cabrera (Co-I).

- **Collaborators**: (14) Ernesto Rodríguez, Arunas Kuciauskas, Peter Colarco, Honbin Yu, Jack Molinei, Ellsworth Judd Welton, Lisbeth San Miguel-Rivera, Brent Holben, Randall Martin, Jack Molinei, Ana Ortiz-Martinez, Cynthia Perez-Cardona, Andrea Sealy, Leonardo Alfredo Pineda Pardo

- **Institutions**: (6) University of Puerto Rico-Medical Sciences Campus, Graduate School of Public Health, San Juan-Puerto Rico (http://sp.rcm.upr.edu/); University of Puerto Rico-Rio Piedras Campus, College of Natural Sciences (http://natsci.uprrp.edu/); University of South Florida, College of Marine Science (http://www.marine.usf.edu/), St. Petersburg, Florida; National Weather Service-San Juan Office, Naval Research Laboratory's Marine Meteorology Division (NRL-MMD), Instituto de Hidrología, Meteorología y Estudios Ambientales - IDEAM

- **End-users:** (3-4) Caribbean Institute for Meteorology and Hydrology (CIMH), St. James, Barbados; Puerto Rico Department of Health, Office for Public Health Preparedness and Response; National Weather Service-San Juan Office

Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region

- **What do we proposed to NASA on November 2017?**

  - We proposed to characterize the distribution pattern and variability of dust in these annual events using synoptic Earth observations from satellites and ground stations, and quantify the impact on respiratory diseases using detailed time histories of medical records from Caribbean SIS (small island states).

  - The goal of the proposed work is to improve the effectiveness of the public health sector to mitigate impacts of poor air quality. The way we approach this is to provide clear and actionable information on African Dust and Diesel Particulate Matter to public health agencies, in a format that they can use quickly and effectively.
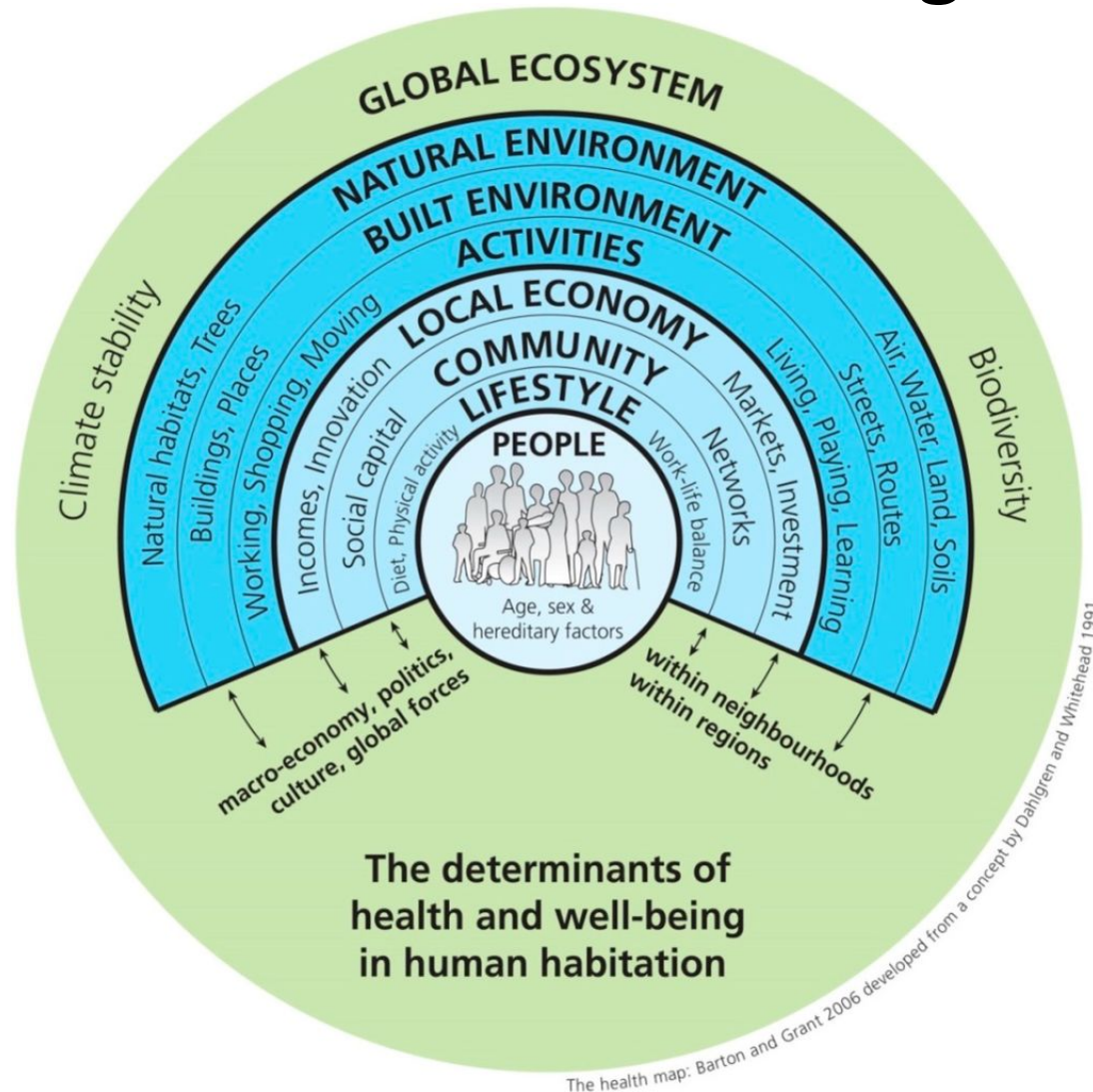
Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region

- To address the various elements of the research, we proposed three Working Groups:

  - **WG1: Resilience, Public Health and Well Being (Mendez-Lázaro, P., Muller-Karger, F., Pérez-Cardona, C., Ortíz-Martínez, A., Cabrera, J., Hongbin, Y)**

  - **Atmospheric Forcing and Air Quality (Mayol-Bracero, O., Muller-Karger, F., Pimenta, A., Rodríguez, E., Colarco, P., Molinie, J., Holben, B., Welton, E.J.Martin, R.)**

  - **Decision Support Tool: Computation and Visualization. (Muller-Karger, F., Méndez-Lázaro, P., Rodríguez, E., Sealy, A., E., Kuciauskas, A, Cabrera, J.)**

- The three groups will work closely together to implement and transition the human health application to local public health and government officials.

Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region

- **Working Group 1. Resilience, Public Health and Well Being:** (Mendez-Lázaro, P., Muller-Karger, F., Pérez-Cardona, C., Ortíz-Martínez, A., Cabrera, J., Hongbin, Y.).

- This group focuses on synthesizing historical air quality observations and generating knowledge, including specific metrics and options to increase resilience of human societies. The research questions (Q) that guide this Working Group are:

    - Q1. What are the main factors including social determinants that contribute to air quality vulnerability?

    - Q2. How can climate and air quality information be translated into action to increase resiliency of our communities?

Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region

The health map: Barton and Grant 2006 developed from a concept by Dahlgren and Whitehead 1991

- The social determinants of health are the conditions in which people are born, grow, live, work, age and died.

- These circumstances are shaped by the distribution of money, power and resources at global, national and local levels.

- Beyond the profile, we need to pay attention to the interactions and processes that are key components of the system.

- After all, our Adaptive Capacity could be determined by these pre-existing conditions.

http://www.who.int/social_determinants/sdh_definition/en/

Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region

- **Working Group 2. Atmospheric Forcing and Air Quality *(Mayol-Bracero, O., Muller-Karger, F., Pimenta, A., Rodríguez, E., Colarco, P., Molinie, J., Holben, B., Welton, E.J.Martin, R.).*** A major goal of this activity is to characterize and quantify African Dust concentration, transport, and dispersal and dispersal patterns, including variability of African Dust particle properties (e.g., size, composition).

- The specific questions that guide this Working Group are:
  - *Q1*. What are the spatial and temporal patterns of African Dust within the Caribbean Region?
  - *Q2*. What are the composition and concentrations of African Dust, and, based on event intensity and subsequent dispersion throughout the Great Caribbean Basin, how do these change?
  - *Q3*. What are the spatial patterns of DPM accumulation in areas of high Diesel consumption
  - within the Caribbean Region?
  - *Q4*. What are the composition and concentrations of DPM, and how to improve calibration
  - using speciation of DPM components?

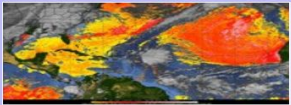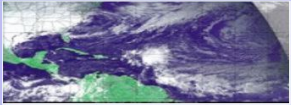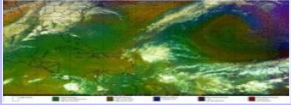# Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region
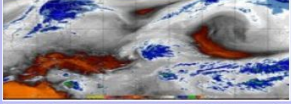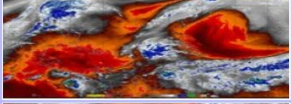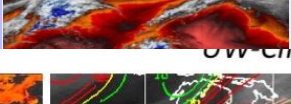
- **Working Group 3. Decision Support Tool: Computation and Visualization. *(Muller-Karger, F., Méndez-Lázaro, P., Rodríguez, E., Sealy, A., E., Kuciauskas, A, Cabrera, J.)*** This Working Group is responsible for data management, developing products and an application, and delivery of these products to public health practitioners. We will develop a set of visualization techniques that can be applied to specific urban environments to communicate complex science at the intersection of many disciplines to stakeholders.

- Working Group 3 Specific Aims:
  - Develop a decision-support tool, built with input and feedback from the user community.
  - Organize and implement an intensive outreach effort through collaboration with established air quality, climate and health education networks.
  - Coordinate regional workshops, sampling, data sharing, and applications sharing activities.
  - Develop a set of visualization techniques that can be applied to specific urban environments to communicate complex science at the intersection of many disciplines to stakeholders.
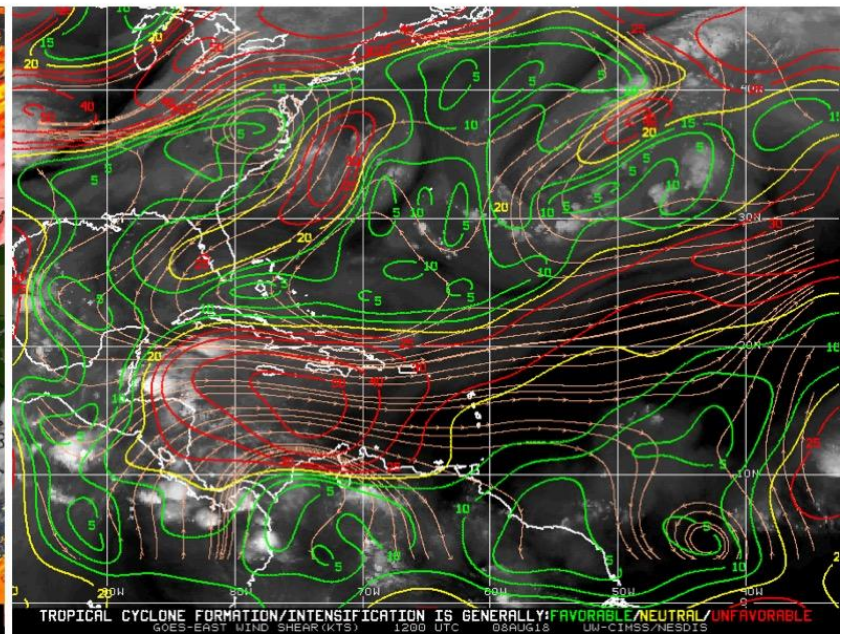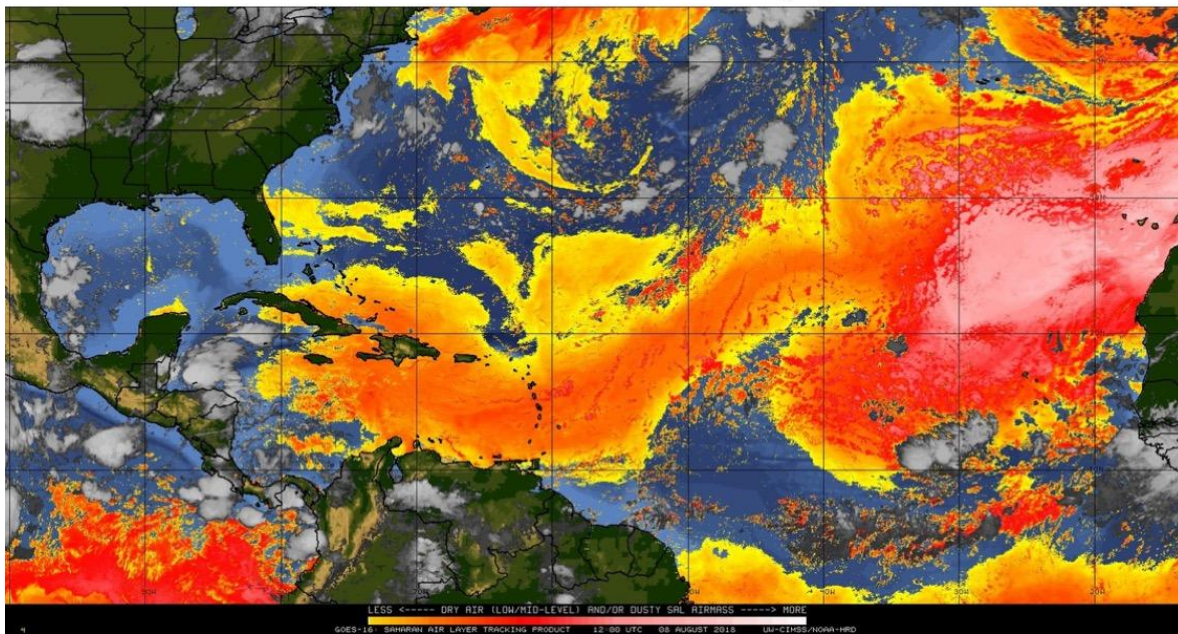
http://tropic.ssec.wisc.edu/real-time/sal/

Thank you so much for your attention!

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Environmental Health Department

https://www.facebook.com/SALUDAMBIENTALUPR/

Principal Investigator: NASA--Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region (17-HAQ17-0064)

Co-Principal Investigator: NIH--Impact of Hurricane-Related Stressors and Responses on Oncology Care and Health Outcomes of Women with Gynecologic Cancers from Puerto Rico and US Virgin Islands

City Co-lead: NSF--Urban Resilience to Extreme Weather Events-SRN, www.urexsrn.net