PROJECT / REPORT

GeoHealth: A Surveillance and Response System UPDATE

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Ameri GEO
Earth Observations for the Americas

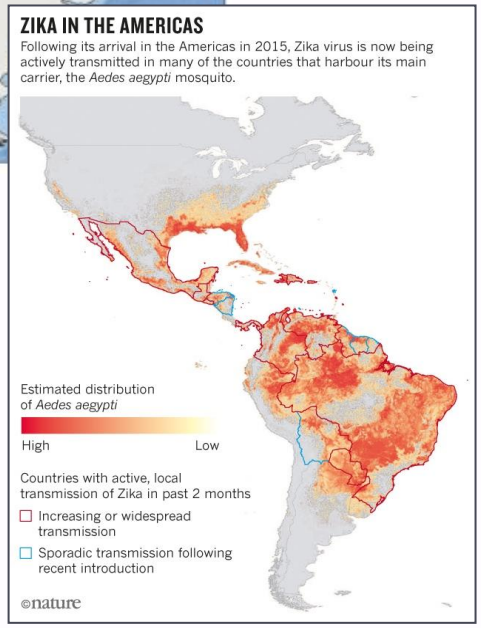
PROJECT OBJECTIVES

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



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GEOHEALTH STRUCTURE

1. Satellite climatology models

2017 – 2019 Data

VIIRS - GPM – SMAP - GOES-16

2. Biology based models

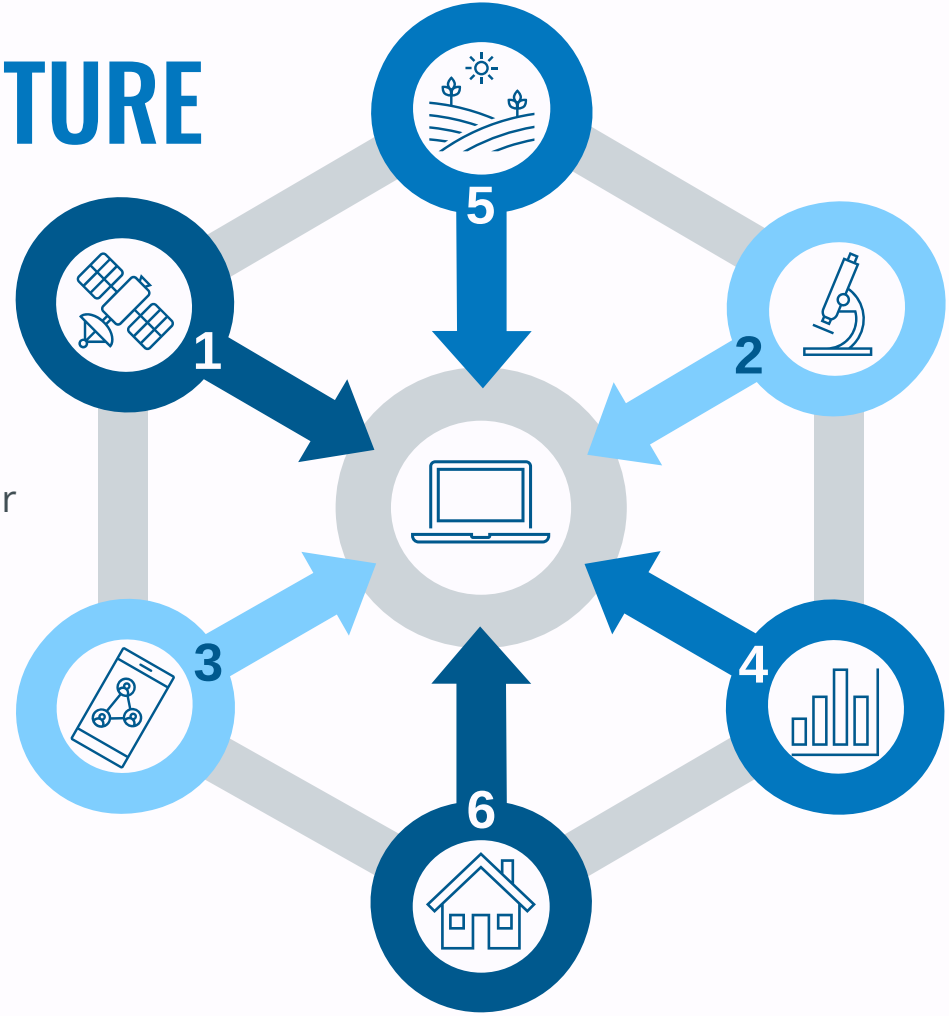
GDD – Water budget / Generations per year

3. Neural Network models

4. Statistical models

5. Agriculture scale (1 Km)

6. Household scale (community level)
< 1m (Household = epidemiologic unit)



STUDY AREA
DEMO

Collaboration between LSU, Marshall Space Flight Center and Brazilian Universities to work on two countries:

Brazil – Two states (Bahia and Sao Paulo)

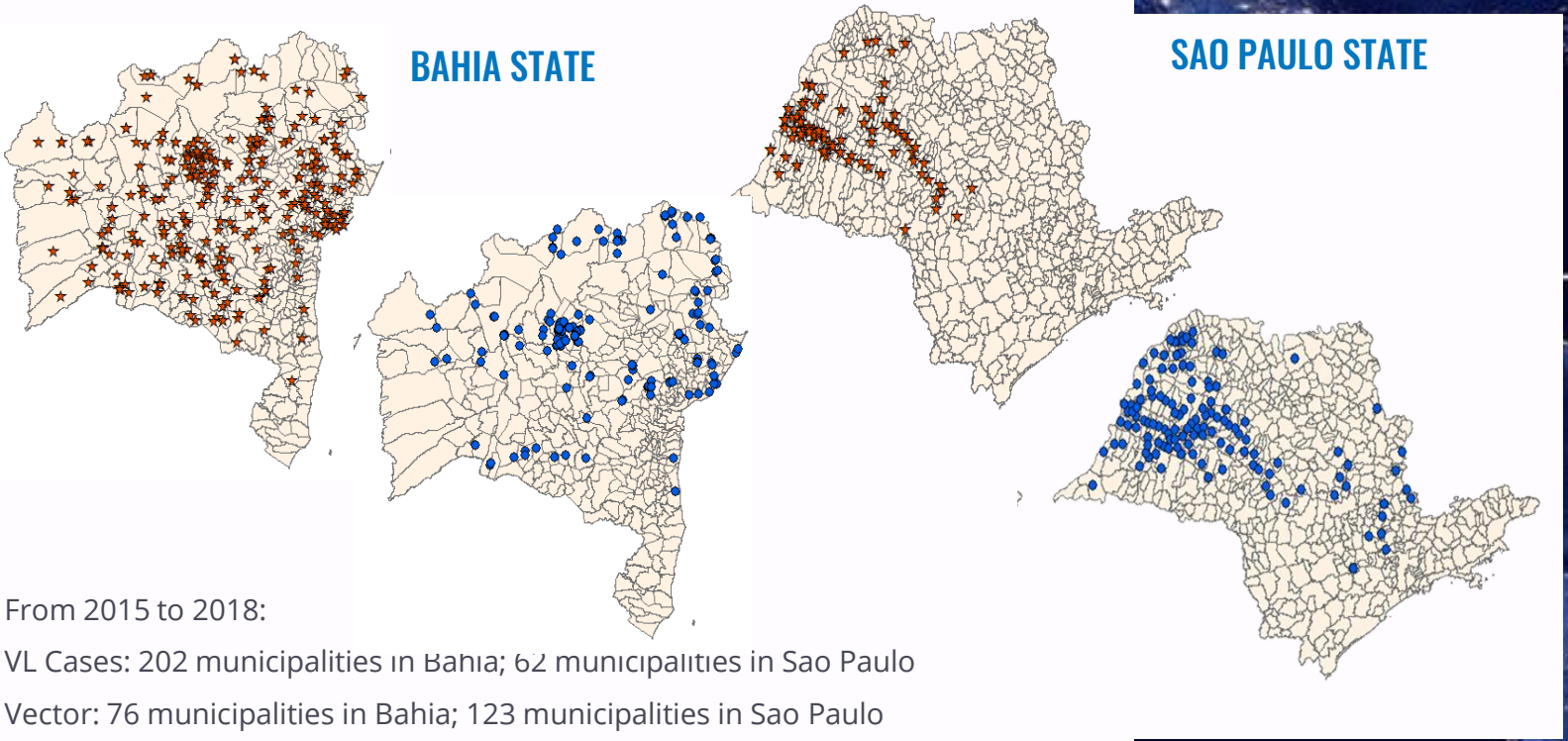
Colombia

Work developed in Brazil

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

Sao Paulo (Bauru – community level)

SPATIAL DISTRIBUTION



From 2015 to 2018:

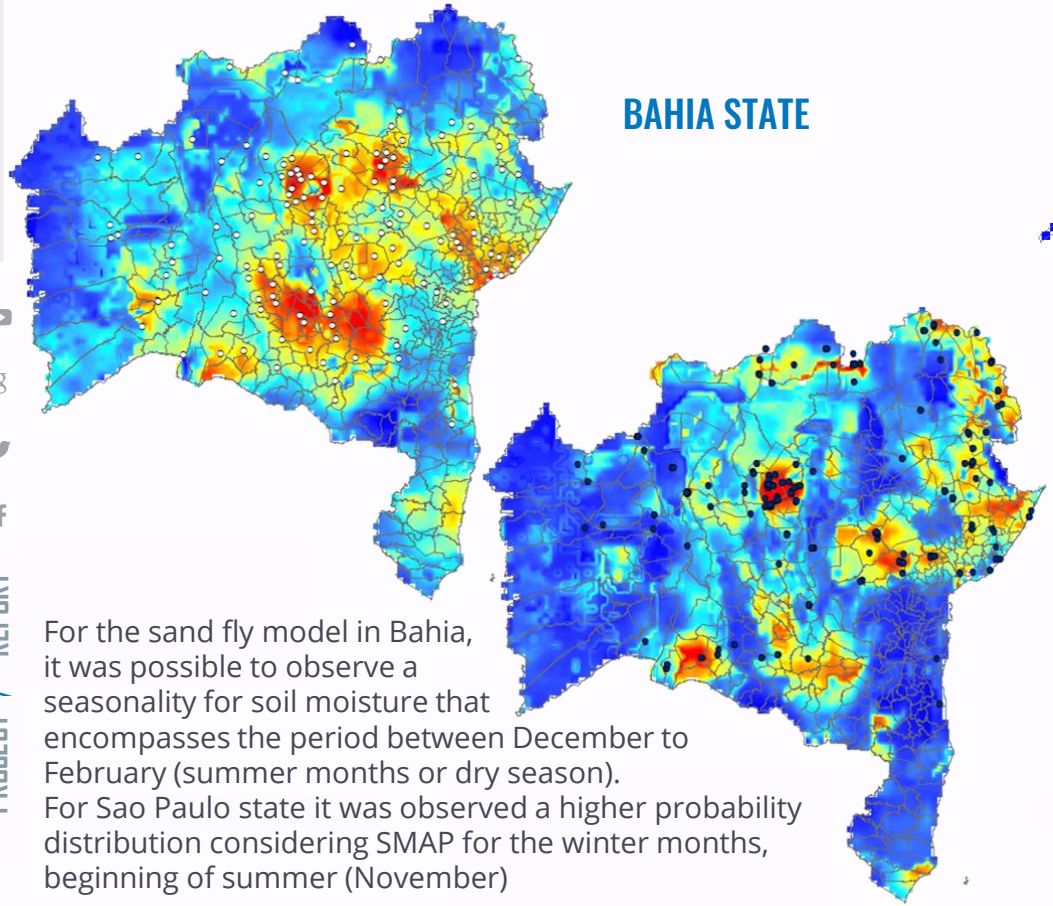
VL Cases: 202 municipalities in Bahia; 62 municipalities in Sao Paulo

Vector: 76 municipalities in Bahia; 123 municipalities in Sao Paulo

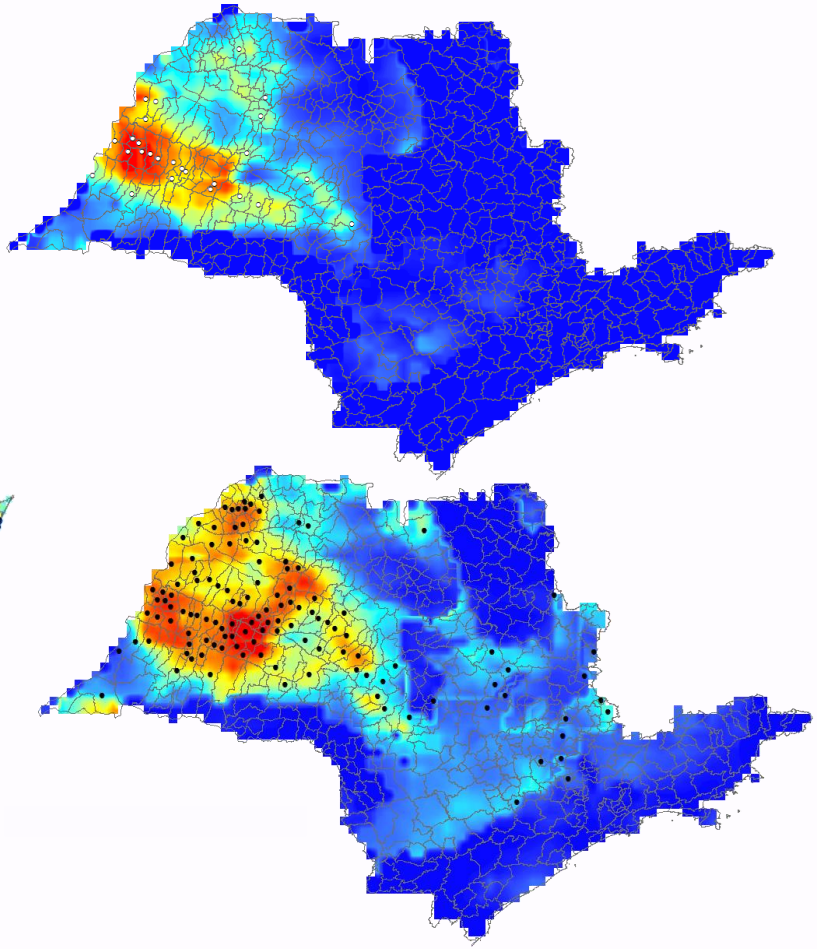
Red stars represent reports of visceral leishmaniasis in humans and the blue circles represent locations where surveys using CDC light traps have captured the vector species that transmit the disease to humans.

SMAP

BAHIA STATE

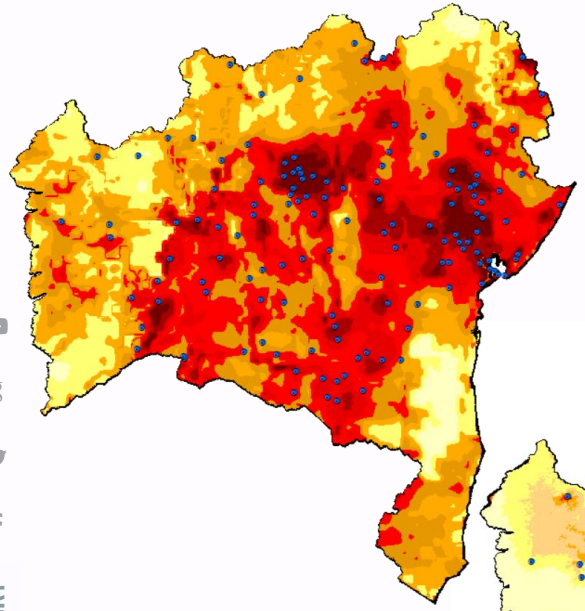


SAO PAULO STATE

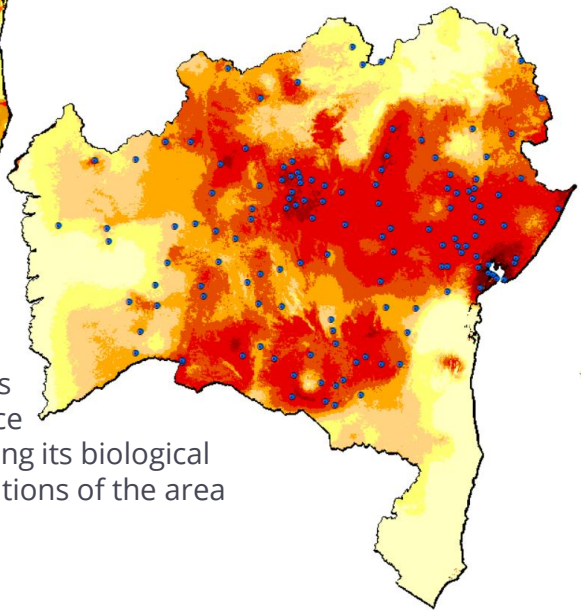


For the sand fly model in Bahia, it was possible to observe a seasonality for soil moisture that encompasses the period between December to February (summer months or dry season).
For Sao Paulo state it was observed a higher probability distribution considering SMAP for the winter months, beginning of summer (November)

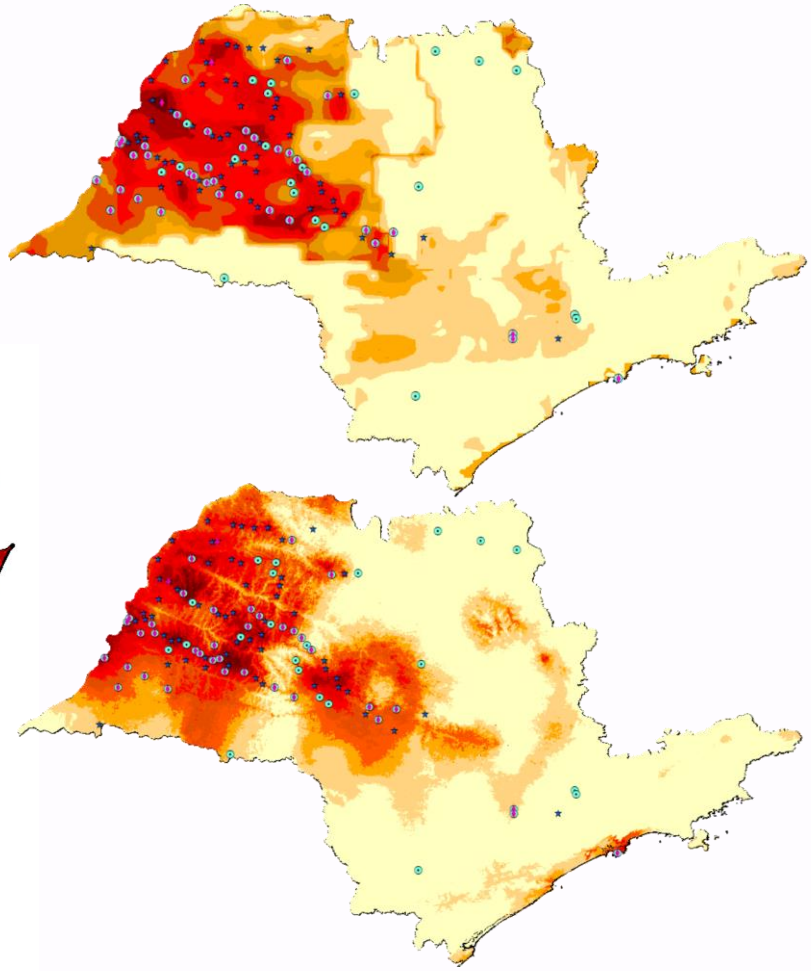
SMAP vs WB



BAHIA STATE

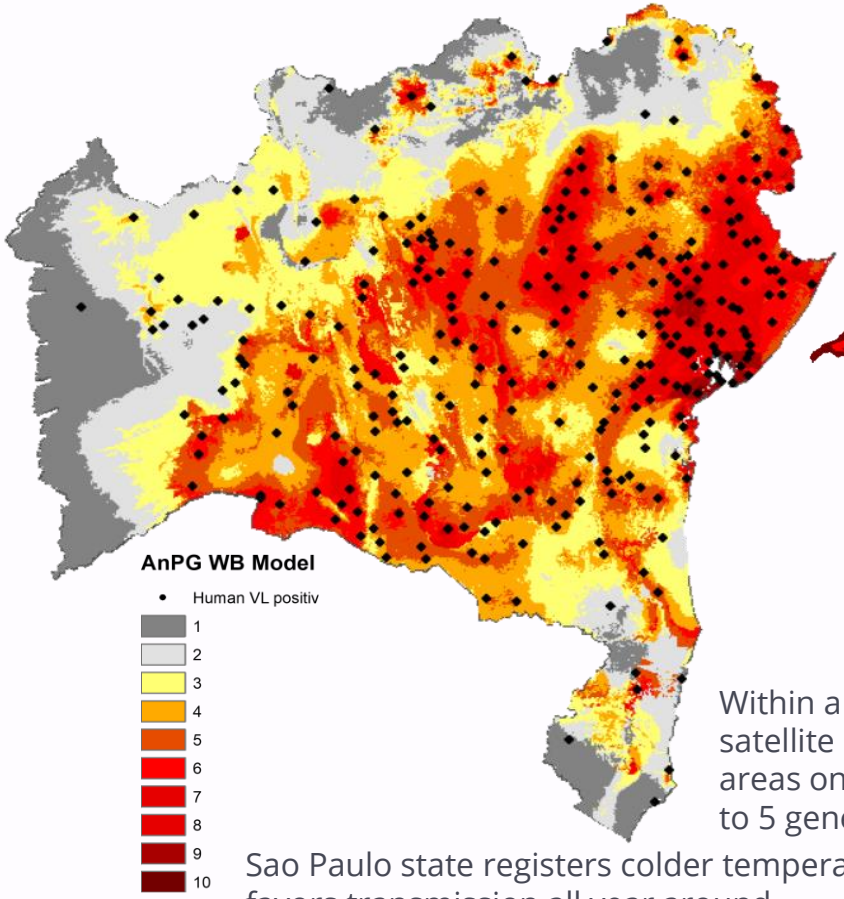


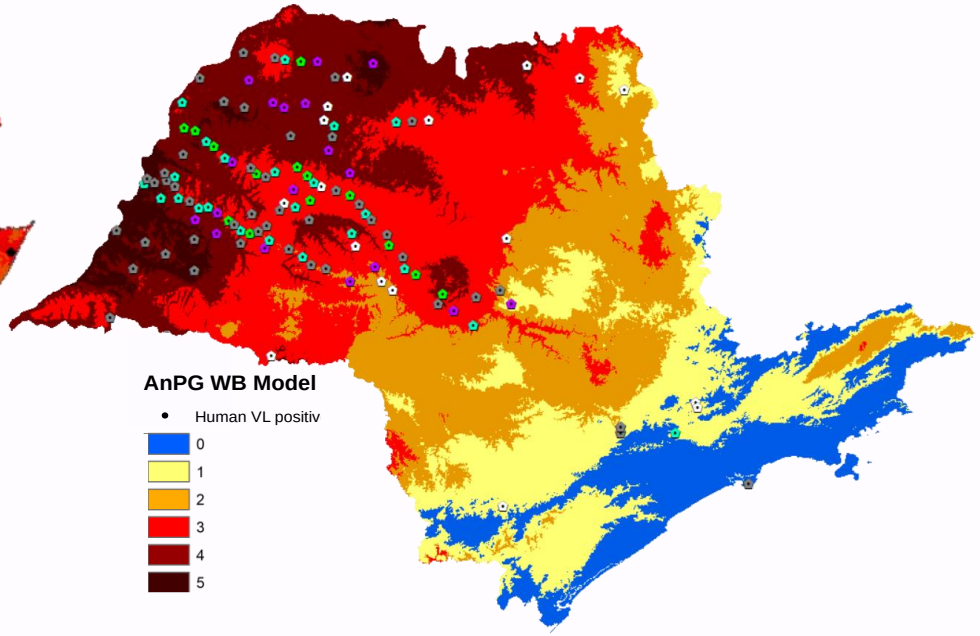
SAO PAULO STATE



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

ANNUAL POTENTIAL GENERATIONS

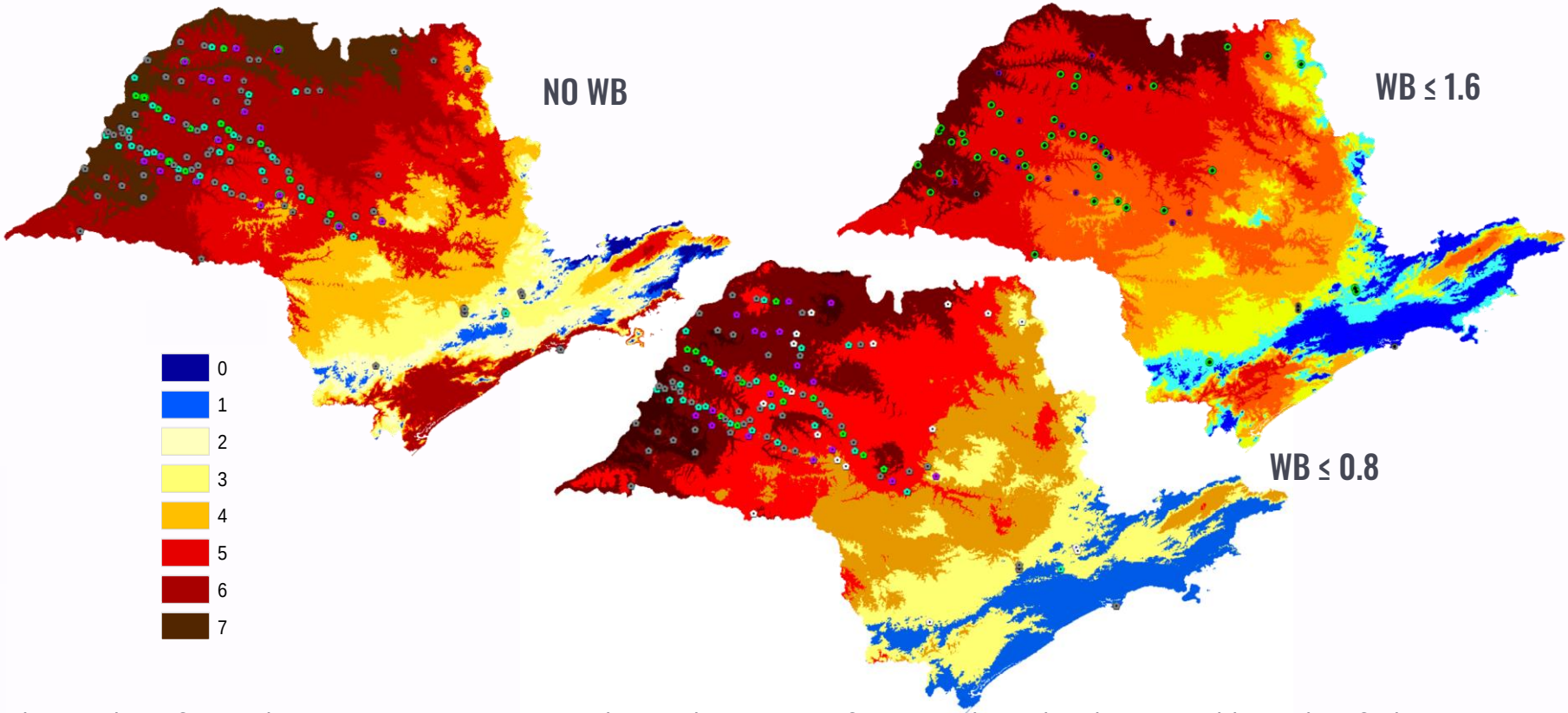




Within a year and considering the soil moisture extracted from SMAP satellite data e biological requirements it is possible to expect some areas on Bahia state to have up to 10 generations of the vector and up to 5 generations per year in Sao Paulo.

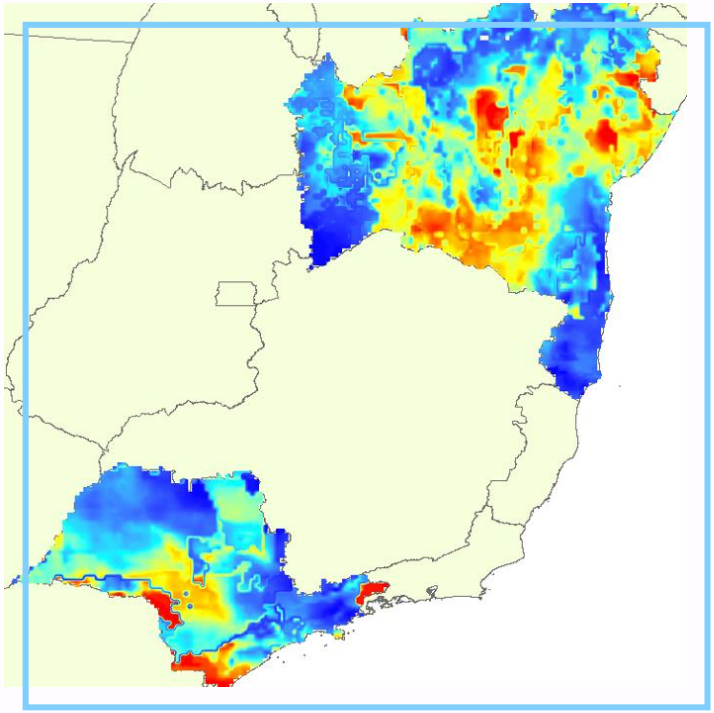
Sao Paulo state registers colder temperatures than Bahia and Bahia is more of a semiarid region that favors transmission all year around

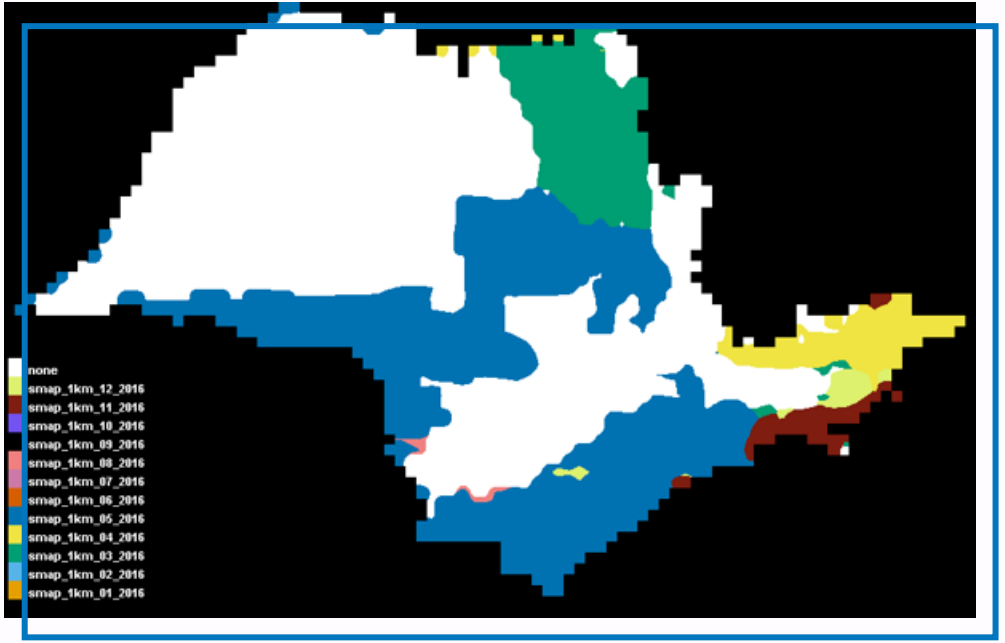
ANNUAL POTENTIAL GENERATIONS



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

AREAS OF SIMILARITY VL





LIMITING FACTORS

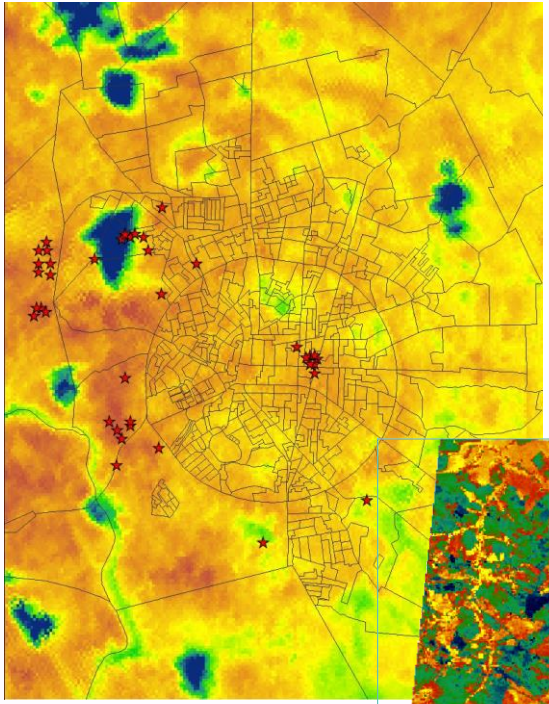
Comparison of Bahia to see if it could be expected in Sao Paulo. We observed not only areas that are similar to the original probability of distribution but also identify areas that don't have the disease but can be considered potential areas.

ECOSTRESS

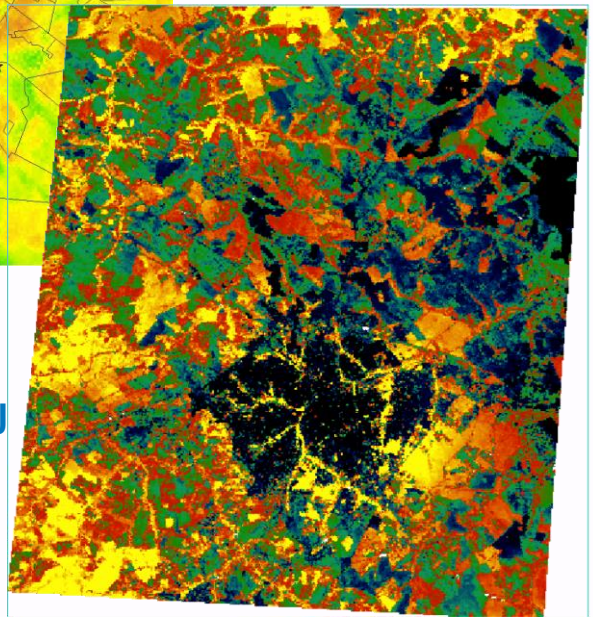
Evaporative Stress Index

Land Surface Temperature

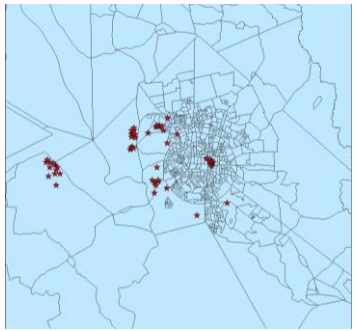
Association with disease in humans, canines and impact on vector population

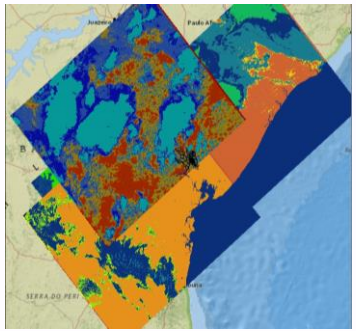


FEIRA DE SANTANA



BAURU





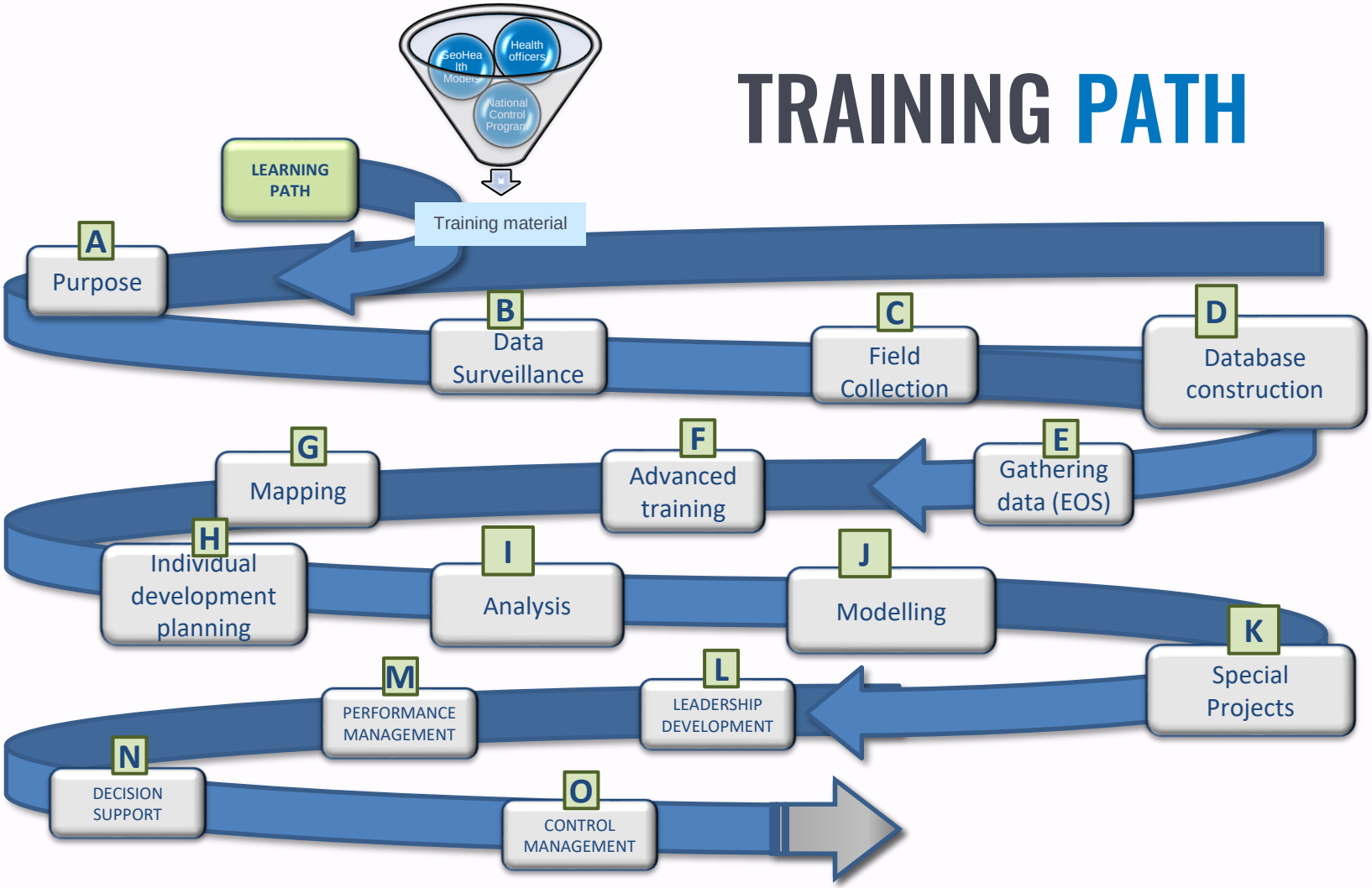
TRAINING
TECHNOLOGY TRANSFER

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

TRAINING PATH



THANK YOU!

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