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New rainfall dataset enhances global monitoring of extreme weather

Our ability to forecast the rains would've been the envy of our agrarian ancestors. It's given us an unprecedented ability to take advantage of good growing seasons and prepare for tough times.

Researchers at UC Santa Barbara have just released the latest version of one of the world's most widely used rainfall data products, the Climate Hazards Center Infrared Precipitation with Stations, or "CHIRPS." The improvements in CHIRPS v3 appear in a new paper published in the Nature journal Scientific Data.

The CHIRPS dataset provides high-resolution, near-real-time precipitation data by combining satellite observations with ground station measurements. This produces consistent, long-term records of precipitation. It's an especially important tool for the The Famine Early Warning Systems Network (FEWS NET), a leading provider of early warning and analysis on acute food insecurity across the globe.

"People around the world rely on CHIRPS data to monitor weather events, track rainfall and inform critical decisions," said Chris Funk, director of UCSB's Climate Hazards Center, which developed and maintains the dataset. "We've significantly enhanced CHIRPS v3 to paint a more accurate picture of both drought and flood risk."

Each month, more than 30,000 users download terabytes of rainfall data from CHIRPS for a wide variety of purposes, including disaster relief, drought early warning, agricultural advisory services, index insurance applications, anticipatory risk management and more. The CHIRPS dataset guides decisions that affect millions of people and billions of dollars in investments worldwide.

In the Americas, Africa and Asia, CHIRPS feeds into advisories for millions of farmers, enhancing food production, prosperity and economic stability. Globally, this data helps the U.S. State Department, the Department of Agriculture and the G20's GEOGLAM Crop Monitor track global cropping outcomes so that farmers can make better decisions.

CHIRPS version 3 includes twice as many rainfall observations as earlier versions, thanks to expanded contributions from meteorological agencies and partners across Africa, Latin America and Asia, as well as new data collected through the use of low-cost technologies like 3D-printed automatic weather stations, which have been expanding in eastern and southern Africa. CHIRPS v3 also features improved, satellite-based rainfall estimation that more accurately captures extremes. The new resource better represents both severe drought conditions and intense rainfall events, strengthening its ability to support disaster response and risk management. The dataset — enhanced with the 3D printed weather stations — was recently used to track severe rainfall deficits in Kenya.

This innovation equips farmers with the insights needed to make informed decisions about which crops to plant and when, while helping communities better prepare for droughts and floods before they strike, and then supporting insurance and disaster response after the fact.

"With CHIRPS v3, we're able to better capture the depth of droughts and the intensity of heavy rainfall," Funk said. "So when a crop-growing region or pastoral area experiences extremely low rainfall, the satellite component of CHIRPS v3 tracks those low values — making it easier to tell when harvests and livestock herds face catastrophic failure." Conversely, when persistent, heavy precipitation raises the risks of flooding, CHIRPS v3 will reflect this better than its predecessor. This makes it easier to identify areas likely to experience extreme runoff and high streamflow.

The improvements to the dataset have been documented and validated in the recent journal paper, which can be cited when using CHIRPS as an authoritative source of evidence. “Scientific transparency and rigorous validation are critical to maintaining trust in the data that underpin early warning systems,” said FEWS NET Program Director Kiersten Johnson. “This new publication reinforces CHIRPS as a reliable, evidence-based resource for the global community.”

“CHIRPS is a public good supported by the public,” Funk added. “Many institutions provide weather observation data for CHIRPS, and it’s these contributions that enable us to maintain the most complete, rapidly updated global rainfall observation archives available.”

Hannah Button at the Famine Early Warning Systems Network (FEWS NET) contributed to this story.

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Disaster Management

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