# Assessing the Impact of Dust on the Spread of Bacterial Meningitis Epidemics in Upper East Region, Ghana

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# OUTLINE OF PRESENTATION

- Introduction
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# Introduction

- Study of the link between climate and infectious diseases is increasingly important due to climate change (Codjoe et al., 2014).

- Dust could have an impact on climatic variables, such as temperature and humidity, which are also seen as important variables of meningitis infection and disease (Sultan et al., 2005).

- Over 3000 meningitis cases and 400 deaths were reported in Ghana between 2010 and 2015 (Ghana Health Service, 2016)

Dust aerosol climatology over Bolgatanga, based on the monthly data of Dust aerosol optical depth (DAOD) derived from **ECMWF ERA5 reanalysis dataset.**

*ERA5 is the fifth generation ECMWF reanalysis for the global climate and weather for the past 4 to 7 decades with a resolution of* **0.25° x 0.25°**

# Study Aim and Objectives

- To analyze the impact of dustiness on the spread of bacterial meningitis epidemic over northern Ghana (Upper East region).

**Objective 1:**

- Identify the onset and cessation date of dust storms over Northern Ghana during the harmattan period using **ECMWF ERA5 reanalysis dataset**

**Objective 2:**

- Analyze the severity of dry climatic conditions during these dust storms periods over Northern Ghana

**Objective 3:**

- Determine the impact of the onset of Dust storms on the incidence of the bacterial meningitis epidemic in Northern Ghana

# Materials and Methods

Determining the normal climatic trend during the study period using climatic data from Ghana Meteorological Agency

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Apply ECMWF ERA5 reanalysis dataset on the detection and propagation of dust during the dry season

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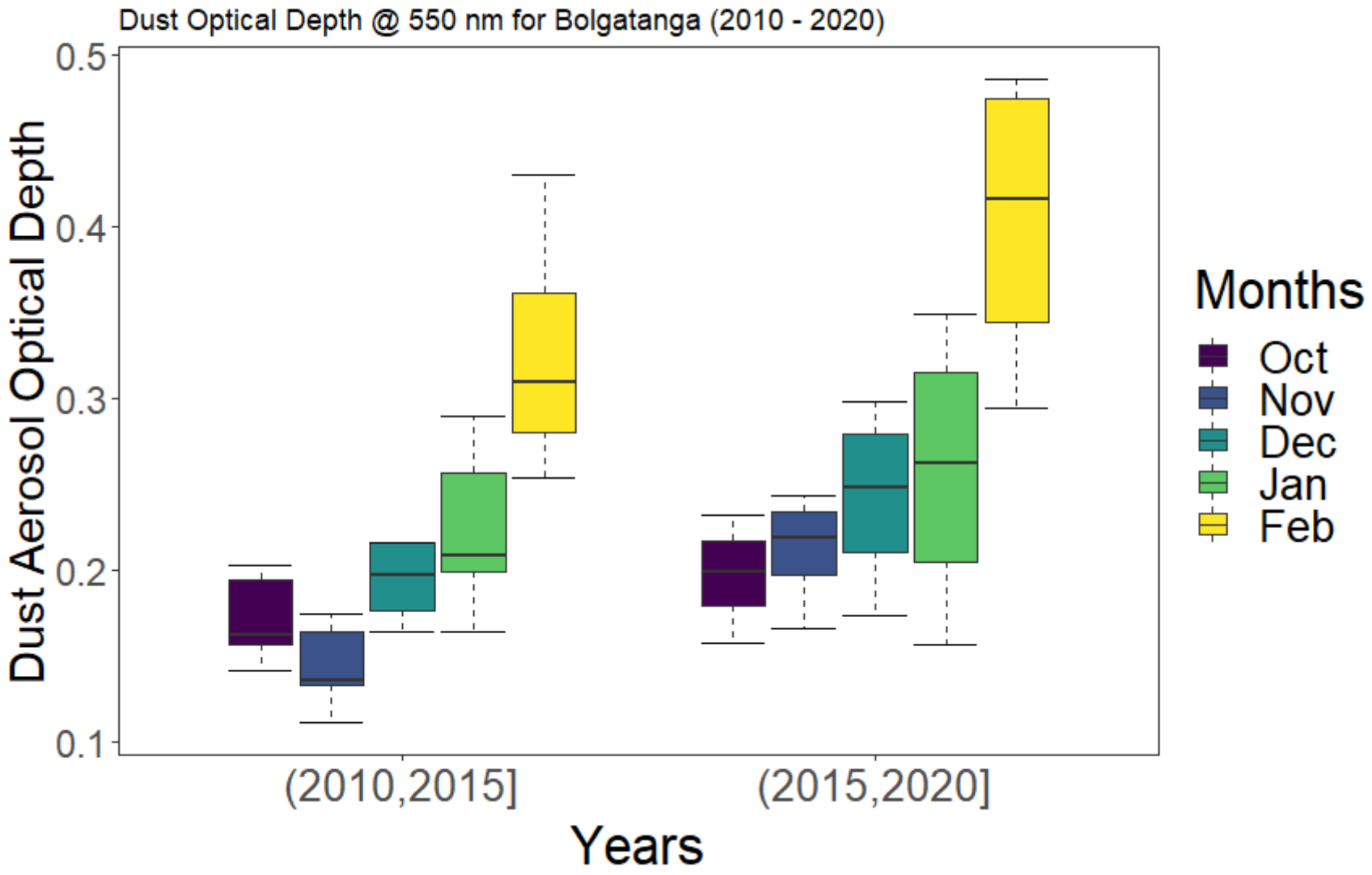
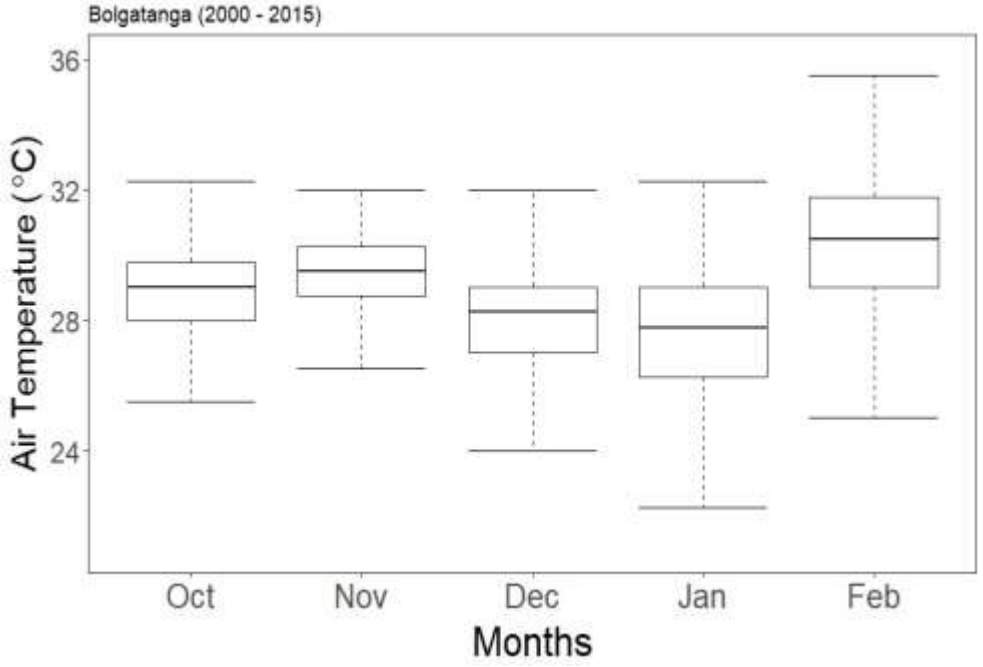
Using statistical analyses to determine the impact of dust on the severity of the bacterial meningitis disease during the period.

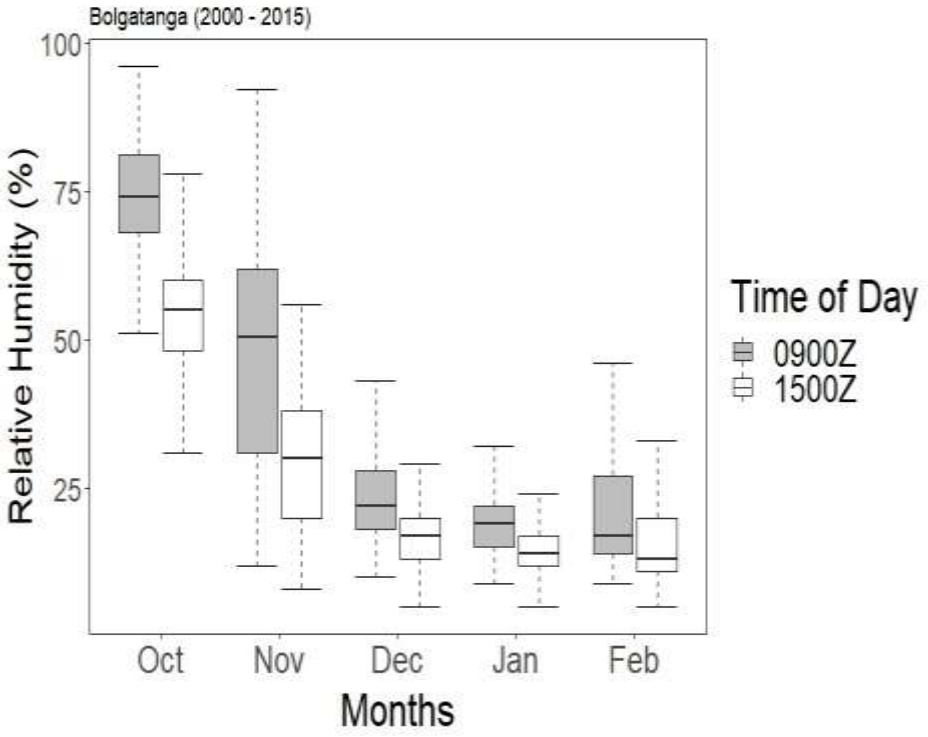


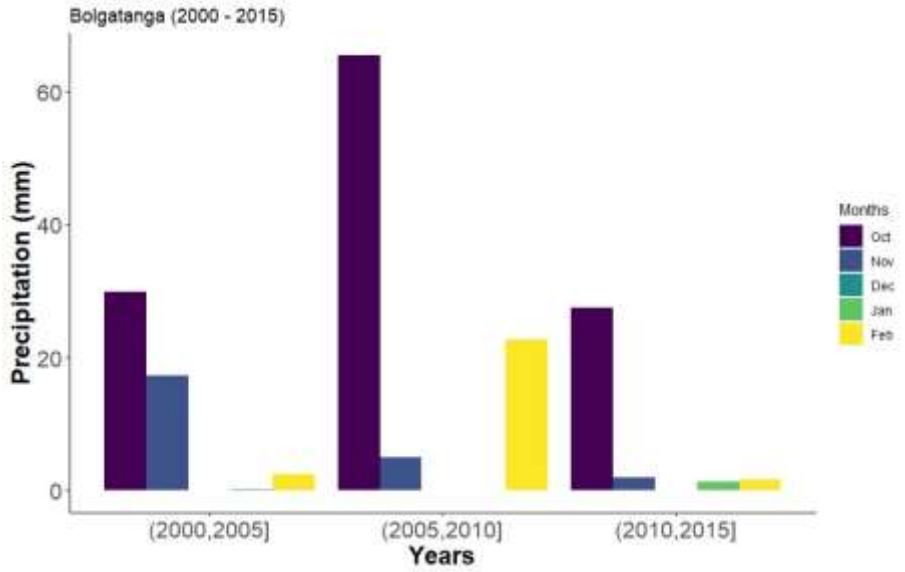

*January and February are mostly characterized by very dusty conditions, especially for 2015-2020*

# Results

*Climatic Conditions during the Harmattan at Bolgatanga*




*The peak periods of the harmattan = December, January, and February with very dry and hot conditions*

# Preliminary Results

- From 2010 to 2020, results of DAOD-meteorology correlation analyses suggest reduced precipitation and low relative humidity during December, January, and February over Bolgatanga was characterized by increased DAOD levels, especially for 2015 - 2020.

- The health data records on the incidence of the bacterial Meningitis epidemics in the Upper East region of Ghana will be compared to the preliminary results to investigate the number of cases recorded during these dry and dusty conditions over Bolgatanga.

- Study to be expanded over other stations in the Northern part of Ghana.

# References


- Sultan, B., Labadi, K., Guégan, J. F., & Janicot, S. (2005). Climate drives the meningitis epidemics onset in West Africa. PLoS medicine, 2(1), e6.
- Nii, S., Codjoe, A., & Nabie, V. A. (2014). *Climate Change and Cerebrospinal Meningitis in the Ghanaian Meningitis Belt*. 6923–6939. https://doi.org/10.3390/ijerph110706923
- Risk, S. C. (n.d.). *Climate Change Health Risk Mapping*.
- Tyler, K. L. (2009). Chapter 28 A history of bacterial meningitis. In *Handbook of Clinical Neurology* (3rd ed., Vol. 95, Issue C). Elsevier B.V. https://doi.org/10.1016/S0072-9752(08)02128-3
- Aili, A., & Oanh, N. T. K. (2015). Effects of dust storm on public health in desert fringe area: Case study of northeast edge of Taklimakan Desert, China. *Atmospheric Pollution Research*, *6*(5), 805–814. https://doi.org/10.5094/APR.2015.089


THANK YOU