GeoHealth: A Surveillance and Response System

UPDATE

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PROJECT OBJECTIVES

01 Construct a geospatial health resource data portal (GeoHealth) compatible with GEOSS

02 Map and model the epidemiological risk of two prototype vector borne diseases: Visceral leishmaniasis and Aedes borne arboviruses

03 Process big data to discover “hidden” associations of disease for ecological niche modeling vs hypothesis-driven statistical analysis

04 Implement dissemination and training programs to promote geospatial mapping and modelling for VBD as envisioned in GEOSS
GEOHEALTH STRUCTURE

1. Satellite climatology models
   2017 – 2019 Data
   VIIRS - GPM - SMAP - GOES-16
2. Biology based models
   GDD – Water budget / Generations per year
3. Neural Network models
4. Statistical models
5. Agriculture scale (1 Km)
6. Household scale (community level)
   < 1m (Household = epidemiologic unit)
Collaboration between LSU, Marshall Space Flight Center and Brazilian Universities to work on two countries:

Brazil – Two states (Bahia and Sao Paulo)

Colombia

Work developed in Brazil

Two states: Bahia (Feira de Santana – community level)

Sao Paulo (Bauru – community level)
From 2015 to 2018:

VL Cases: 202 municipalities in Bahia; 62 municipalities in Sao Paulo
Vector: 76 municipalities in Bahia; 123 municipalities in Sao Paulo

Red stars represent reports of visceral leishmaniasis in humans and the blue circles represent locations where surveys using CDC light traps have captured the vector species that transmit the disease to humans.
For the sand fly model in Bahia, it was possible to observe a seasonality for soil moisture that encompasses the period between December to February (summer months or dry season).

For Sao Paulo state it was observed a higher probability distribution considering SMAP for the winter months, beginning of summer (November).
Calculating the water budget was a step into calculating the potential number of generations the vector is expected to produce in the period of a year considering its biological requirements and climate conditions of the area.
Within a year and considering the soil moisture extracted from SMAP satellite data and biological requirements, it is possible to expect some areas in Bahia state to have up to 10 generations of the vector and up to 5 generations per year in Sao Paulo.

Sao Paulo state registers colder temperatures than Bahia and Bahia is more of a semiarid region that favors transmission all year around.
The number of annual generations can vary according to the amount of water in the soil and it is possible to identify the areas where having more or less generations are expected to proper allocate control measures such as spraying insecticides or compare where the cases of disease or presence of the vector are in relation to the annual generations expected.
Comparison of Bahia to see if it could be expected in Sao Paulo. We observed not only areas that are similar to the original probability of distribution but also identify areas that don’t have the disease but can be considered potential areas.
ECOSTRESS

Evaporative Stress Index
Land Surface Temperature
Association with disease in humans, canines and impact on vector population
TRAINING TECHNOLOGY TRANSFER

GOAL: Implement dissemination and training programs to promote geospatial mapping and modeling for vector borne diseases as envisioned in GEOSS

Building an organization of continuous learners

Creating a workforce that excels in the requirements without the burden of one more task to be completed
Purpose

Data Surveillance

Field Collection

Database construction

Gathering data (EOS)

Advanced training

Modelling

Special Projects

Analysis

PERFORMANCE MANAGEMENT

LEADERSHIP DEVELOPMENT

CONTROL MANAGEMENT

Individual development planning

Mapping

Training material

GeoHealth

Health officers

Health efficiency

National Control Program

TRAINING PATH

LEARNING PATH

PERFORMANCE MANAGEMENT

LEADERSHIP DEVELOPMENT

CONTROL MANAGEMENT

PROJECT REPORT
THANK YOU!
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