

SURVEILLANCE AND AMBIENT AIR QUALITY

The Effect of African Dust in Barbados

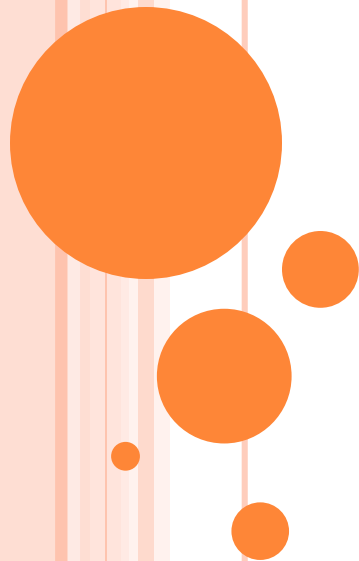
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**CARPHA 12th Meeting
National Epidemiologists**

&

Laboratory Directors

17 September 2014




OUTLINE

- Slant to Climate Change
- Monitoring of Africa Dust
- Air quality with reference to local pollen and fungal spores
- Health impacts with specific reference to paediatric asthma
- Suggestions for further collaboration



CLIMATE CHANGE

“Climate change is potentially the largest global threat to human health ever encountered.” (Shea et. al 2008. “Climate change and allergic disease. J Allergy Clin Immunol 2008;122:443-53.)

- Depending on the vulnerability of a society, climatic variability can have an immense impact on societies, sometimes positive and sometimes disastrous.
 - Therefore, there is the interconnected issue of world ecosystems and social stress
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CLIMATE CHANGE INFLUENCES

- Weather changes (driest month)
 - Severe flooding and displacement
 - Heat waves, longer winters, earlier springs..... pollination
 - More and greater intense hurricanes
- Potential for negative health impacts
 - Increase or impact on vector borne disease
 - Effect on respiratory disease
 - Effect on cardiovascular disease (how dirty air hurts the heart)



RAINFALL

- Biological allergens - pollen, fungal spores
- Global climate change and anticipated increases in prevalence and severity of asthma and related allergic disease mediated through worsening ambient air pollution and altered local and regional pollen production.

(Shea et. al 2008. “Climate change and allergic disease
J Allergy Clin Immunol 2008;122:443-53.)

- Vector Borne and Zoonotic Disease (VBZD)
 - Dengue, Malaria, Chickungunya, Leptospirosis, Lyme disease, Hantavirus, West Nile Virus, (CARPHA)



AFRICAN DUST

- Dust, as would any aerosol, can affect climate:
 - Directly by scattering and absorbing solar radiation
 - Indirectly by impacting on cloud processes
- African Dust is different from other aerosol types (Not PM) in that:
 - The generation of A. dust is itself affected by climate and therefore raises concerns about feedback on climate.
- Dust-iron is an essential micronutrient in the marine biosphere contributing to algal and Sargassum blooms...



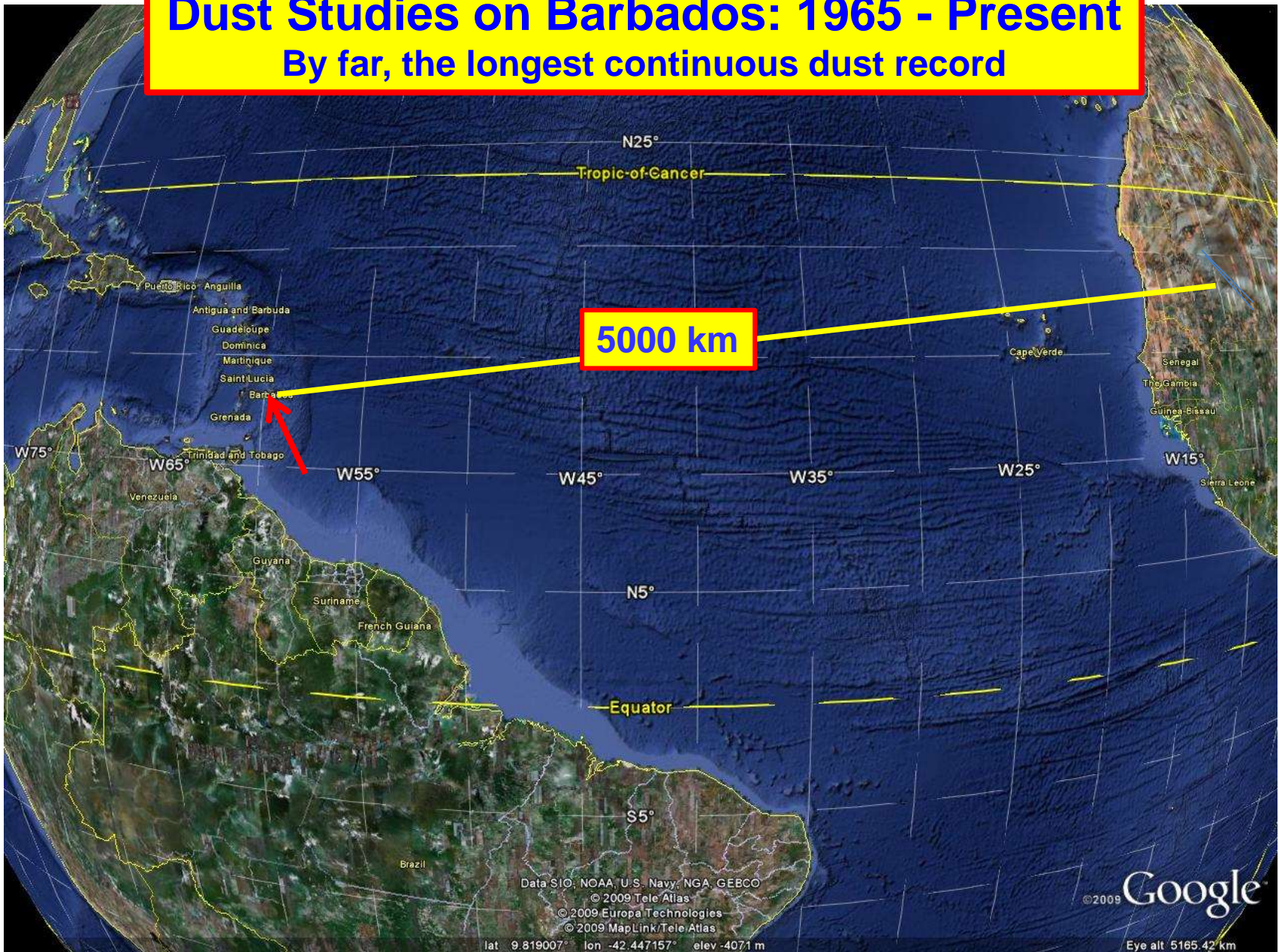
DUST TRANSPORT

- Inter-hemispheric and trans-continental transport of African dust.....to every island in the Caribbean
- Prof Edward “Kamau” Brathwaite writing from St. Lucia called it “Seasonal dust cloud....that milky haze,.... that sense of dryness,..... drifting out of the great ocean of Sahara”
- Sampling Station on Barbados (most eastern) continuously for 4 decades, 1965-present
- Relationship to major climate indices e.g El Niño and tropical cyclones



Dust Studies on Barbados: 1965 - Present

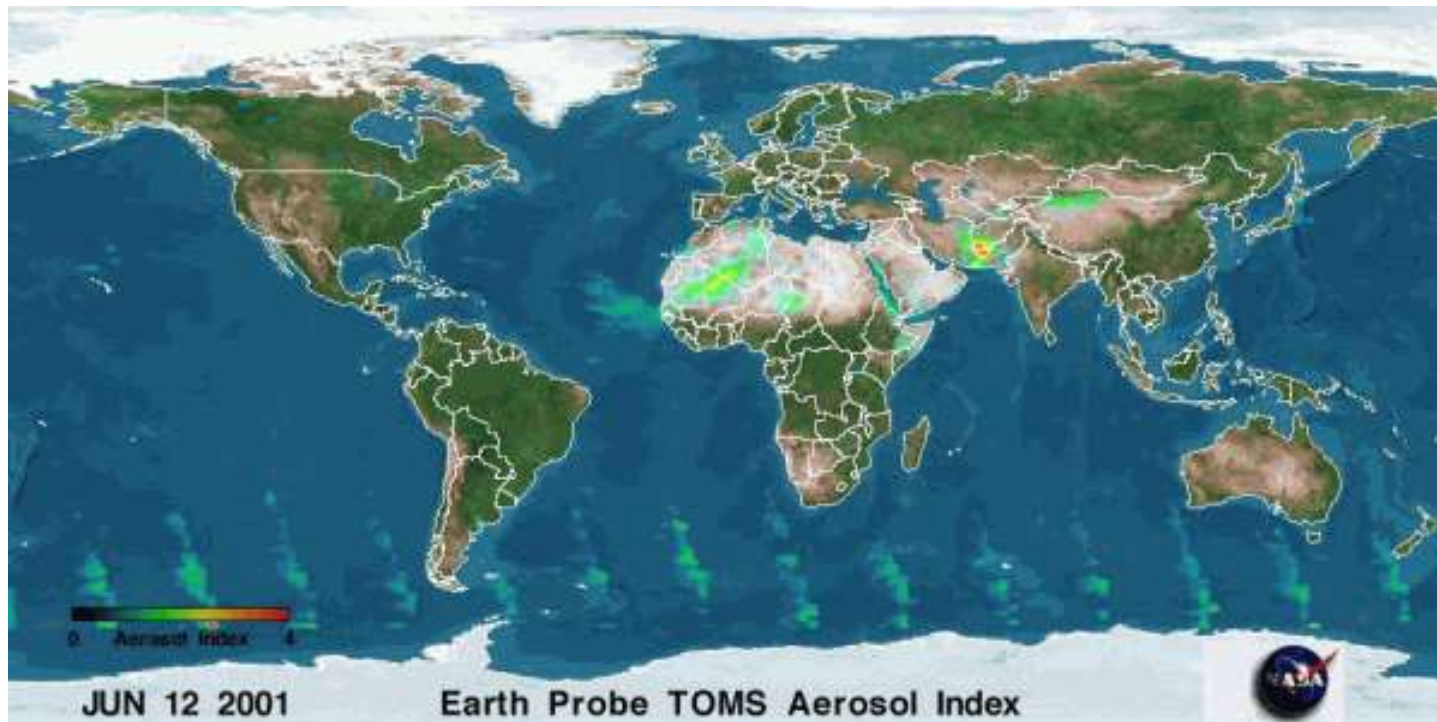
By far, the longest continuous dust record



VIEW FROM ABOVE THE CLOUDS



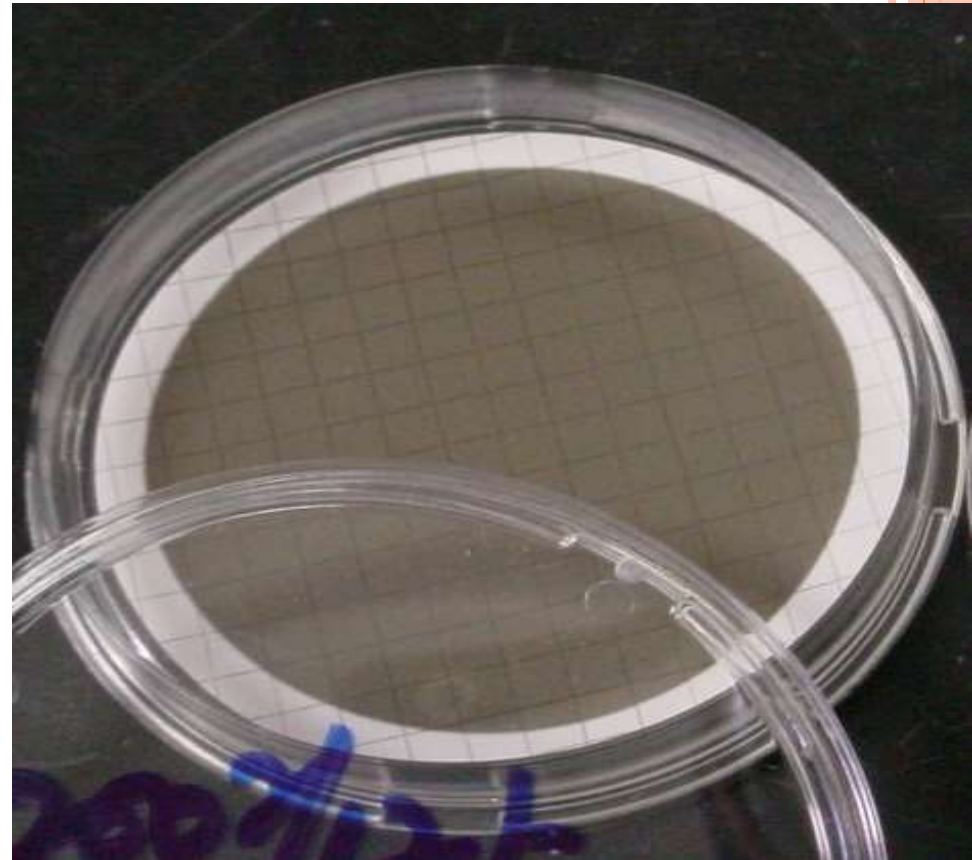
AFRICAN DUST TRANS - ATLANTIC CROSSING



U. Miami Aerosol Research Station, Barbados



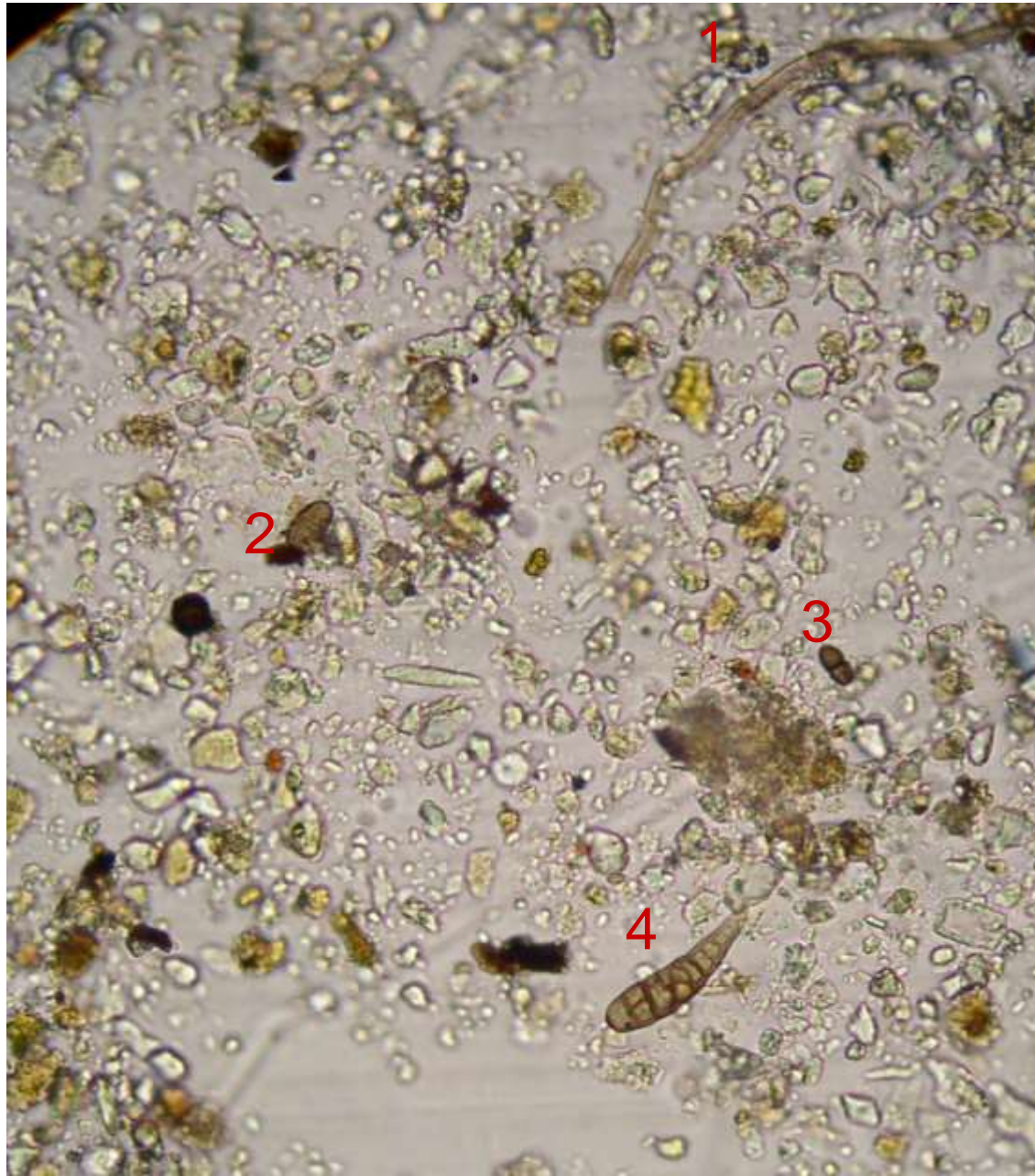
AFRICAN DUST VS AFRICAN SMOKE



Burkard One Day Air Sample

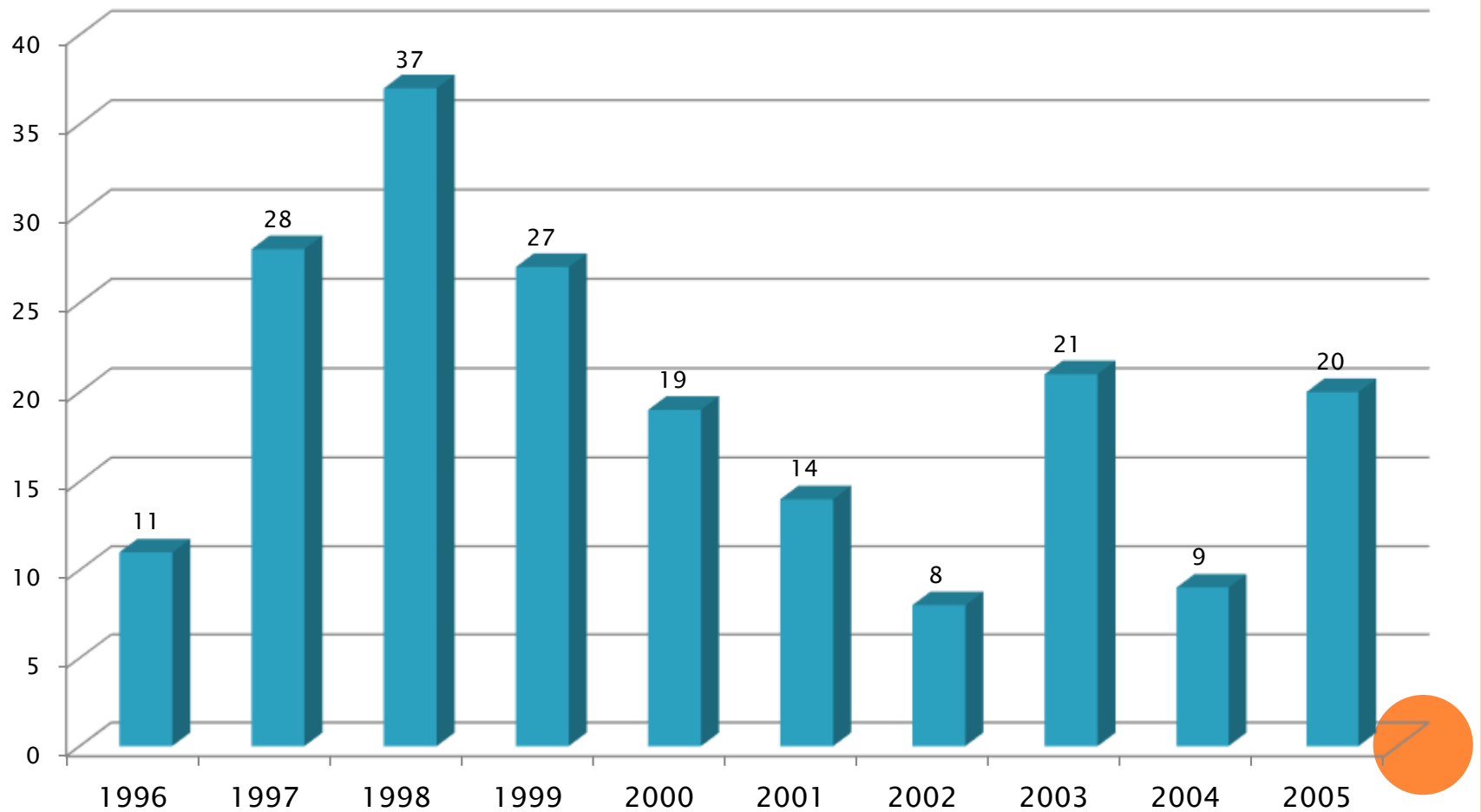


AFRICAN DUST CONTAINING FUNGAL SPORES (400X)

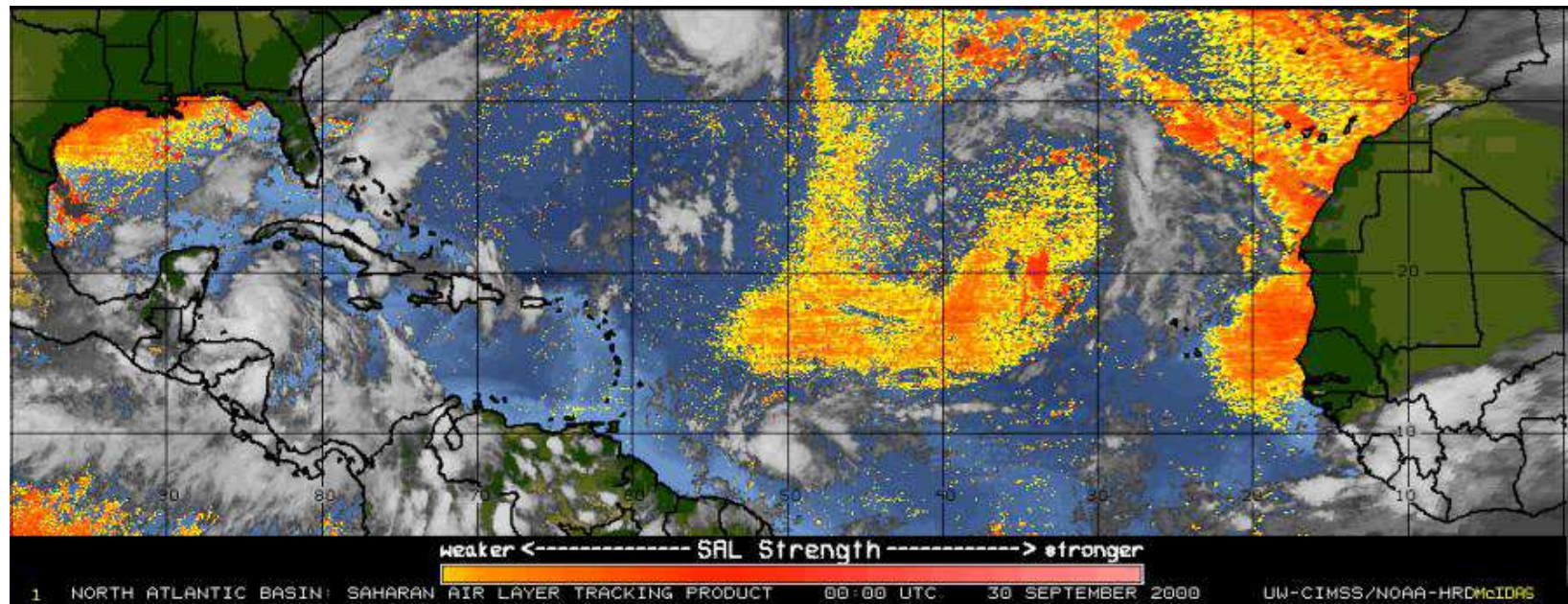
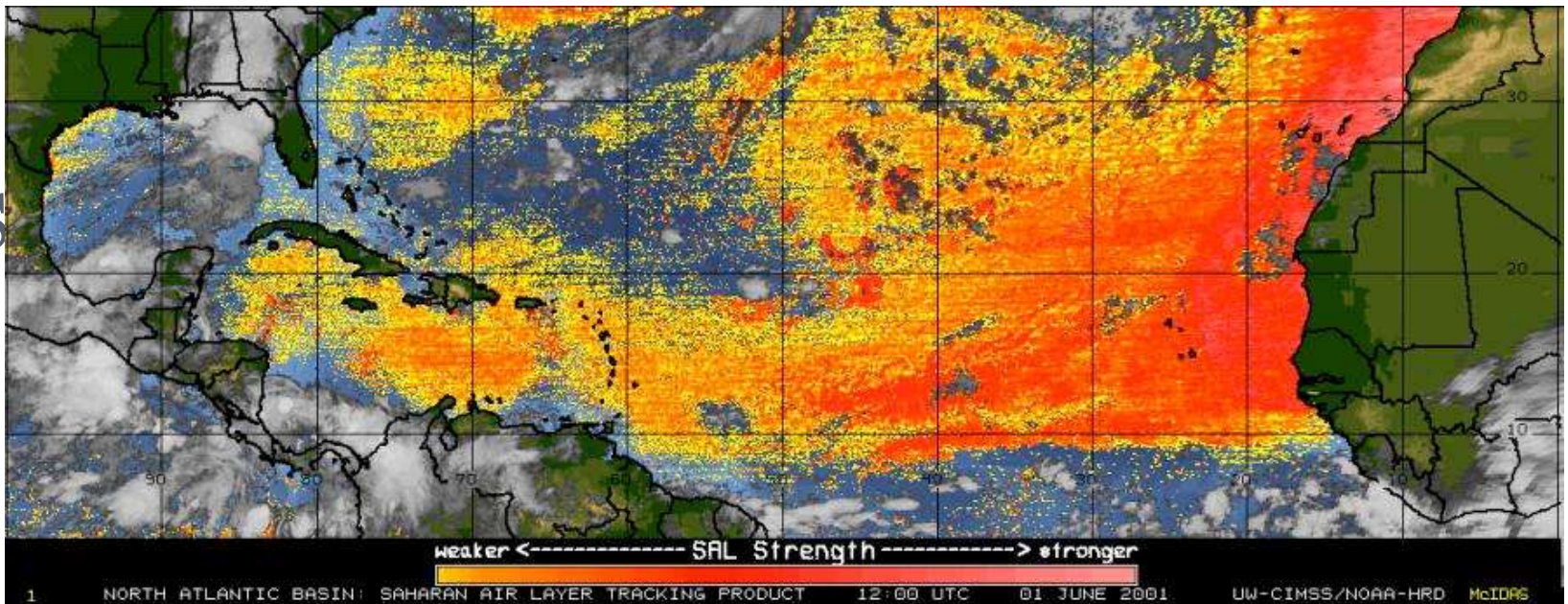


DUST TRANSPORT 1996-2005

No. of dust events (50–149 $\mu\text{g}/\text{m}^3$)



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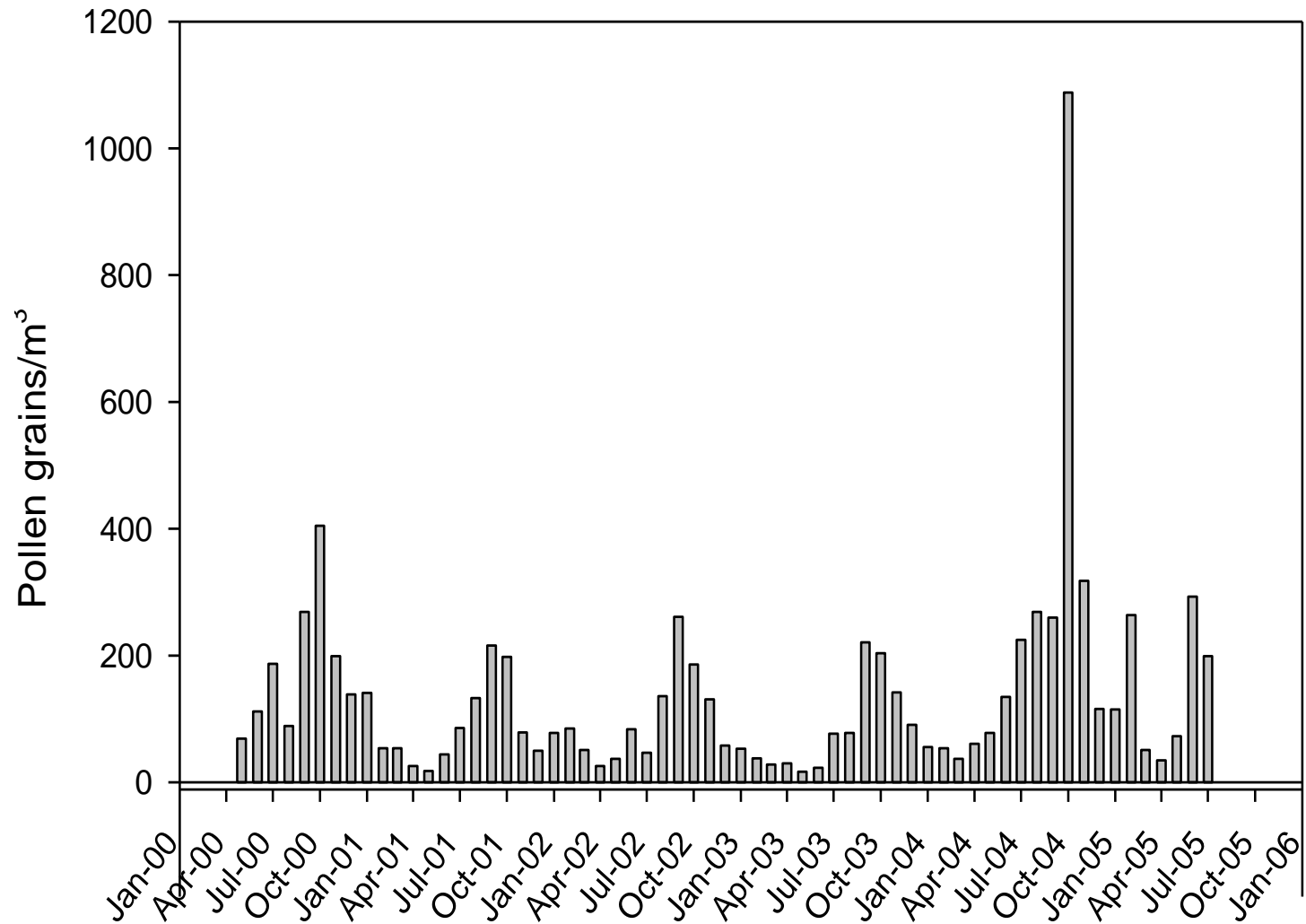
Dunion, J.P., and C.S. Velden. 2004. "The Impact of the Saharan Air Layer on Atlantic Tropical Cyclone Activity." *Bull. Amer. Meteor. Soc.* 85: 353-365

GRASS POLLEN AND SPORE COUNTS

- Pollen season in Barbados occurs between July and September primarily in response to rainfall
- Highest correlation with rain one month after rain
- High rainfall in November 2000 and 2004 produce double peaks of grass pollen in January 2001 and 2005 respectively
- Spores were present every day
- Minimum count was 112 spores/m³ (March 2001) and the maximum count was 18,965/m³ (October 2004)



GRASS POLLEN – JANUARY 2000-JULY 2005



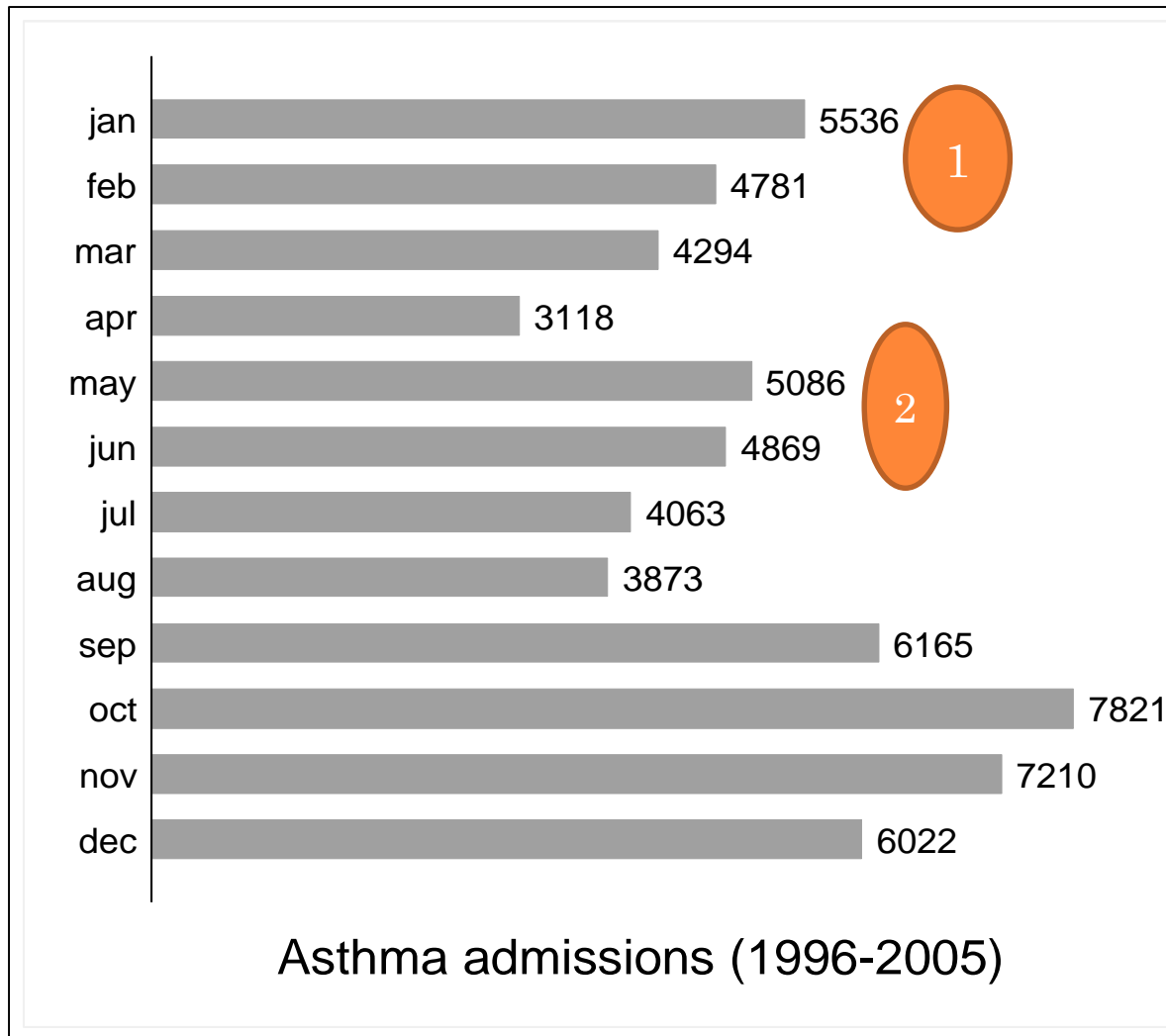
GRASS POLLEN



AIRBORNE GRASS POLLEN ALLERGEN



ASTHMA ADMISSIONS BY MONTH

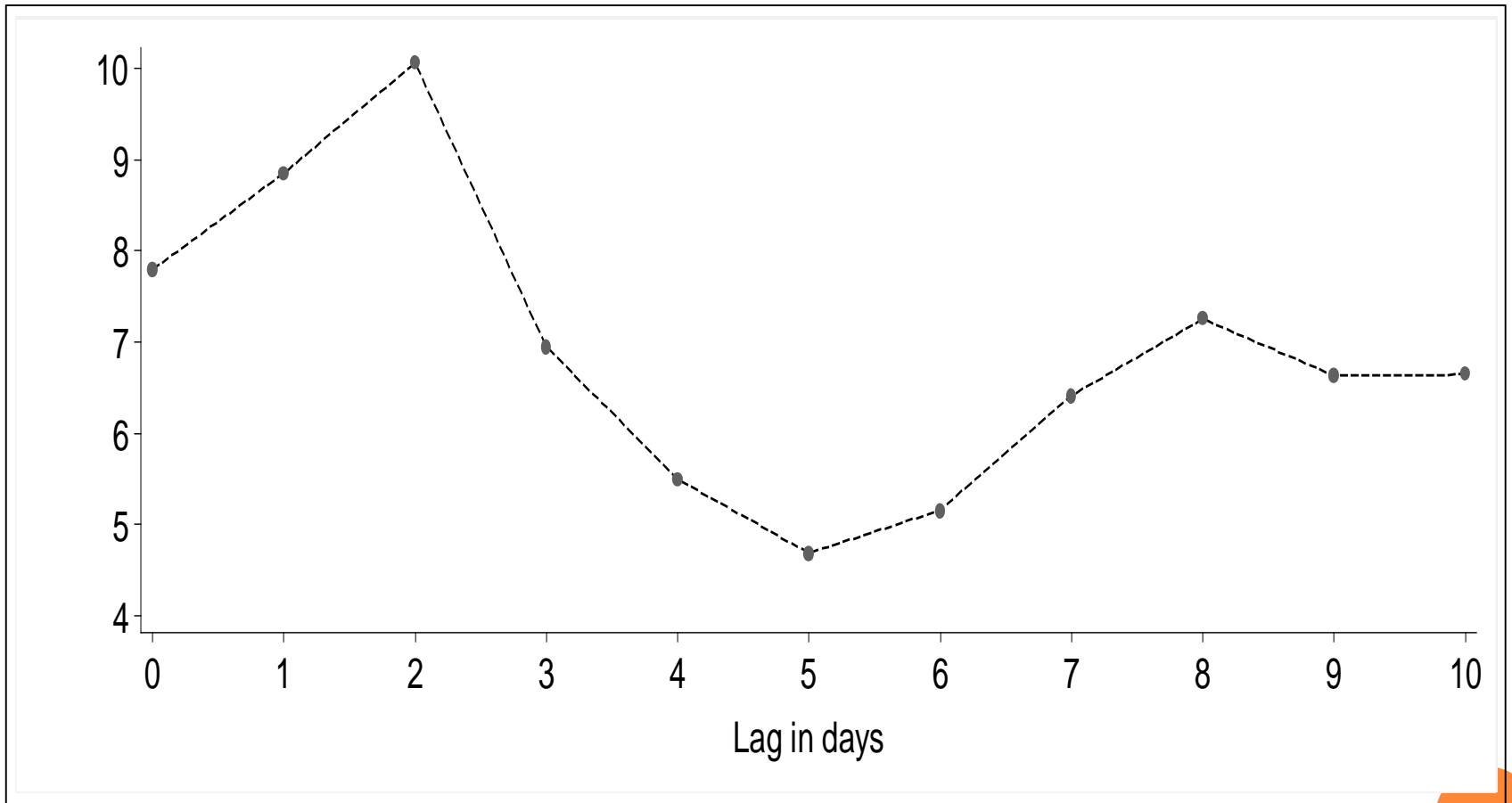


PRIMARY ANALYSIS- AFRICAN DUST AND ASTHMA

- For the 10-year period, the airborne dust concentration was consistently *negatively associated* with emergency asthma admissions to the QEH A&ED.
- This negative effect was always strongest two (2) days after the dust measurement



10 DAY LAG BETWEEN DAY OF DUST MEASUREMENT AND ASTHMA ADMISSION



FURTHER WORK

- Debate continues on the effect of African dust on human health and ecosystems in Caribbean
- All major research groups ...
 - Prospero (USA, Barbados),
 - Garrison, Monteil, Guyan, Gowrie (T&T),
 - Mayol-Bracero (PR)
- “Dire need for *coordinated long term studies* on cardiovascular and respiratory health for the peoples of the region from a public health point of view”.
- UWI and CARPHA have a unique opportunity to lead this agenda in Caribbean.. many research groups
- B'dos... NASA, Hamburg, UK, US Universities: T&T ..USGS, Martinique



THANK
YOU!

