Description: Emerging global health challenges – such as poor air and water quality, spread of infectious diseases (including COVID-19), extreme heat temperatures, and unprepared health systems – should be a leading priority in the upcoming decade. Earth observation data offer real-time information for scientists and stakeholders to examine the impact of these environmental risks on human and animal health, and ultimately enhance community health decision-making. By building these One Health networks, the global workforce can leverage expertise and incorporate innovative data and technology to enhance community response efforts that protect population health.

FLASH TALKS: PART I
Tuesday, September 7, 2021 from 8:30-10:00AM EDT (GMT-4)

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## Category: Infectious Diseases II

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<td>NASA’s NextGen Remote Sensing Instruments have been Announced: Implications for Public Health</td>
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## FLASH TALKS: PART II
**Tuesday, September 21, 2021 from 8:30-10:00AM EDT (GMT-4)**

## Category: Public Health Infrastructure and Capacity Building

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<td>Tanya Maslak</td>
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**Category: Community-based Applications**

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Chikungunya in the Americas: The Value of Earth Observations

Assaf Anyamba (NASA Goddard; USA; assaf.anyamba@nasa.gov)

Emerging and re-emerging diseases of global public health concern are recognized to be closely associated with variations in global climate. Recent chikungunya outbreaks in the Americas (2013-2016), Africa, Indian Ocean islands and Asia (2004-2007) have been associated with extreme departures in climate parameters including rainfall and temperature. Chikungunya has illustrated the potential for global spread as demonstrated with the recent epidemics in the Americas. We have developed a global chikungunya mapping and forecasting application system to map areas at risk for chikungunya ahead of time to assist public health organizations including Pan American Health Organization (PAHO), World Health Organization etc. in real-time monitoring and surveillance efforts. This risk mapping and forecasting effort ingests NASA and NOAA climate observations (rainfall and temperature) and baseline variables (population density and chikungunya vectors) utilizing a machine learning framework.

El Rol de la Infraestructura de Datos Geoespaciales de Chile (IDE Chile) durante la Pandemia COVID-19, Emergencias y Desastres

Cristian Araneda Hernández (Sistema Nacional de Información Territorial, SNIT-IDE; Chile; caraneda@mbienes.cl)

Durante los últimos años, Chile ha enfrentado catástrofes naturales, incendios forestales y un complejo escenario de Pandemia, esto genera una alta demanda de información por parte de la comunidad, en este contexto, el Sistema Nacional de Información Territorial debe garantizar el acceso a la información territorial pública que generan los organismos y la visualización de los datos. Junto con la creciente demanda e innovación para compartir información de forma ágil, se ha creado una plataforma crowdsourcing para que las instituciones puedan compartir rápidamente información territorial en caso de emergencias y desastres, como así también establecer redes de contactos inter-institucionales. Además, se creó un punto de inflexión en el acceso a información geográfica, a través del uso de Dashboards Territoriales, los cuales han tenido un éxitooso recibimiento por parte de la ciudadanía, llegando a segmentos de población que desconocían la importancia de la información territorial.

Frena La Curva Honduras: A Resilience Map

Caridad Cardona,1 Douglas Alonzo,1 Martin Murillo,2 Kelly Díaz,2 Oswaldo Rodríguez,3 Javier Funes,4 David Mejía,4 Sandra Gómez Ventura5 (1Walabis Honduras, 2Honduras Biological Research, 3Fundación Lucas para la Salud, 4Universidad Tecnológica Centroamericana (UNITEC), 5Frena La Curva Honduras; Tegucigalpa, Honduras; drsgomezv@hotmail.com)

The “Frena la Curva” project is a citizens’ initiative that uses digital systems to connect, support and inform the population in response to the COVID-19 pandemic. At the start of the pandemic, Spain launched “Frena la Curva” on March 14, 2020. As other countries learned about this project, a group of Honduran civil society members adapted this platform to the Honduran territory on April 26, 2020, using maps, digital resources, and social media. The “Frena la Curva Honduras” has the following approaches: 1) The geo-reference resilience map collects and displays needs, businesses, and health care centers as well as offers support for citizens. This service is free and under the responsibility of the user. 2) Internet resources and social media (Facebook) of the project help to educate the population on how to have a healthy lifestyle, promote environment protection, and learn about resources to improve reading and writing skills. Zoom discussion forums offer additional opportunities for interaction. 3) Promotion for local businesses is disseminated for each business registered in the map through social media posts, television, and radio interviews. 4) Since 41.4% of the population represents children between 6 and 12 years old, Zoom forums with children facilitated educational activities on healthy lifestyle habits, since schools were closed due to the COVID-19 pandemic.
Group on Earth Observations (GEO) Health Community of Practice: Using Environmental Observations to Improve Health Decision-Making

*Helena Chapman (NASA HQ; USA; helena.chapman@nasa.gov)*

The GEO Health Community of Practice (CoP) was developed to serve as a global network of governments, organizations, and observers who use EO data to improve health decision-making. These EO data for health that inform early warning to early action and disaster risk reduction are relevant for monitoring progress of the UN 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction 2015-2030. To strengthen cross-collaborations and synergies, five working groups were established to engage health partners, clarify and address health needs for capacity building, and identify and address gaps. During the COVID-19 pandemic, this community leveraged global expertise, shared resources, and discussed priorities and challenges across geographic regions. By strengthening these multidisciplinary collaborations, CoP members can stimulate continued partnerships and provide technical expertise on environmental health decisions and actions that affect global ecosystems.

Earth Observations for Mosquito Research and Surveillance in Costa Rica and Panama

*Luis Fernando Cháves (Instituto Conmemorativo Gorgas de Estudios de la Salud; Costa Rica; lfchavs@gmail.com)*

Problems with vector surveillance are a major barrier for the effective control of vector-borne disease transmission through Latin America. Some of the issues reflect the lack of research on vector ecology. Here, I will present results from a 80-week longitudinal study where *Aedes aegypti* (L.) (Diptera: Culicidae) ovitraps were monitored weekly at 92 locations in Puntarenas, a coastal city in Costa Rica with syndemic Zika, chikungunya, and dengue transmission. I will also present results from a 24-month long study on the ecology of *Anopheles albimanus*, the main malaria vector in Mesoamerica, from a Village within a region targeted for malaria elimination in Panama. In these studies, Earth observations were employed to understand mosquito population ecology and inferences drawn from the research have been used for policy making related with vector-borne disease control in both Costa Rica and Panama.

Building Capacity to Use Earth Observations for Health Applications: A Summary of NASA’s DEVELOP Program and Projects in Central and South America

*Lauren Childs-Gleason (NASA Langley; USA; lauren.m.childs@nasa.gov)*

NASA’s DEVELOP program engages individuals and organizations in 10-week feasibility studies to apply NASA Earth observations to decision makers’ needs. Since 2018, DEVELOP conducted 21 projects in Central and South America, eight of those in collaboration with Sistema de la Integración Centroamericana (SICA) and its member state partner agencies. These projects addressed a diverse set of community needs across multiple themes, including a project focused on monitoring aerosols using satellite-based measurements from Aqua and Terra MODIS, Suomi NPP VIIRS, and CALIPSO CALIOP and in situ data in El Salvador, Guatemala, and Panama. This poster introduces DEVELOP, its approach to capacity building, key partnerships, and project results highlighting the capabilities of Earth observations for enhanced decision making in the area of health.
Spatiotemporal Variation in Childhood Risk of Enteric Shigella Infection: A Quasi-global Predictive Model and Risk Mapping Tool
Josh Colston (University of Virginia School of Medicine; USA; josh.colston@virginia.edu)
We modeled the spatiotemporal variation in pediatric Shigella infection risk using covariates with quasi-global coverage and used these to map the predicted prevalence of shigellosis across Low- and Middle-Income Countries. Data were combined from numerous studies that used PCR to diagnose Shigella in stool samples collected from children aged <5 years and matched with covariates including historical daily Earth Observation- and model-based re-analysis-derived estimates. Variable selection was carried out by forward stepwise addition of covariates and a predictive projection method was implemented. The final database included results from over 64,000 stool samples collected from 21,000 subjects in 19 LMICs. The model predicted wide belts of elevated Shigella risk in tropical Sub-Saharan Africa, India, and Brazil, as well as smaller pockets of high prevalence in New Guinea, Ethiopia, the Sahel, coastal Central America, and Colombia, among others.

Applying a Social Vulnerability Index to Explore Inequalities in a Rural Settlement of Brazil
Clóvis da Silva Jaime; Samuel do Carmo Lima; Elivelton da Silva Fonseca (Federal University of Uberlandia; Brazil; elivelton.fonseca@gmail.com)
This study aims to evaluate the social vulnerability in the Nova Tangará Agrarian Reform Settlement Project (NTARSP), in order to test the implications of using complex indicators in understanding of inequalities. The study is designed as quantitative, using descriptive statistics and mapping. Data were collected by the Incubation Center of Popular Solidarity Enterprises with 45% of the lot owners, from 2015 to 2018. The statistics were performed using Epi-info, QGis and SPSS. The most influential indicators are related to work, family, information, education, health and safety. Other influential factors are related to territory: soil, water, and lot conditions and are responsible for settlers’ situations of social vulnerability. The Vulnerability of the Population contributed with 56% of the model and the Vulnerability of the Place contributed to 44%. In conclusion, about 29% of NTARSP families are at high or very high levels of social vulnerability, living in extreme poverty.

Satellite-based Models to Predict the Potential Generations of Visceral Leishmaniasis Vector (Lutzomyia longipalpis) in the State of Bahia, Brazil
Prixiadela Mar Nieto, Louisiana State University; USA; prixiadelmar@yahoo.com
Two predictive models based on WorldClim and satellite data were developed within a geographic information system to calculate the growing degree day (GDD)-water budget (WB) to obtain the potential generations of visceral leishmaniasis vector (Lutzomyia longipalpis). The potential generations is a method used to predict the distribution and potential risk of visceral leishmaniasis (VL) in the State of Bahia, Brazil. The objective is to define the variables that intervene in the reproduction of the Lutzomyia longipalpis, the thermal limits and the environmental suitability of the disease to obtain a deeper understanding of the biology of the vector.
GIS Tools to Help Honduras Navigate the Crisis due to COVID-19, Dengue, and Two Hurricanes

Reyna Durón,1,2 Eduardo Sánchez,2 Gracia Pineda,1,2 Gaspar Rodríguez,2 Guímel Peralta,1,2 Sandra Gómez Ventura,2 Ramón Soto,2 Aldo Romero,1 Oswaldo Rodríguez,1,3 José Bardales,1 Javier Salgado1 (1COVID-19 Observatory of Universidad Tecnológica Centroamericana (UNITEC), 2Honduras COVID-19 Research Consortium, 3Centro Universitario Tecnológico de UNITEC; Tegucigalpa, Honduras; reyna.duron@unitec.edu.hn)

Geographic informatics systems can help the decision-making processes in public health. Honduras faced a multiple crisis in 2020 due to COVID-19, dengue, and hurricanes Eta and Iota, which struck the country in November that year. We implemented a demonstration project to show how health surveillance systems combine several technological platforms and develop multidisciplinary research that could help the country navigate the crisis. The COVID-19 and Dengue Observatory was established in June 2020 by using an ArcGIS Online platform donated by the Esri’s Disaster Response Program. Dashboards or storymaps were used to track official health statistics, as well as self-report surveys. From November to December 2020, other tools facilitated by NASA and Brigham Young University were used to track hurricanes and to forecast floods. Our project restarted in January 2021 and will continue as we overcome challenges in data acquisition and processing.

NASA Space Apps COVID-19 Challenge: Collaborating and Applying Earth Observations for Global to Local Solutions

Shobhana Gupta (NASA HQ; USA; shobhana.gupta@nasa.gov)

In May 2020, NASA, ESA, JAXA, CSA, and CNES, hosted a virtual 48-hr hackathon, Space Apps COVID-19 Challenge, focused on using Earth observations to learn about SARS-CoV-2 virus and its spread, understand impacts of COVID-19 on Earth systems, and identify opportunities for economic recovery. A total of 15,000 participants from 150 countries built, designed, coded, and created “solutions” to twelve “challenges” on topics including pandemic impacts on UN SDGs and relationships between disease spread and population density. Winners created information portals to inform economic and policy decisions at national scales, applications to address social isolation and improve mental health, and tools to provide location-based health recommendations to individuals. This international collaboration event highlights how space agencies, sharing their data and scientific and technical expertise, can engage citizens around the world to inform and support decision-making at global and local scales.

Using NASA Earth Observations to Enable Open Science

Cynthia Hall (NASA Earth Science Data Systema; USA; cynthia.r.hall@nasa.gov)

NASA Earth science data provide a wealth of information to aid in our understanding of Earth’s processes, in the development of innovative solutions for real-world challenges, and in making data-based decisions. These datasets are freely and openly available to anyone but not always intuitively discoverable and accessible in GIS formats. NASA’s Earth Science Data Systems program has developed resources and tools to overcome this challenge. There is a growing need for NASA data to be GIS-ready for easy integration and analysis in the primary tools employed by user communities. Join us to learn about how NASA Earth Science is enabling data through services, applications and story maps and distributing content through online platforms. Learn about our Earthdata community space and GIS Data Pathfinder, developed to guide users to numerous geospatial web services and tools to access GIS-ready data.
Harnessing Earth Observations to Make Programmatic Decisions and Respond to Food Security Challenges Around the World

_Cynthia Hall_ (NASA Earth Science Data System; USA; cynthia.r.hall@nasa.gov)

Through Sustainable Development Goal 2, the UN proposes to end hunger, achieve food security, and promote sustainable agriculture by 2030. A critical part of this goal is monitoring food production and implementing agricultural practices that increase production, while also maintaining ecosystems, and strengthening the capacity for adaptation to challenges such as climate change, extreme weather, drought, flooding, etc. NASA Earth observations can be used in monitoring and understanding climate and agriculture/water resources to help ensure food security and efficient agricultural practices and to aid in the assessment of progress towards meeting this goal. We will provide resources to aid in your access and use of NASA data, such as an SDG 2 Data Pathfinder, which provides direct access to NASA data and tools; remote sensing training through NASA’s Applied Remote Sensing program; and feasibility projects from NASA’s SERVIR–Amazonia and DEVELOP programs.

Vulnerability for River Floods in San Manuel, Cortés after Hurricanes Iota and Eta

_Luis Herrera_ (Universidad Tecnológica Centroamericana, UNITEC; San Pedro Sula, Honduras; luis.herrera@unitec.edu.hn)

This report presents the vulnerability of the community of San Manuel, Cortes in North Honduras after hurricanes Iota and Eta caused river floods that destroyed 80% of banana plantations and other fruit crops in November 2020. The methods used to collect the data were group interviews by Zoom with farmers and the registers of Casmul (Company of Banana plantation) of the town. They provided information to identify the breaks in borders, using Google Earth application to measure the flooded area. The first phase of field explorations and map building showed that 38% of the breaks originated from the small arm (“El Quinel”) of the Ulua River and 62% from the Ulúa River. The area of river floods was 42.32 km² in Santiago and 7.32 km² in Pimienta, Cortés. More evaluations are underway to determine the vulnerability and risk of floods in a region involving 11 communities. Joint efforts with municipality authorities, microentrepreneurs, academic institutions, and affected populations have been proposed, which seeks to empower communities in the face of these unforeseen events, and to mitigate their impact in regional development.

What’s the Buzz? from Satellites to your Cell Phone

_Dorian Janney_ (NASA Goddard/GPM; USA; dorian.w.janney@nasa.gov)

Learn how and why NASA Earth observing data are used to help predict, monitor, and respond to mosquito-transmitted disease and find out how to help reduce the threat of mosquito-transmitted disease using a free app on your smartphone.

Earth Observations and Infectious Diseases

_Antar Jutla_ (University of Florida; USA; ajutla@ufl.edu)

Data from Earth observations have been used to understand spread and emergence of infectious pathogens. This presentation will summarize what has been achieved in the domain of clinically active pathogens as a function of use of satellite data. We will also discuss potential future of use of Earth observations using examples from water- vector- and air-borne diseases from the literature.
NASA’s NextGen Remote Sensing Instruments have been Announced: Implications for Public Health

Jeffrey Luvall (NASA Marshall Space Flight Center; USA; jluvall@nasa.gov)

NASA will design a new set of Earth-focused missions to provide key information to guide efforts related to climate change, disaster mitigation, fighting forest fires, and improving real-time agricultural processes. The Surface Biology Geology (SBG) mission will collect global remote sensing measurements using a hyperspectral spectrometer and multispectral thermal data. These data sets will provide a significant enhancement in our ability to study disease vector ecology globally. Global public health is entering a new information age through the use of spatial models of disease vector/host ecologies driven by the use of remotely sensed data. Currently, instruments on the International Space Station (ISS)-ECOSTRESS (Thermal), DESIS (hyperspectral) and GEDI (lidar) are currently providing data sets that can be immediately used for public health applications and prepare the community for using SBG data products.

Utilizing NASA Earth Observations for Climate-Resilient Energy Management

Tanya Maslak (Battle Memorial Institute; USA; maslak@battelle.org)

To ensure reliable and resilient energy supply, electric utilities must adapt to threats from environmental change and natural hazards. Understanding weather and climate variability allows utilities to be more resilient in producing or distributing energy supplies and decisive at addressing vulnerabilities. Through iterative capacity building with stakeholders, NASA Earth observations (EOs) were identified and prioritized for inclusion in an Esri ArcGIS StoryMap® that provides actionable data to support resilience planning, vulnerability assessment, and disaster response planning. The StoryMap® enables efficient acquisition of EOs and includes more than 75 data products across 16 environmental parameters. Use cases are featured in the StoryMap® to demonstrate the usability of EOs to solve common environmental challenges for utilities. This talk will discuss end user engagement, emergent themes, lessons learned, and showcase the StoryMap® and EOs potentially relevant across AmeriGEO.

Using Internet of Things to Tackle Climate Change: Smart Thermostats and Heat Waves

Arlene Oetomo (University of Waterloo; Canada; arlene.oetomo@uwaterloo.ca)

Background: Heatwaves are silent killers. Further research is needed to understand where the education and knowledge gaps are. Research Questions: 1) What is the current climate of risk perception towards heat waves and heat-related illnesses? 2) How do people receive public health messaging on extreme heat events, and how is it used? 3) Can smart thermostat data be collected to create hyper-local to improve existing heat alert response systems? Methods: A scoping review will be done to understand how groups perceive risks to their health and community. We will gather data to understand how people respond and act during a heatwave and analyze social media use for communication. We will deploy smart thermostats to collect temperature data in real-time. Benefits: It will identify populations requiring more education about heat-health risks. It will inform on heat health risk communication in a digital age. It will validate a cost-saving, real-time, granular data collection method.
Emerging Trends on Satellite-based Applications in Healthcare: A Synoptic View

Alessandro Paravano (Politecnico di Milano; Italy; alessandro.paravano@polimi.it)

This study examines the state of the art and the maturity adoption of the satellite-based applications in the healthcare domain. Moreover, it deepens the main drivers and barriers for their effective development. Indeed, space technologies may be a valid asset to tackle the future healthcare challenges as stated by the UNOOSA and the WHO. However, despite the clear linkage of the two domains, literature lacks a holistic view on the current adoption of space assets in the healthcare. To investigate this issue, 86 business-cases gathered from a systematic review of the ESA and NASA public databases have been analyzed. In addition, the PEST factors have been explored in terms of barriers to or opportunities. Further information was gathered through a systematic literature review of 89 scientific articles and interviews with five internationally recognized experts. In conclusion, the analysis presented may be useful in promoting national and international One Health networks worldwide.

Energy Observatory in Honduras: Data and Maps to Monitor the Energy Framework

Gracia M. Pineda, Wilfredo C. Flores (Universidad Tecnológica Centroamericana, UNITEC; Tegucigalpa, Honduras; graciapineda087@gmail.com)

Data management is a strategic tool for decision making, planning, and monitoring the energy sector. The Engineering Faculty at Universidad Tecnológica Centroamericana (UNITEC) launched the Energy Observatory of Honduras, as the first available platform in the country. This platform fills the gap that exists in the access to energy data within the country and provides information about the demand, generation, and energetic performance. Multiple national and international data sources, including statistics, rates, weather data, and satellite measures (Landsat 8), were used to develop an interactive dashboard by Tableau. This platform includes data models and a hub of maps showing the energy sector framework in Honduras and some regions of Central America, which is updated periodically as new information is published by public energy offices.

GIS Analysis and Visualization for COVID-19 Contact Tracing, Contact Investigation, and Vaccination: A Case Study in Pima Co, Arizona

Jonnell Sanciangco, Andrew Sommers, Nomana Khan (Maximus; USA; jonnellcsanciangco@maximus.com)

The use of geospatial methods in public health has expanded significantly in response to the COVID-19 pandemic. In Pima Co, Arizona, GIS has been utilized extensively to manage the spread of the coronavirus. Dashboards developed using GIS have been used by local authorities to effectively monitor viral transmission, target resources to communities, and inform contact tracing activities. Geospatial tools have also played a role in vaccine administration efforts. Access to timely, accurate, and complete data including demographics, cases trends, and vaccination can be visualized to support response activities and strategic planning. Unfortunately, robust surveillance systems needed to effectively manage a public health crisis using GIS are rarely established in many countries in Central and South America. This may interfere with their capacity to protect the health of their residents. Timely collection of reliable health data will be essential to avert emerging threats to public health.
Mapping Forecasting Error for Dengue in Brazil at High Spatial Resolution
Julie A. Spencer, Martha Barnard, Carrie A. Manore (Los Alamos National Laboratory; USA; jaspencer@lanl.gov)
Dengue is a mosquito-borne viral disease that infects over 400 million people per year worldwide, resulting in vast disease burden. Forecasting dengue incidence is inherently challenging because of the difficulty of tracking mosquito populations. We adopt a data fusion approach that incorporates climate and satellite data as proxies for mosquito density. We apply penalized regression models to retrocast historic weekly dengue data for representative tropical and temperate metro areas in Brazil. We quantify error using mean squared error and R2. We map the R2 values at the municipality level and hypothesize that the differences reflect fine-grained geographic and demographic heterogeneities. This investigation could provide new insights into the causal forces driving seasonal and sporadic outbreaks of dengue, improving community decisions that protect human health.

The GEO Health Community of Practice Small Work Group on Heat: Progress and Opportunities
Ben Zaitchik (Johns Hopkins University; USA; zaitchik@jhu.edu)
The GEO Health Community of Practice Small Work Group aims to reduce morbidity and mortality associated with extreme heat events and rising temperatures through reliable, decision-relevant integrated information systems, that include early warning, targeted to reduce heat impacts on vulnerable populations. The Work Group’s efforts focus on identifying, applying and documenting Earth observation (EO) needs to reduce heat-related health risks. The goal is to build a globally relevant capacity to use EO to understand, predict, and reduce health risks from heat across time scales. This poster will highlight key accomplishments, high priority research needs, and opportunities for enhanced collaboration.