Utilizing Precipitation Measurement Missions (PMM) Data in Applied Science Projects

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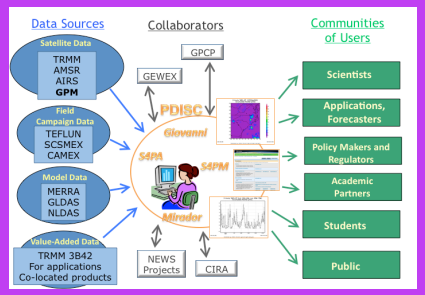
Abstract

Based on the popularity of TRMM data by remote sensing Earth science applications, including decision support systems, forecasting, policy making, and education, the availability of GPM data will provide even greater opportunities for NASA Earth science application research, given improved temporal and spatial resolution, greater spatial coverage, enhanced measurement sensitivity, and more accurate near real time precipitation information. This presentation exemplifies the contributions of NASA precipitation data, beyond science research, in the NASA Earth science applications of agriculture, public health, and natural disasters. GES DISC projects, collaborations, and relevant customer queries are featured.

Precipitation Data And Information Services Center (PDISC) at the Goddard Earth Sciences (GES) DISC



Public Health

Currently, NASA is funding 8 **Public Health projects that utilize TRMM and TRMM derived data products**, and plan to **utilize GPM data**. Precipitation data is key to projects studying environmental factors effecting the **spread, surveillance, and predictability of vector borne and water borne diseases**. The following is a list of NASA Public Health projects, and represents a sampling of the increasing number of studies making use of remote sensing data.

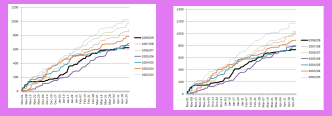
- 'Predicting Zoonotic Hemorrhagic Fever Events in Sub-Saharan Africa using NASA Earth Science Data for DoD - Global Emerging Infections Surveillance and Response System', Jorge Pinzons
- 'Development of a Detection and Early Warning System for Malaria Risk in the Amazon', Benjamin Zaitchik
- 'SERVIR Africa', Daniel Irwin,
- 'Enhanced Forecasting of Mosquito-Borne Disease Outbreaks Using AMSR-E', Michael Wimberly
- 'Avian Influenza Risk Prediction in Southeast Asia and Early Warning of Pandemic Influenza, 'Modeling Global Influenza Risks using NASA Data', and 'Malaria Surveillance Modeling Project', Richard Kiang
- 'Influence of Land-Use and Precipitation on Regional Hydrology and Public Health', Charles Tilburg

Agricultural

Integrating NASA Data and Technologies into USDA World Agricultural Outlook Board Decision Making Environment

NASA ROSES NNH08ZDA001N-DECISIONS

Historical analog year comparisons for crop yield forecasts (Parana, Brazil; soybeans)



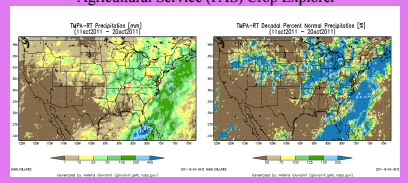
WMO station precipitation — TRMM 3B42-V6 precipitation

- WMO station and TRMM 3B42-V6 precipitation data both resulted in the same analog year (2004-05) for the target year of (2008-09).
- Complementary nature of satellite and weather station data, in identifying analog years, implies the possibility of "calibrating" the analog analysis methodology in station-rich areas, to be then applied in station-poor areas.

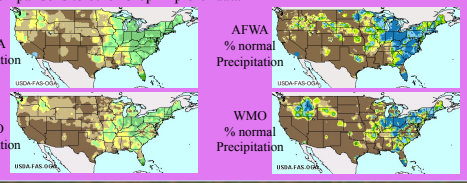
NASA TRMM Precipitation Data for Monitoring Crop Conditions

http://daac.gsfc.nasa.gov/agriculture/ (Funded by NASA's REASoN CAN-02-OES-01)

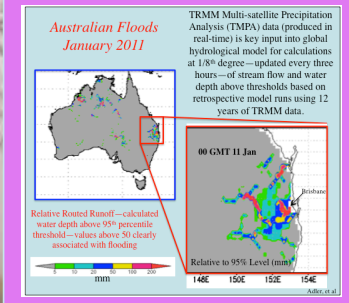
10 Day Precipitation required for the USDA Foreign Agricultural Service (FAS) Crop Explorer



… comparisons to other Crop Explorer data

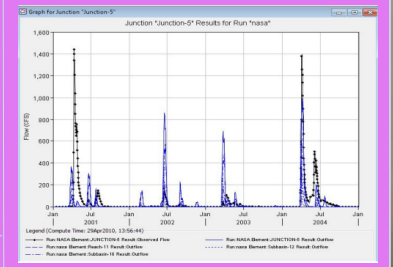


Natural Disasters



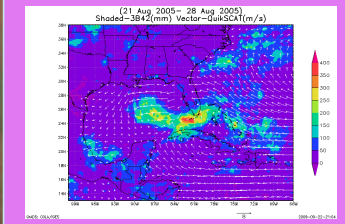
Using TMM 3B42-V6 data to improve the calibration of HEC-HMS (Hydrologic Modeling System) for use within the Devils Lake Basin of North Dakota, where only one ground-based rain gauge is available.

NASA ROSES NNH08ZDA001N-FEASIBILITY

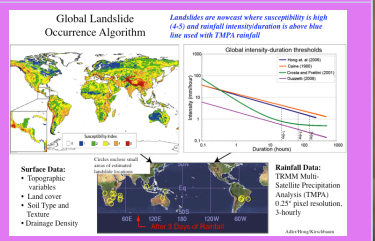


Comparison of HEC-HMS model-generated runoff, over a 4-year period, using TRMM 3B42-V6 with observed flow series at USGS station 05056100 within the Devils Lake Basin of North Dakota.

QuikScat data overlying TRMM data showing hurricane winds and precipitation total, simultaneously



Hurricane Katrina



TRMM Applications (from user queries)	
Health related	User location
NASA DEVELOP project with Mobile County Health Department examining specific parameters that West Nile/Encephalitis vectors and their larvae require. Interested in rainfall amount.	Alabama
Work on malaria mosquitoes in Asia. Interested in daily accumulated rainfall (3B42-V6).	Belgium
Monitoring weather in NE Kenya for disease outbreaks; comparing rain gauge data and TRMM. Interested in 3B42-V6.	Kenya
Work on possible implications of climate change on enhancement of schistosoma mansoni transmission in humans in the Dhofar region of Sultanate of Oman. Interested in monthly rainfall.	France
Disaster, Flood-related	
Hydrological studies of damaged bridges in Pakistan during floods of July-September 2010.	Pakistan
Creating maps and information graphics in response to complex emergencies and natural disasters. Interested in identifying a good rainfall anomaly data set (monthly and annually).	Central Africa
Using TRMM data for Early Warning System for floods in near real time. Interested in 3B42RT.	Italy
Disaster, Landslide-related	
Academic project on "RAINFALL THRESHOLDING FOR LANDSLIDES in Himachal Pradesh, India"	India
Process studies (general, regional)	
Studying Mag-Asawang Tubig Watershed, Mindoro, Philippines.	Phillipines
Studying spatial and temporal distribution of precipitation over Samar Island, Philippines. Interested in TRMM 3B42.	Philippines
Estimating rainfall of typhoon over ocean by using TRMM satellite data.	Taiwan
Using TRMM data for typhoon studies.	China
Project involving storm modeling for the Pacific.	Idaho
Usding hydrometeor profile to validate Weather Research and Forecasting model simulation.	India
Using 2A23 product to analyze convective and stratified rain types.	Florida
Using 3B42 products to study variability of extremes over Western India.	India
Using 3B42 three hour data to study rainfall at Andean basin, especially where Bolivia is located.	Bolivia
Working with TRMM 2A23 data to study convective-stratiform structure over Indian region.	India
Using 2A12 data (latent heat profiles) to study monsoon depressions.	India
Using TRMM 3B42 RT product to observe tropical rainfall patterns associated with convectively-coupled equatorial waves.	New York
Investigating rainfall across South Australia.	Australia
Studying monthly rainfall of January 1998 by inverse distance method of Pangani river basin, Tanzania.	Netherlands
Would like to validate 3B42 data for Nepal region in central Himalaya.	Nepal
Looking for TRMM satellite rainfall data for Jeddah, Saudi Arabia.	Pennsylvania
Agriculture-related	
Planning to use combination of monthly Willmot and Matsuura data, monthly TRMM (3B43 V6), and daily global rainfall (3B42RT) for historical analog analysis for crop yield forecasting in PR China.	
Human geography	
Analyzing how rainfall affects investments in childrens' education in Uganda. Interested in monthly rainfall data.	Italy
World Bank project on welfare dynamics and risk in Nicaragua. Using TOVAS (3A25V6) to complement "household survey data."	Nicaragua
Studying impact of urbanization on land surface temperature and heat fluxes. Interested in TRMM VIRS data.	India
Interested in daily rainfall patterns and how they affect price of latex.	Georgia
Working with rainwater harvesting systems; gauge data are hard to come by, so trying to access TRMM satellite data.	Uganda
Misc.	
Gathering data for an ecological reserve located just outside Chico, CA.	California
Some study for UNESCO-IHE. Interested in daily TRMM (3B42 V6 derived) data.	China
Studying possible effects of Galactic Cosmic Rays on tropical and overall climate, precipitation amount, and cloud cover.	India
Gathering information on the different types of applications of satellite precipitation estimates.	France