NOAA Climate Data Record informs food security decisions to manage global famine

SUMMARY

Summary

The Gridded Satellite (GridSat) B1 Climate Data Record (CDR) from NOAA provides homogenous satellite infrared brightness temperature data for the past 40 years. The data derive from meteorological geostationary satellite data. The Climate Hazards Group (CHG) at the University of California Santa Barbara (UCSB) combine GridSat data with in situ and model data to produce estimates of precipitation (the Climate Hazards Group InfraRed Precipitation with Station, CHIRPS) and surface temperature (Climate Hazards Center Infrared Maximum Temperature with Stations, CHIRTSmax). While these products are global, their true benefit is providing data in data sparse regions. These products help inform food security managers (via FEWSNET – the Famine Early Warning Systems Network) on the extent and severity of drought and famine.

Service

- Food security

End users

- Government agencies
- Food security managers

Intermediate user(s)

- The intermediate users are the Climate Hazards group at University of California Santa Barbara (UCSB), who use GridSat in concert with model and in situ data in order to produce more complete (viz. improved coverage) global temperature and precipitation data. The end users include the Famine Early Warning Systems Network (FEWSNET) team and the food security industry, who use the products from several sources, including the Climate Hazards group, to make decisions.

Application(s)

- The vast historical data provides a long record of observations that can be used to infer conditions at the surface in data sparse regions. Specifically, the NOAA CDR GridSat-B1 data is merged with model and in situ observations in order to produce a more accurate picture of drought in data sparse regions of the world, in particular in high-risk countries.

Essential Climate Variables

—Atmospere

- Precipitation
- Earth radiation budget

—Land

- Land surface temperature

Models

- The Climate Hazards group at UCSB produces intermediate products (Climate Hazards Center Infrared Maximum Temperature with Stations (CHIRTSmax) and Climate Hazards Group Infra-Red Precipitation with Station (CHIRPS)) using model data, which can include ERA-5 and other model data.

CHIRTSmax
Funk, Chris, Pete Peterson, Seth Peterson, Shraddhanand Shukla, Frank Davenport, Joel Michaelsen, Kenneth R. Knapp, Martin Landsfeld, Gregory Husak, Laura Harrison, James Rowland, Michael Budde, Alex Meiburg, Tufa Dinku, Diego Pedreros, and Nicholas Mata. " A High-Resolution 1983–2016 Tmax Climate Data Record Based on Infrared Temperatures and Stations by the Climate Hazard Center", *Journal of Climate* 32, 17 (2019): 5639-5658, https://doi.org/10.1175/JCLI-D-18-0698.1
CHIRTSmax uses MERRA-2

CHIRPS
Funk, C., Peterson, P., Landsfeld, M. et al. The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes. *Sci Data* **2**, 150066 (2015). https://doi.org/10.1038/sdata.2015.66
CHIRPS uses CFS and ECMWF

Climate data records used

- Geostationary IR Channel Brightness Temperature http://doi.org/10.7289/V59P2ZKR

Agencies that produce records

- NOAA/NESDIS/NCEI

Satellite observation used

- Geostationary Satellite observations of the Infrared Window (~10-12 micron wavelength) radiances. Current satellites (in November 2021) include: GOES 16, 17, Meteosat 8, 11, Himawari 8

Sustainability of service (demonstration or ongoing)

- The level of service is sustained. The GridSat data are produced quarterly as a CDR but are provided monthly as an interim CDR (iCDR). This provides more timely observations. However, the decreased latency requires a decreased analysis of the product's calibration maturity: hence the monthly product is termed an interim CDR that is replaced later on after more calibration information is available.

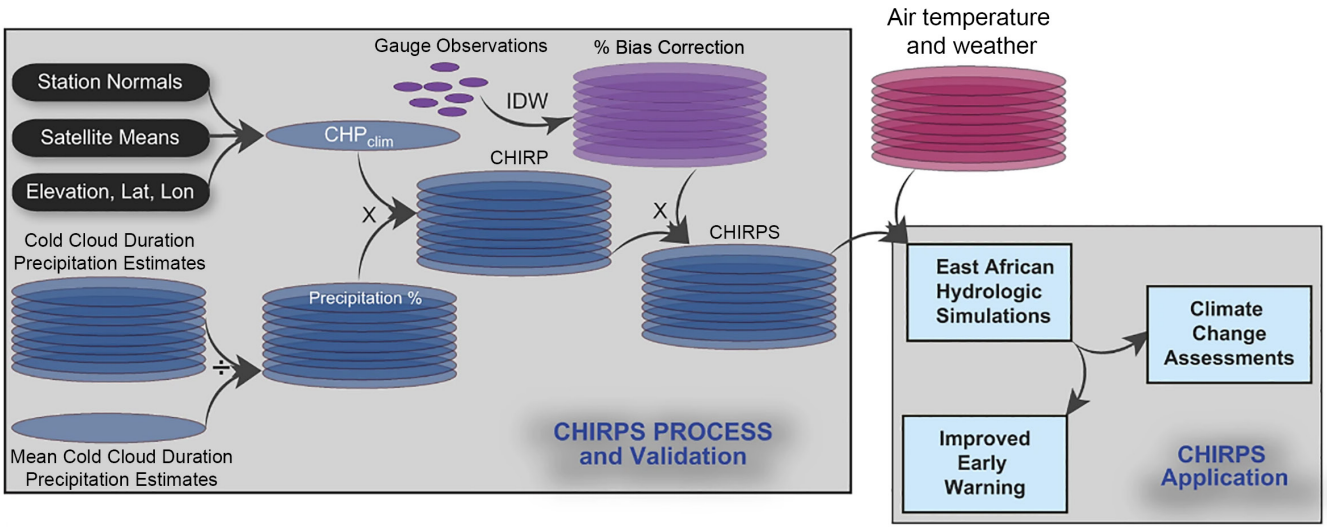
DESCRIPTION

The GridSat CDR is produced from most meteorological geostationary satellites from 1980 to present. This includes more than 30 different satellites from 5 data providers. GridSat simplifies the access to this data record by providing mapped data that has been intercalibrated.

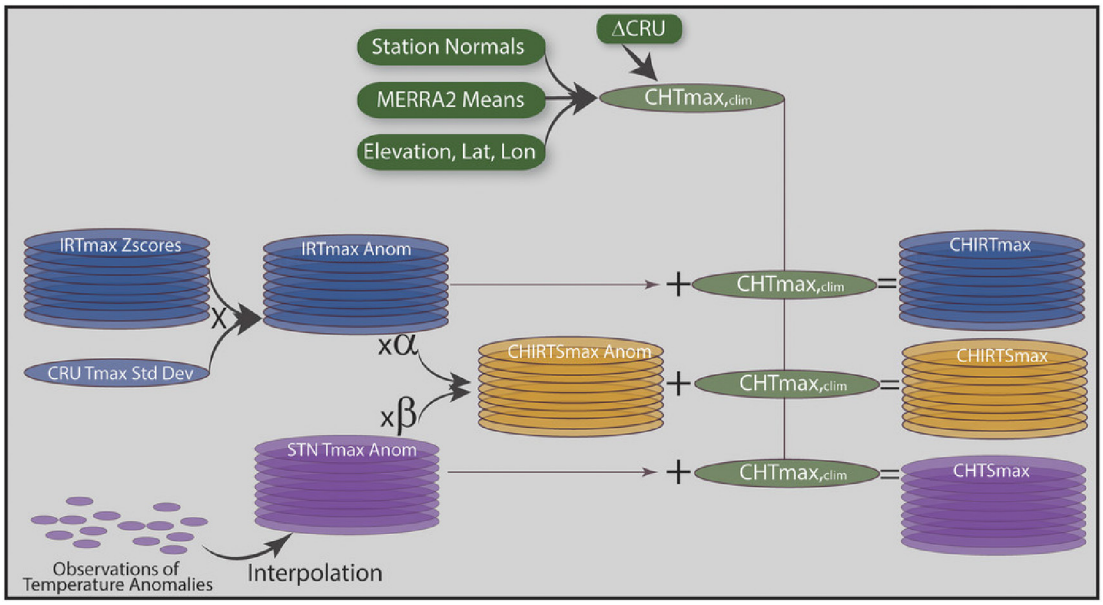
This dataset provides scientific researchers a high quality Climate Data Record (CDR) of global infrared (IR) measurements from geostationary satellites. The Gridded Satellite (GridSat-B1) data facilitates geostationary data usage for wide range of applications. The complete dataset provides data from 3 channels: the CDR-quality infrared window (IRWIN) channel (near 11 µm), the Visible channel (near 0.6 µm) and the Infrared water vapor (IRWVP) channel (near 6.7 µm). 3-hourly International Satellite Cloud Climatology Project (ISCCP) B1 data on a 0.07 degree latitude equal-angle grid provides input to the resulting CDR that spans from 1980-present. The CDR methodology merges satellites by selecting the nadir-most observations for each grid point.

The GridSat CDR is used in two products to help provide observations in data sparse regions: CHIRPS is a merged precipitation record from models/satellite/in situ. CHIRTSmax is a record of land surface maximum surface temperature dataset from satellite/model/in situ data. Many times, regions with food insecurity also suffer from poor in situ coverage. These products provide information where it is needed most. CHIRTSmax is the Climate Hazards group Infrared Maximum Temperature with Stations and CHIRPS is the Climate Hazards group Infrared Precipitation with Stations.

The FEWSNET (Famine Early Warning Systems Network) provides information to food providers and international organizations using information on the cutting edge of drought early warning service, informing food security outlooks that save lives and livelihoods in high-risk countries.



CHIRPS production and application schema, where the 'Cold Cloud Duration Precipitation Estimates' are derived from the GridSat CDR.



Scheme of the CHIRTSmax process. All data are at a monthly time scale. The gridded data use a common quasi-global 0.05° grid. The 'IRTmax Z scores' are derived from the GridSat CDR.

INFORMATION FLOW

Sense

- The GridSat CDR is produced from most meteorological geostationary satellites from 1980 to present. This includes more than 30 different satellites from 5 data providers. GridSat simplifies the access to this data record by providing mapped data that has been intercalibrated. Specifically, GridSat data includes information from (as of November 2021) GOES 2-17, MET 2-11, GMS 1-5, MTS 1-2, HIM 8-9.

Climate data

- This dataset provides a high quality CDR of global infrared (IR) measurements from geostationary satellites. The GridSat-B1 data facilitates geostationary data usage for a wide range of applications. The complete dataset provides data from 3 channels: the CDR- quality infrared window (IRWIN) channel (near 11 µm), the Visible channel (near 0.6 µm) and the Infrared water vapor (IRWVP) channel (near 6.7 µm). 3-hourly International Satellite Cloud Climatology Project (ISCCP) B1 data on a 0.07 degree latitude equal-angle grid provides input to the resulting CDR that spans from 1980-present. The CDR methodology merges satellites by selecting the nadir-most observations for each grid point.

Apply

- The GridSat CDR is used in two products to help provide observations in data sparse regions: CHIRPS is a merged precipitation r ecord from models/satellite/in situ. CHIRTSmax is a record of land surface maximum surface temperature dataset from satellite/model/in situ data. Many times, regions with food insecurity also suffer from poor in situ coverage. These products provide information where it is needed most.
- CHIRTSmax = Climate Hazards group Infrared Maximum Temperature with Stations
- CHIRPS = Climate Hazards group Infrared Precipitation with Stations

Decision making

- The FEWSNET (Famine Early Warning Systems Network) provides information to food providers and international organizations using information on the cutting edge of drought early warning service, informing food security outlooks that save lives and livelihoods in high-risk countries.

- FEWSNET uses several data products. The specific products here use ERA-5 model data, global in situ observations and more to produce the CHIRPS and CHIRTSmax products.

Use additional data

https://climatemonitoring.info/use-cases/