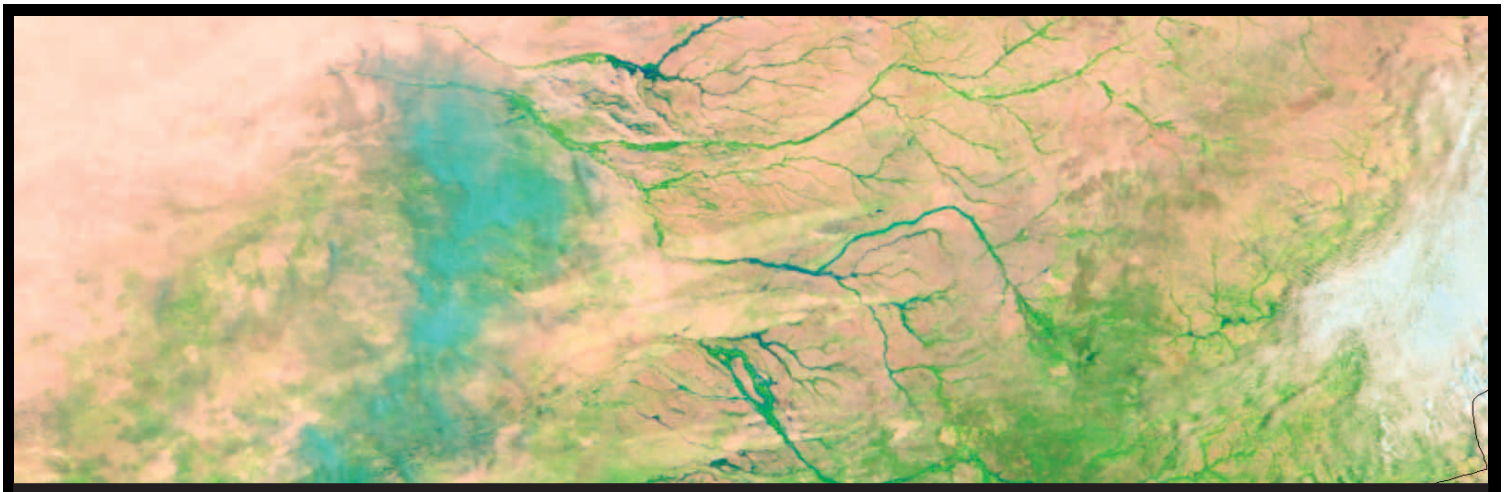
National Aeronautics and Space Administration

NASA and Malaria Early Warning Systems:

Using NASA Data to Combat Epidemics



Climate predictions can help provide health professionals and program managers with forecasts of malaria epidemic risk many months in advance. The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite captured this image of flooding in the Sahel region of Africa.

Malaria is transmitted by female mosquitoes.

Malaria early warning systems can assist health programs and services in preventing and controlling the disease in epidemic-prone areas.

Goals:

To provide near real-time satellite-derived remote sensing information about weather and climate which will impact malaria mosquito vectorial capacity

To develop and test useful information products appropriate to improving epidemic malaria control

To make these products available through FEWS NET's Africa Data Dissemination Service for malaria control experts in the field

Outcomes:

Malaria Early Warning Systems will provide timely, localized, and accurate monitoring information to indicate changes in epidemic potential among vulnerable communities.

This information will be provided to international health organizations, as well as various African NGOs, national Ministries of Health, and Meteorological Service agencies in order to streamline knowledge among all of the organizations.

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Enhancing USAID Malaria Early Warning Systems with NASA Earth Science Results

Summary

Malaria is one of the world's biggest killers, taking the lives of more than 1 million people every year, as well as infecting 500 million worldwide. Although endemic in several regions of the world, malaria is most widespread in Africa, home to an estimated 90 percent of all cases. Early warning systems can assist health programs and services in preventing and controlling the disease in epidemic-prone areas. A recent study shows that climate predictions can help provide health professionals and program managers with warnings of epidemics many months in advance.

Public health officials in developing nations typically have limited resources for malaria control, and when there are malaria epidemics, available staff and supplies are overwhelmed. The U.S. Agency for International Development (USAID) provides humanitarian assistance to vulnerable populations facing disasters or epidemics, such as malaria. To enhance USAID humanitarian programs, NASA Earth observation and modeling results will be integrated into malaria early warning systems (MEWS).

A variety of satellite-derived rainfall and temperature estimation products have been tested against ground observations of malaria outbreaks. These studies will inform the development of integrated vectorial capacity estimates (the environmental driving force of malaria transmission) which will be provided routinely through the famine early warning system network (FEWS NET) Africa data dissemination service. By coordinating the program development with user requirements, public health officials' ability to identify and track negative and positive anomalies in climate conditions will be significantly enhanced. Improved early warning systems can make efficient distribution of limited resources for malaria control possible, helping to reduce rates of infection.

Project Details

The project will provide real-time rainfall, temperature, vegetation and humidity data for the MEWS vectorial capacity model. This work involves obtaining historical data for rainfall, precipitable water and humidity using NASA datasets. These datasets will be integrated with a model of mosquito behavior, which will enable identification of possible malaria epidemics.

Remotely sensed climate data, coupled with a vectorial capacity model, will provide forecasts of changes in malaria vector activity that enables warnings of epidemic risk up to five months before the peak malaria season and four months earlier than predictions based on actual rainfall.

Data cubes, including past, present and future rainfall, temperature, and humidity will be presented in a new viewer for improved understanding and diagnosis of climatic conditions affecting mosquito vector populations. Using web-based data analysis and mapping tools this project will develop a new web site servicing MEWS. Following growing demand for malaria early warning systems, there are calls for more timely, localized and accurate monitoring information to indicate changes in epidemic potential among vulnerable communities. In addition to FEWS NET, NASA is working with international organizations, African NGOs, national Ministries of Health and Meteorological Services agencies.

Each component of the early warning system; remote sensing data, weather forecasts, climate models, and a long-term data record is eventually targeted at reinforcing the capacity of national and local health officials to prepare for and respond to potential malaria epidemics. By using climate data in models of vector activity and providing the information to health care workers, significant reductions in the impact of this devastating disease can be achieved.

For more information about this project

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NASA APPLIED SCIENCES PROGRAM & PUBLIC HEALTH

This application area focuses on the use of NASA assets to support planning and decision making for the public health, medical, and environmental health sectors. The application includes epidemiologic surveillance of infectious disease, environmental health, and emergency response and preparedness. Public Health also explores issues of toxic and pathogenic exposure, natural and man-made hazards for risk characterization and mitigation, and improvements to health and safety.

Key Web sites

MEWS:
http://iridl.ldeo.columbia.edu/maproom/.Health/.Regional/.Africa/.Malaria/

ADDS server:
http://earlywarning.usgs.gov/

Applied Sciences Public Health:
http://appliedsciences.nasa.gov/public-health