

Central America and Hispaniola Hazards Outlooks: Process and Use

WMO-RCC International Workshop
1 October 2019

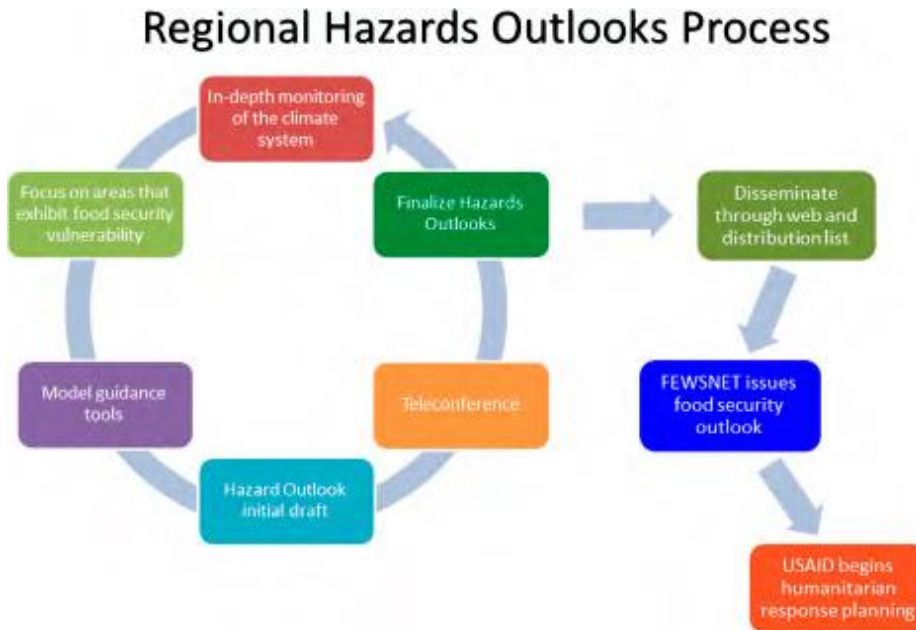
Outlook

1. Background
2. Process and tools
3. Latest hazards
4. Use

Background

- **Goal:**
 - To support the United States Agency for International Development (USAID) Famine Early Warning Systems Network (FEWS NET) program
- **Characteristics:**
 - A short weather and climate document
 - Highlight hazards in both graphical and text formats
 - Has a weekly time scale
 - Operational product
- **Strengths:**
 - Evidence-based, collaborative, and cyclical process

Process



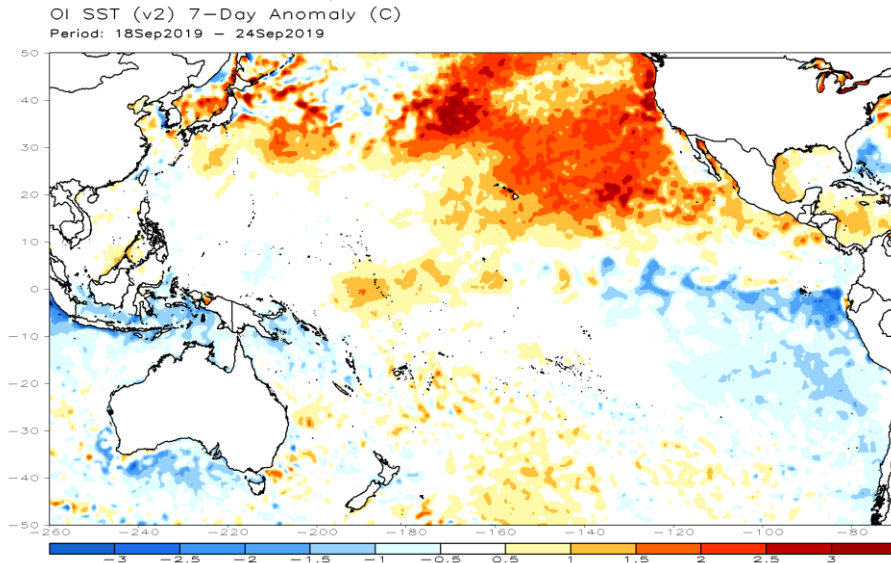
(Thiaw and Kumar, 2015)

1. Begin with climate monitoring
What happened in the past?
2. Analyze forecast
What's in store for the future?
3. Send draft for review
Is there anything wrong?
4. Brief via teleconference
Explain reasoning to partners
5. Issue final document
6. FEWS NET issues food security outlook
7. USAID begins humanitarian responses

El-Nino Southern Oscillation (ENSO)

Current conditions and forecasts

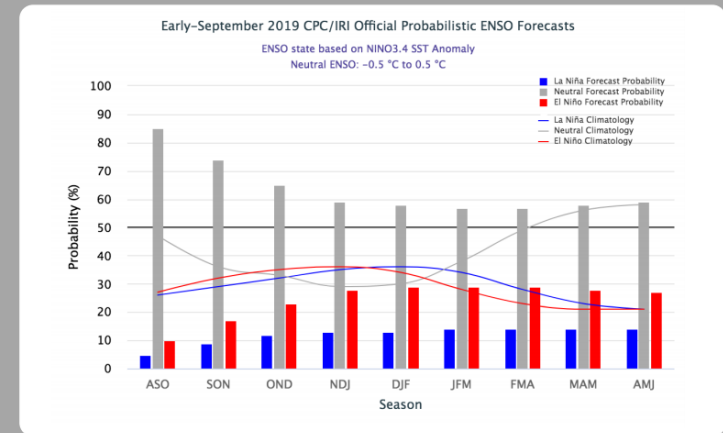
7-day SST anomalies



Probabilistic ENSO forecasts

Updated: 12 September 2019

ENSO-neutral is most likely to continue through the Northern Hemisphere spring 2020.



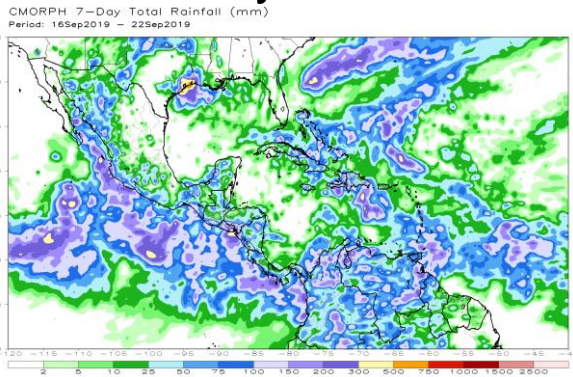
ENSO has well-known teleconnections over Central America and the Caribbean

How will ENSO likely to evolve over the upcoming season?

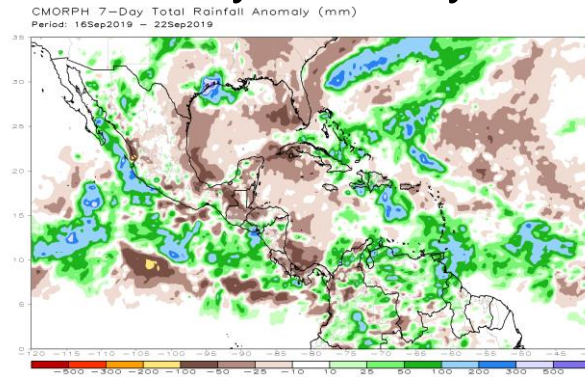
Climate monitoring tools

Rainfall difference anomalies

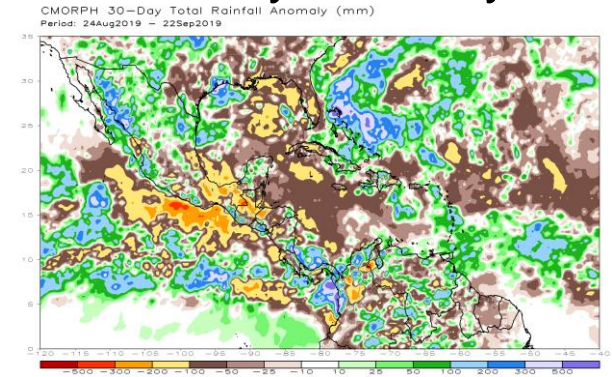
7-day totals



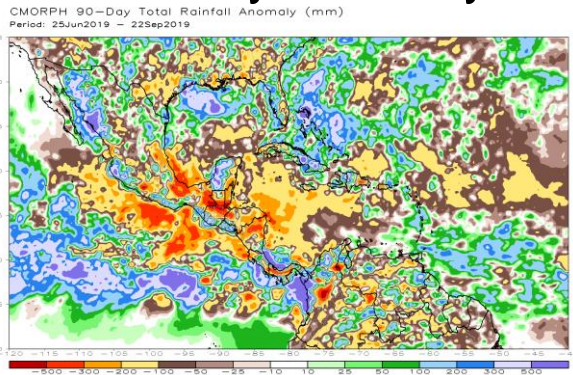
7-day anomaly



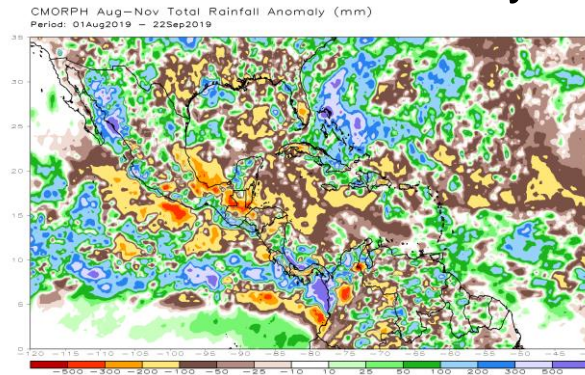
30-day anomaly



90-day anomaly



Seasonal anomaly



Difference anomaly =
observation - climatology

Identify short and long-term anomalies

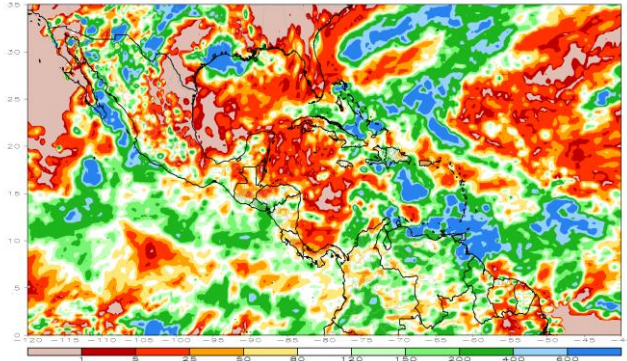
Quantify rainfall deficits
(surpluses)

Climate monitoring tools

Percent of normal rainfall

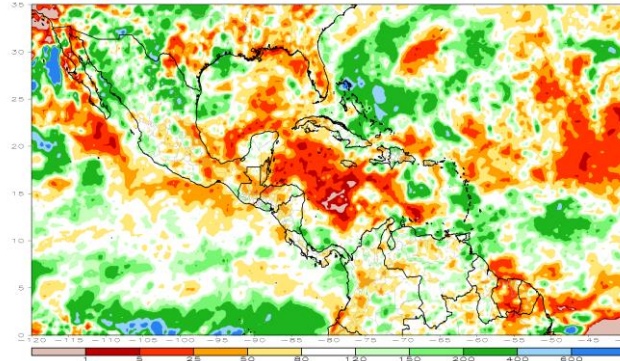
7-day

CMORPH 7-Day Percent of Normal Rainfall (%)
Period: 16Sep2019 - 22Sep2019



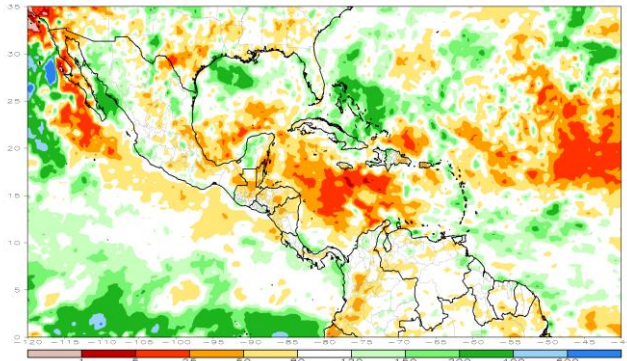
30-day

CMORPH 30-Day Percent of Normal Rainfall (%)
Period: 24Aug2019 - 22Sep2019



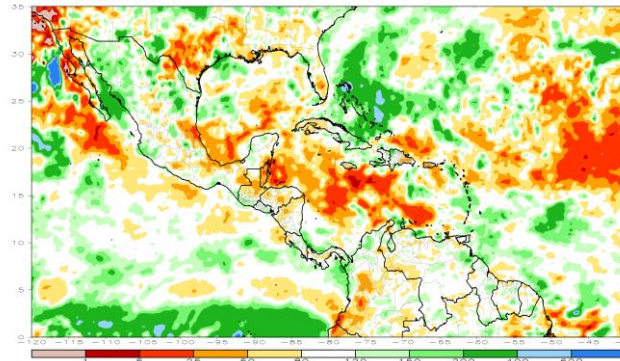
90-day

CMORPH 90-Day Percent of Normal Rainfall (%)
Period: 25Jun2019 - 22Sep2019



Seasonal

CMORPH Aug-Nov Percent of Normal Rainfall (%)
Period: 01Aug2019 - 22Sep2019



Percent of normal =
 $100 \times \text{observation} / \text{climatology}$

Quantifies anomaly as
a fraction of the normal
value

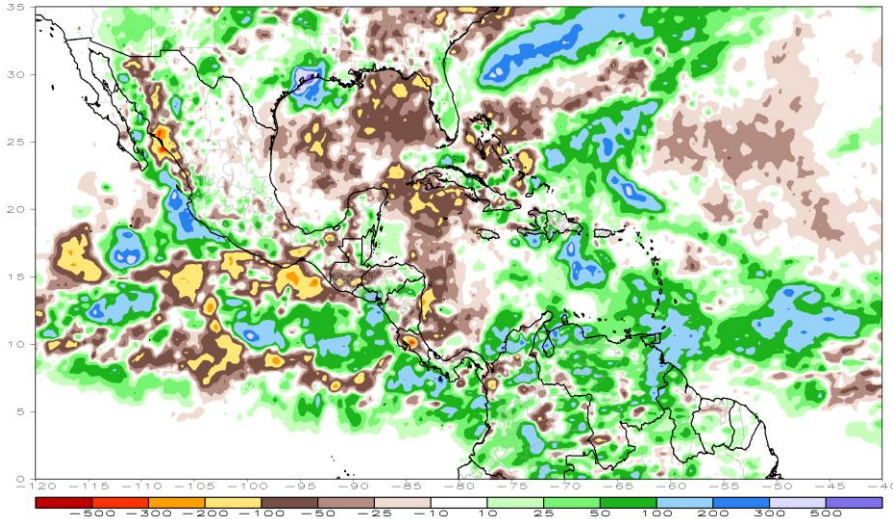
e.g. a quarter, half,
near-normal (80-
120%), twice, ...

Climate monitoring tools

Weekly tendency

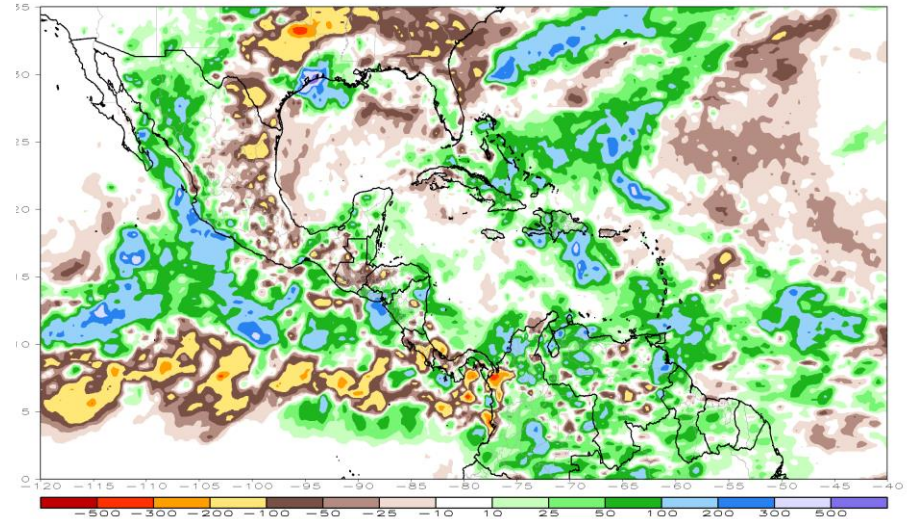
30-day

CMORPH 30-Day Rainfall Anomaly Difference (mm)
Period: (24Aug2019 - 22Sep2019) minus (17Aug2019 - 15Sep2019)



90-day

CMORPH 90-Day Rainfall Anomaly Difference (mm)
Period: (25Jun2019 - 22Sep2019) minus (18Jun2019 - 15Sep2019)



Tendency = current anomaly – previous anomaly

Identifies drying (wetting) or no changes

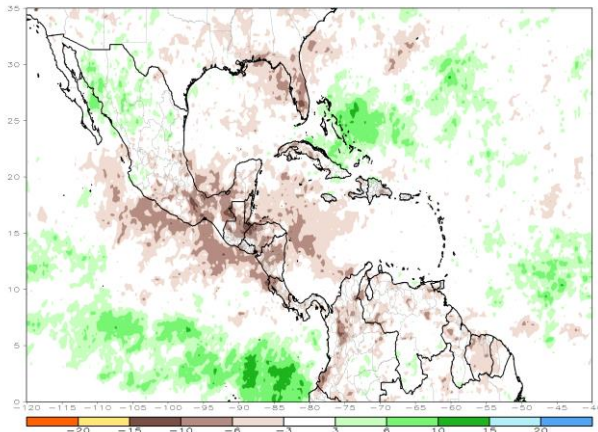
Implies recent worsening (improvement) in climate conditions

Climate monitoring tools

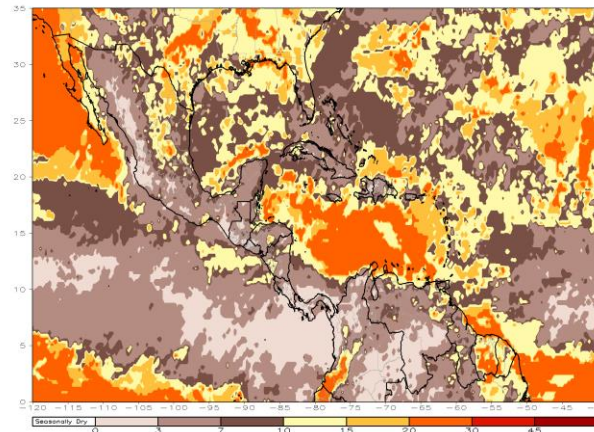
Rainfall frequency analysis

30-day # of rain day anomaly 90-day max consecutive # of dry days

CMORPH 30-Day Total Number of Rain Days Anomaly
Period: 24Aug2019 - 22Sep2019



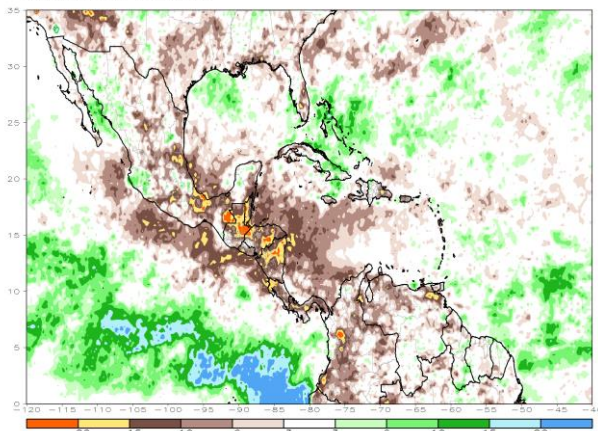
CMORPH 30-Day Max Consecutive Number of Dry Days
Period: 24Aug2019 - 22Sep2019



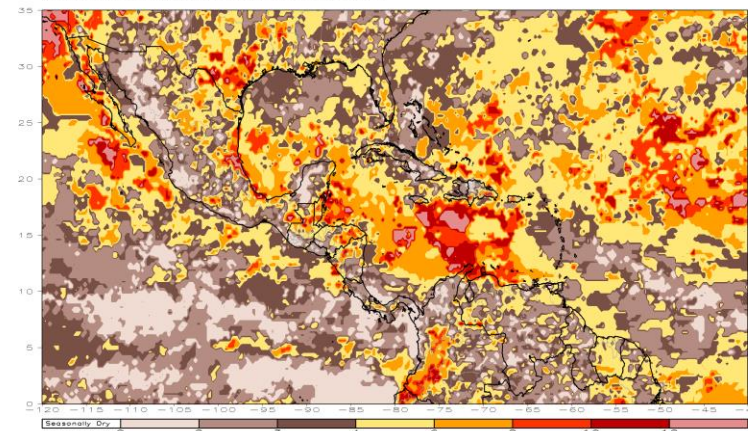
Rain day = day,
with $P \geq 1\text{mm}$

90-day # of rain day anomaly 90-day max consecutive weeks of < 80%

CMORPH 90-Day Total Number of Rain Days Anomaly
Period: 25Jun2019 - 22Sep2019

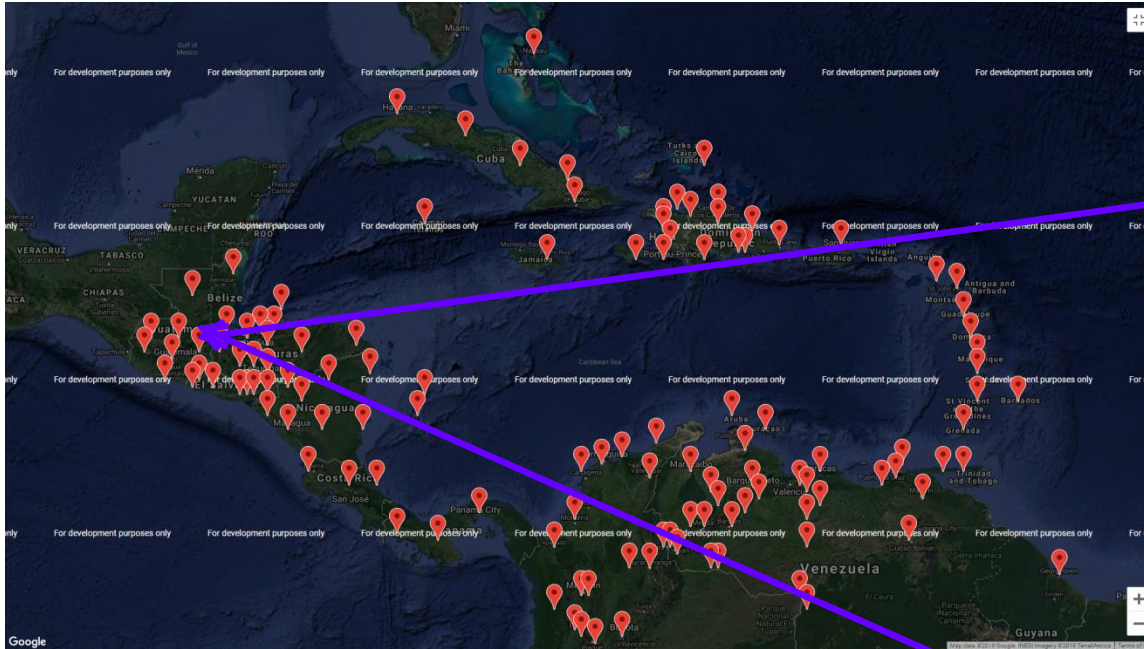


CMORPH Max Consecutive Weeks of Below-Average (<80 % of Normal) Rainfall
Since Initial Week Period: 01Jul2019 - 07Jul2019



Climate monitoring tools

Time series analysis

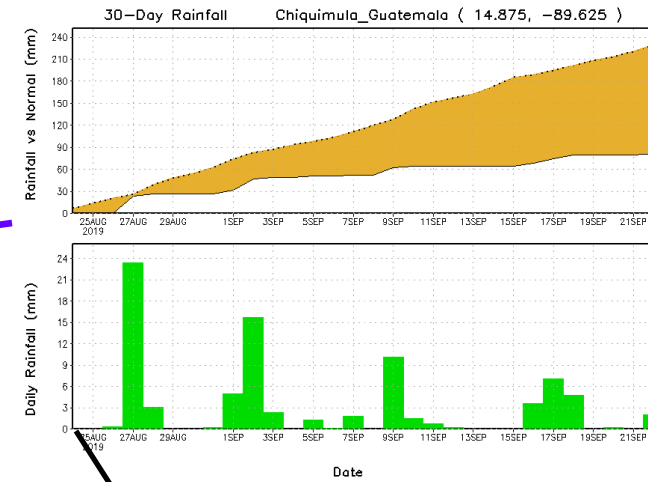


Identify rainfall frequency and amounts to highlight wet (dry) episodes

Delayed onset and early cessation are of importance

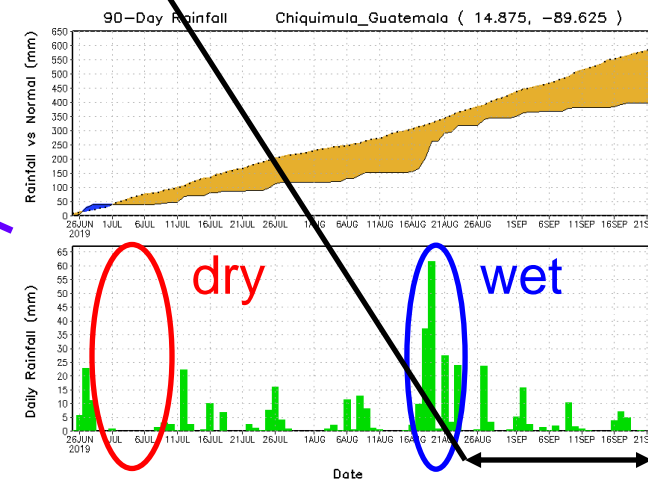
Past 30-days

CMORPH Point Time Series



Past 90-days

CMORPH Point Time Series



Agroclimatic products

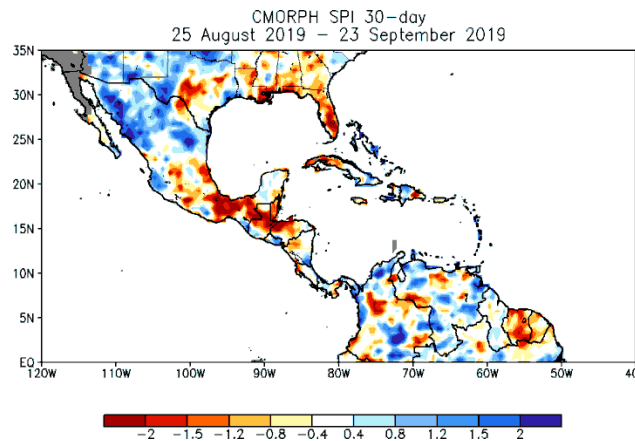
Drought monitors & land surface information

Focus on areas with low values of SPI, indicating dryness/drought

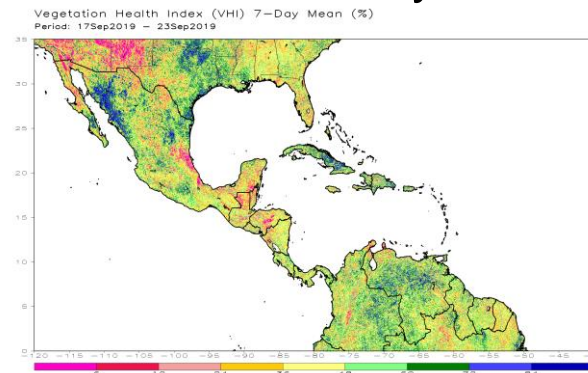
Low (< 48%) values of VHI and below-average NDVI, pointing to poor vegetation conditions

SPI: Standardized Precipitation Index
VHI: Vegetation Health Index
NDVI: Normalized Difference Vegetation Index

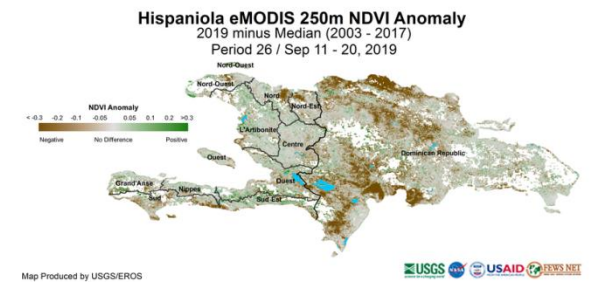
SPI 30-day



VHI 7-day

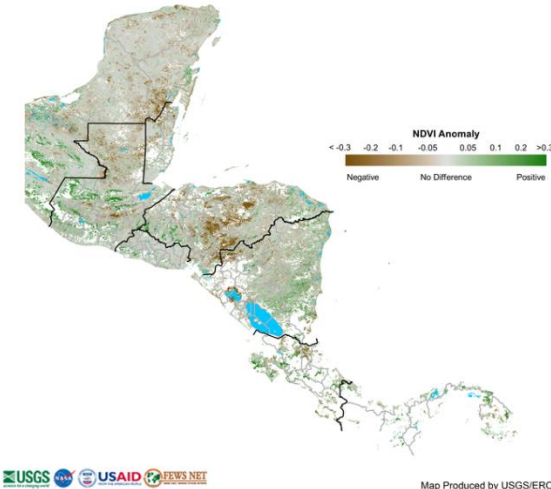


Sep dekad 2 NDVI anomaly



Central America eMODIS 250m NDVI Anomaly

2019 minus Median (2003 - 2017)
Period 26 / Sep 11 - 20, 2019

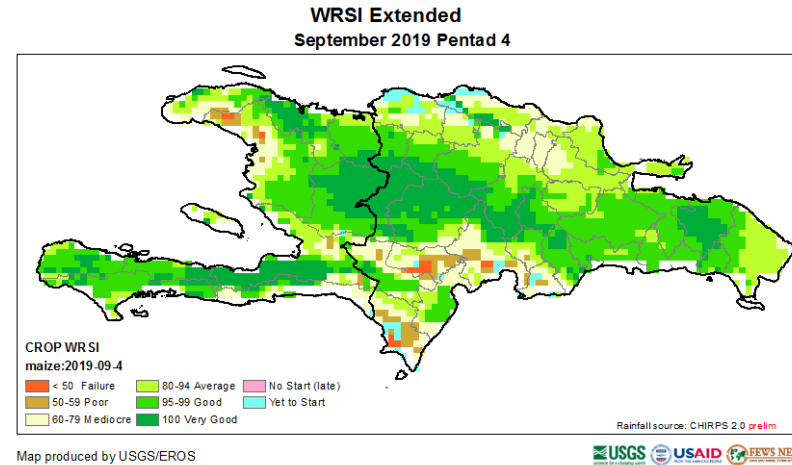
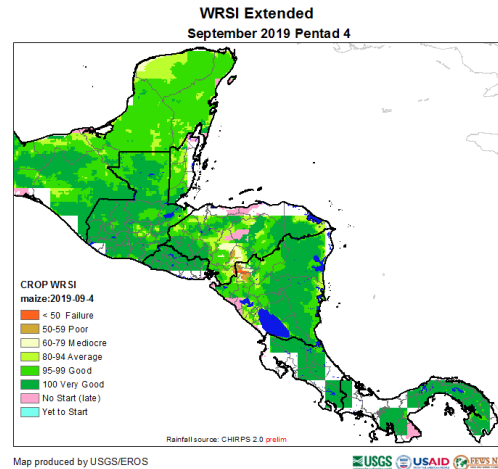


Agroclimatic products

WRSI & SWI

Sep. pentad 4 WRSI

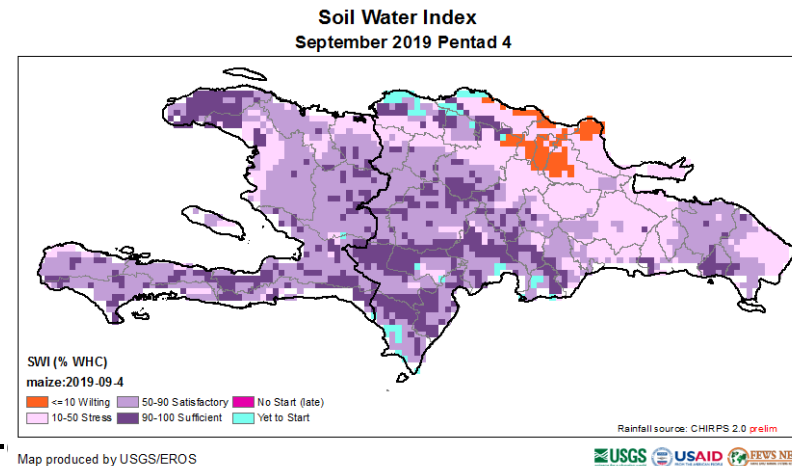
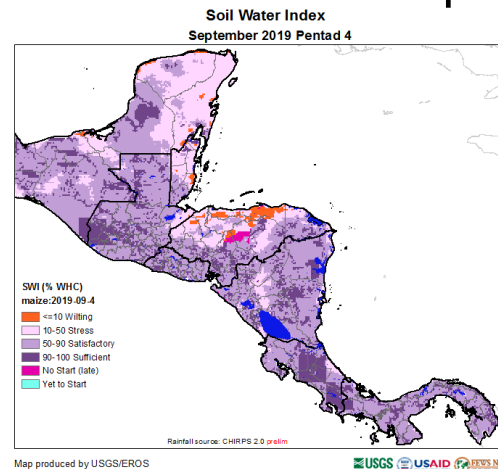
Focus on areas with less than mediocre crop status and under soil moisture stress or worse conditions



WRSI: Water Requirement Satisfaction Index

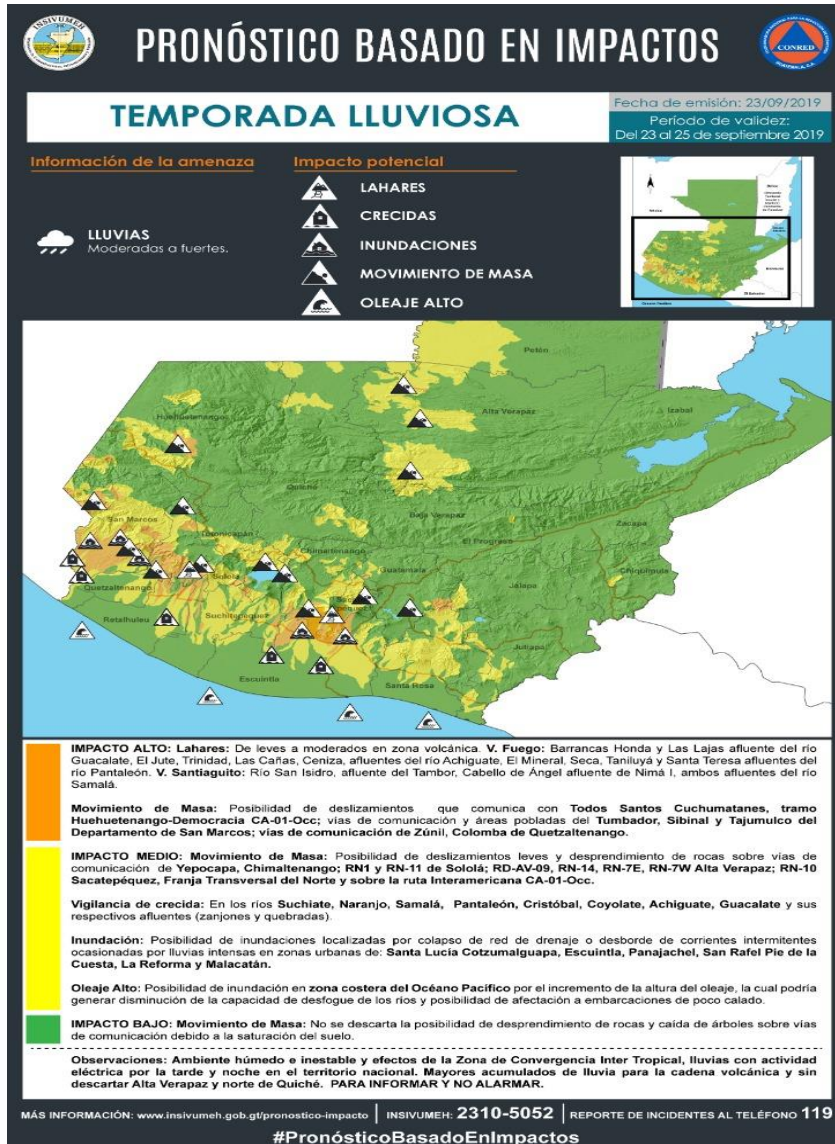
SWI: Soil Water Index

Sep. pentad 4 SWI



Feedback from partners

Impact-based prognostics



In-situ information, shared by partners enable to calibrate and adjust hazards outlooks

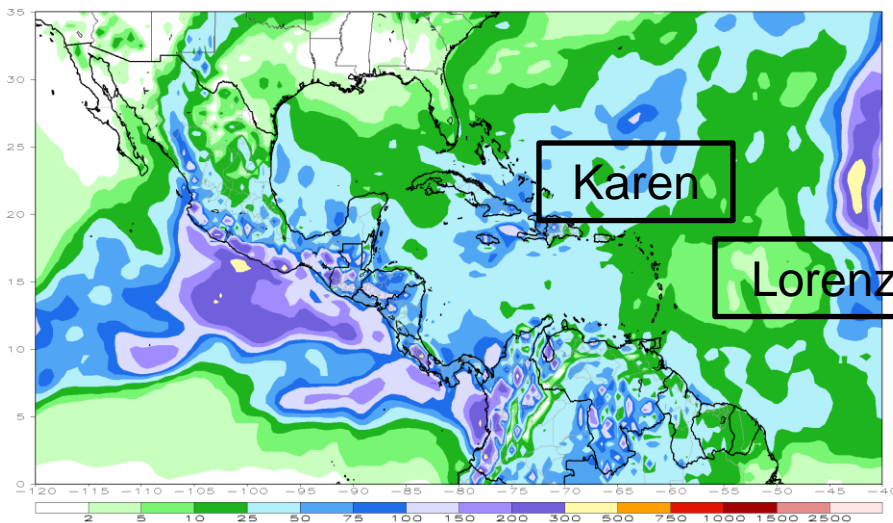
Convergence of evidence reduces uncertainties of ground impacts

Model guidance tools

GEFS QPF and CMORPH climatology

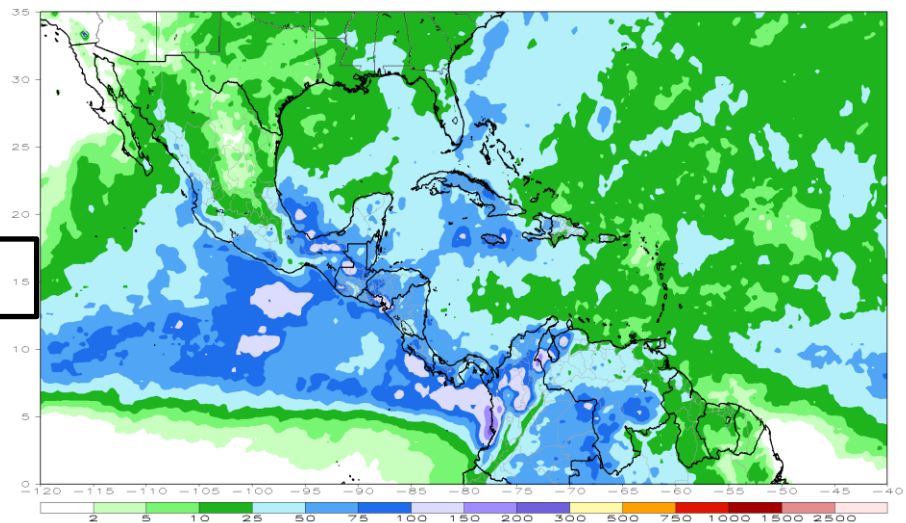
GEFS 7-day forecast

GEFS week1 Ensemble Mean Total Rainfall (mm)
Ending: 06z03Oct2019



Week 1 climatology

CMORPH week1 Climatological Rainfall (mm)
Period: 25SEP - 01OCT



Comparison gives a first estimate on how rainfall may evolve during the upcoming week:

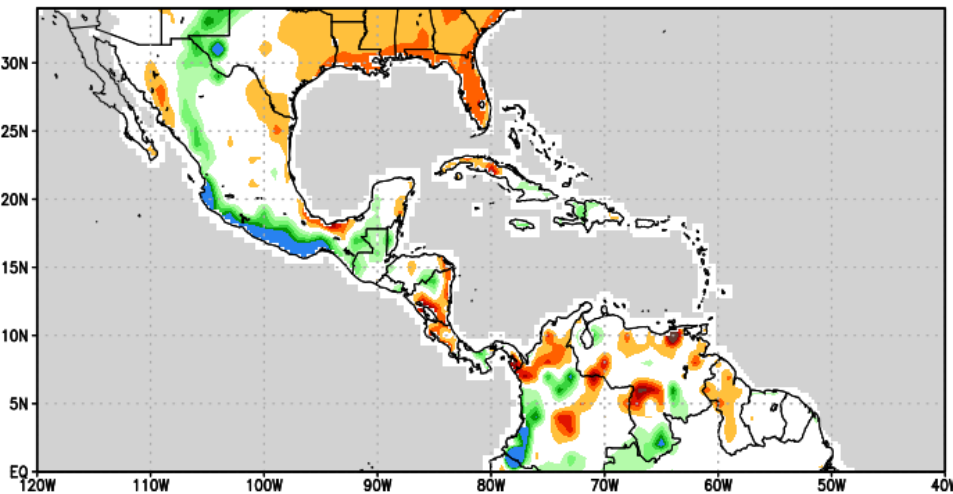
- Rainfall amounts forecast
- Rainfall anomaly forecast

Model guidance tools

Rainfall anomaly forecast

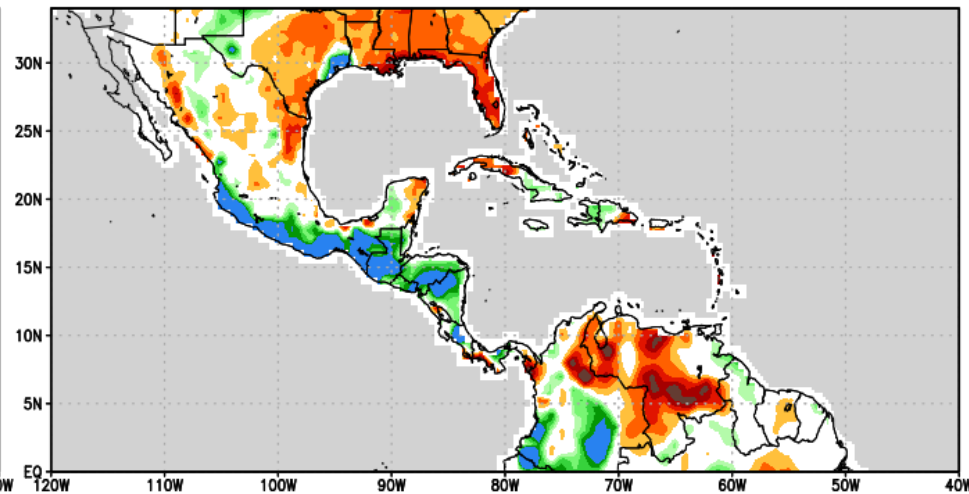
no bias correction

GEFS Week 1 Forecast (Valid: September 27, 2019 – October 03, 2019)
Anomaly in mm (no bias corrected)



with bias correction

GEFS Week 1 Forecast (Valid: September 27, 2019 – October 03, 2019)
Anomaly in mm (bias corrected)



Provides forecast anomalies from the GEFS model perspective, accounting for recent biases

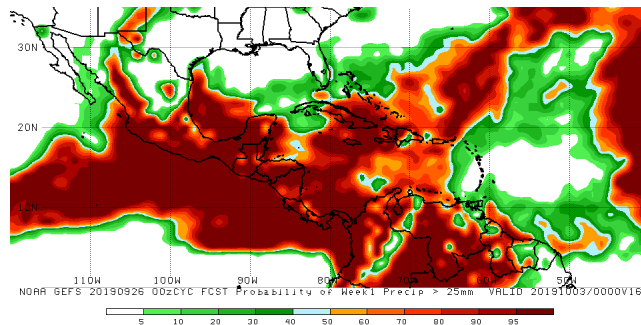
Model guidance tools

Probability of exceedance

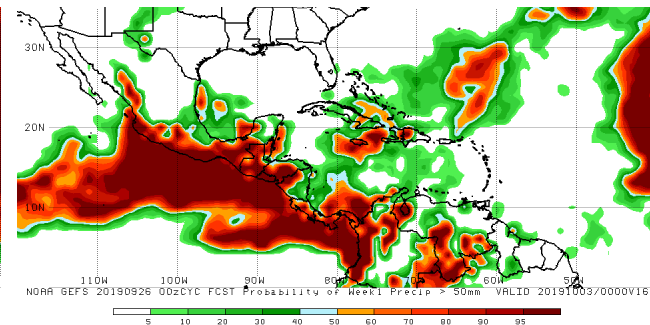
Increases confidence that rainfall totals would exceed a given threshold

Important for flood risks analysis

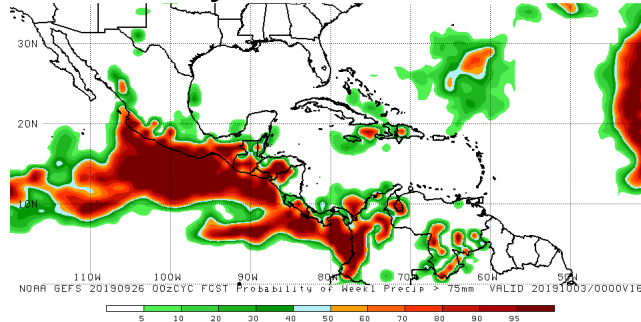
Weekly totals > 25 mm



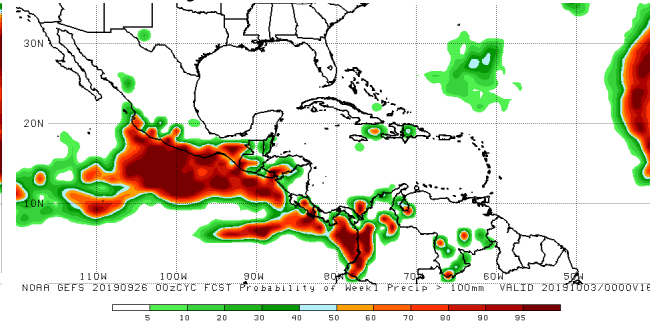
Weekly totals > 50 mm



Weekly totals > 75 mm



Weekly totals > 100 mm

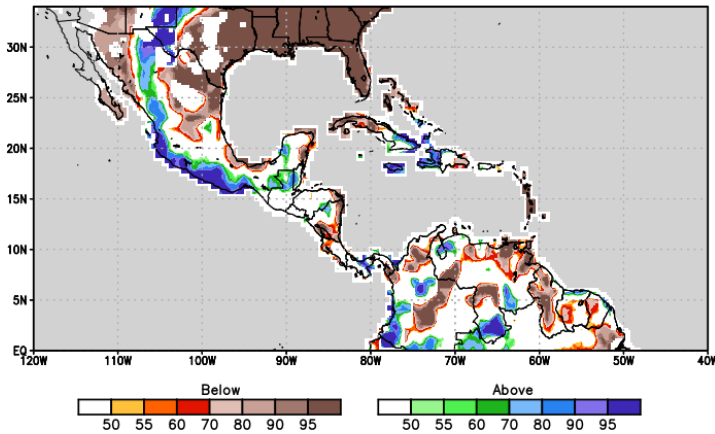


Model guidance tools

Probabilistic rainfall forecast

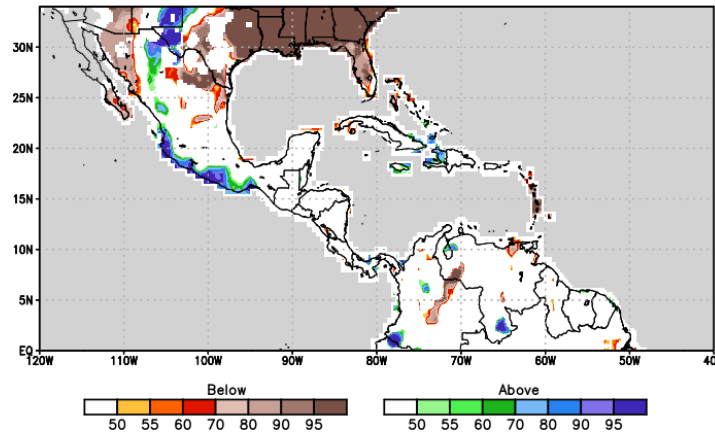
< 80% and > 120%

GEFS Week 1 Forecast (Valid: September 27, 2019 – October 03, 2019)
Wet(>120%) and Dry(<80%) Probability



< 50% and > 150%

GEFS Week 1 Forecast (Valid: September 27, 2019 – October 03, 2019)
Wet(>150%) and Dry(<50%) Probability

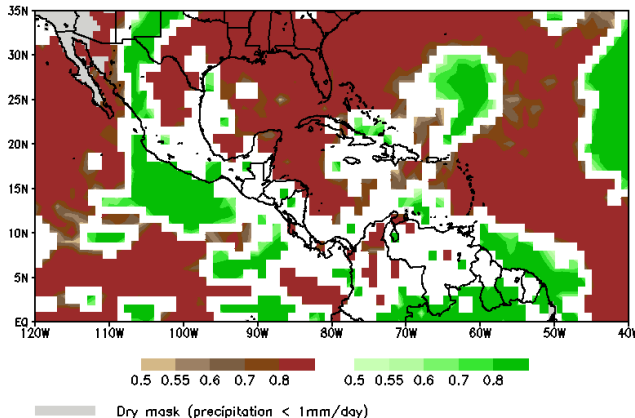


Complement
previous
forecast
anomalies in a
probabilistic
format

no calibration

Non calibrated Week 1 Precipitation Forecast

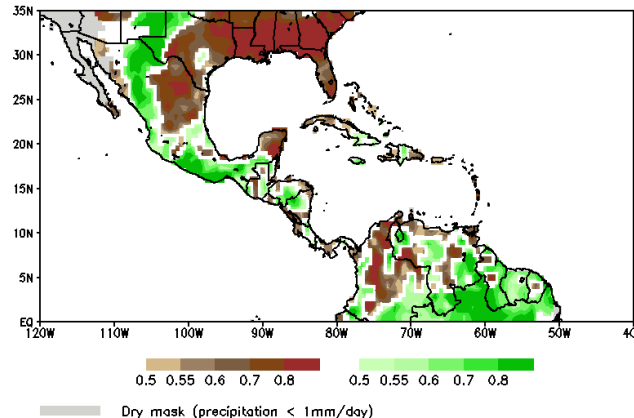
NCEP/GEFS, valid: 27 Sep 2019 – 03 Oct 2019 (IC: 26 Sep 2019)



with calibration

Calibrated Week 1 Precipitation Forecast

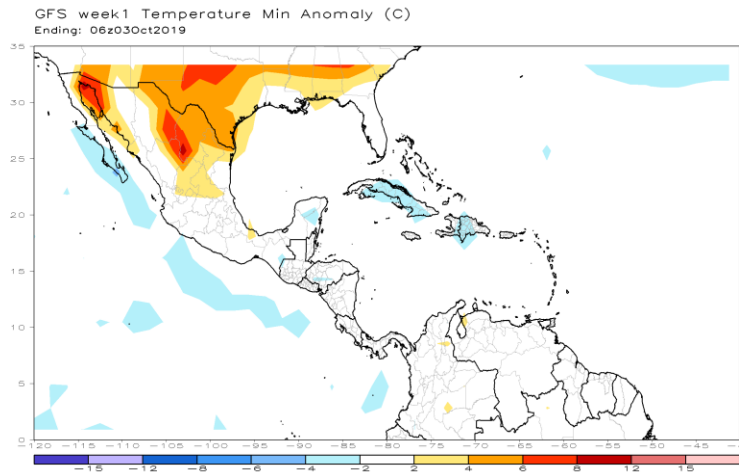
NCEP/GEFS, valid: 27 Sep 2019 – 03 Oct 2019 (IC: 26 Sep 2019)



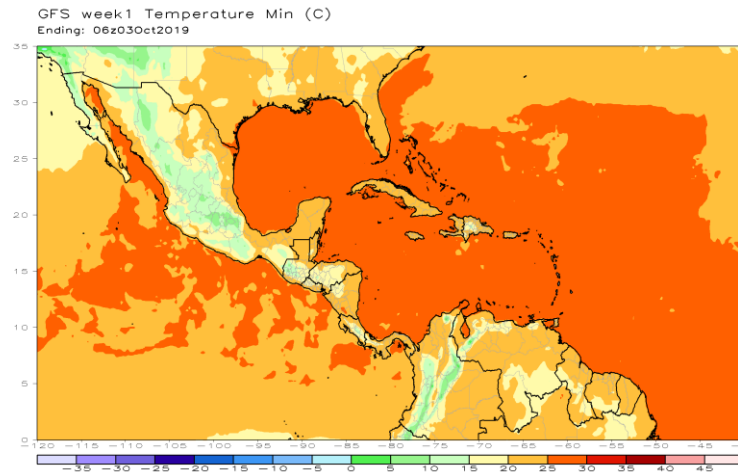
Model guidance tools

Temperature forecast

Min. temperature anomaly



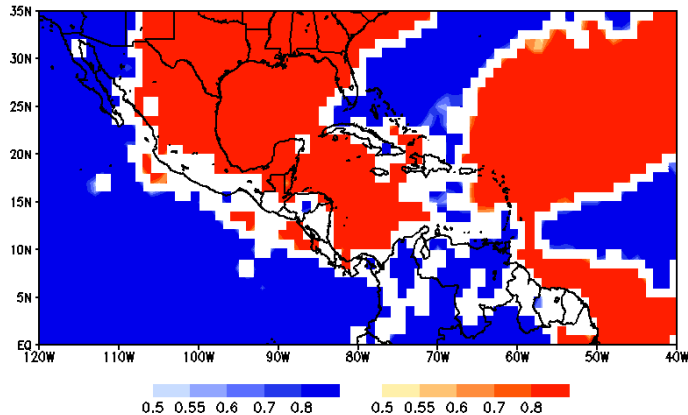
Min. temperature



Important for abnormal cold over higher terrains

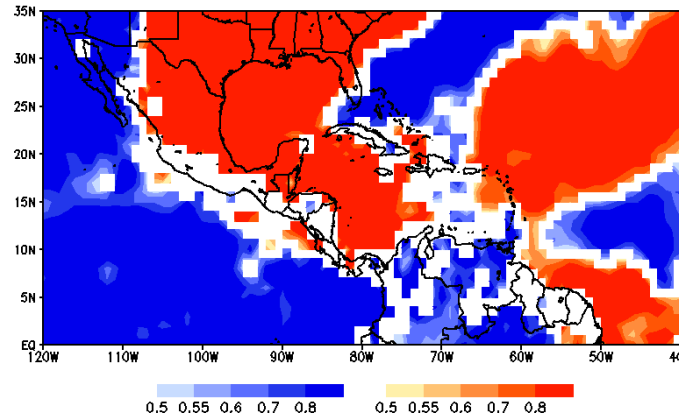
no calibration 2-m temperature

Non calibrated Week-1 2m Temperature Forecast
NCEP/GEFS, valid: 27 Sep 2019 - 03 Oct 2019 (IC: 26 Sep 2019)



with calibration 2-m temperature

Calibrated Week-1 2m Temperature Forecast
NCEP/GEFS, valid: 27 Sep 2019 - 03 Oct 2019 (IC: 26 Sep 2019)



Higher temperature increases evaporation and exacerbates droughts

Model guidance tools

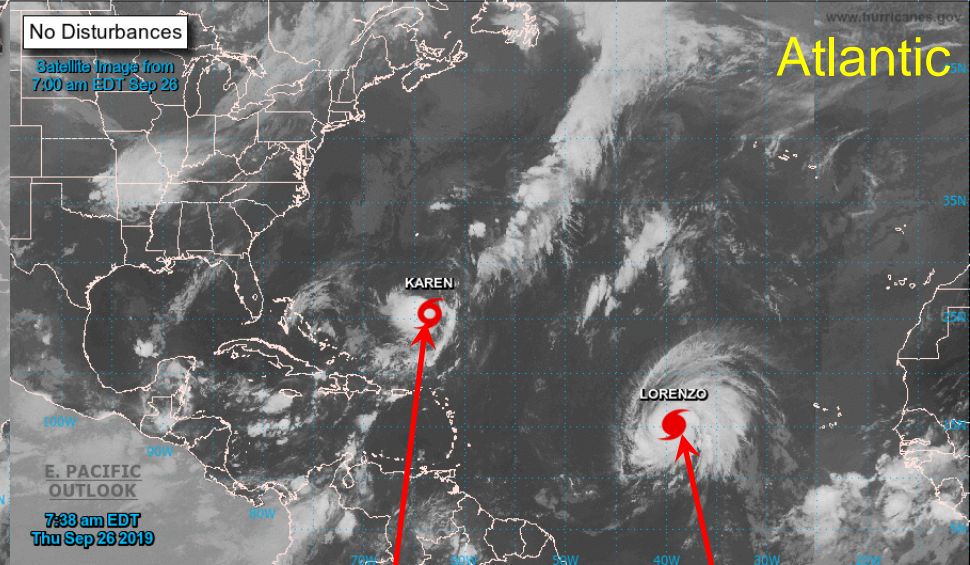
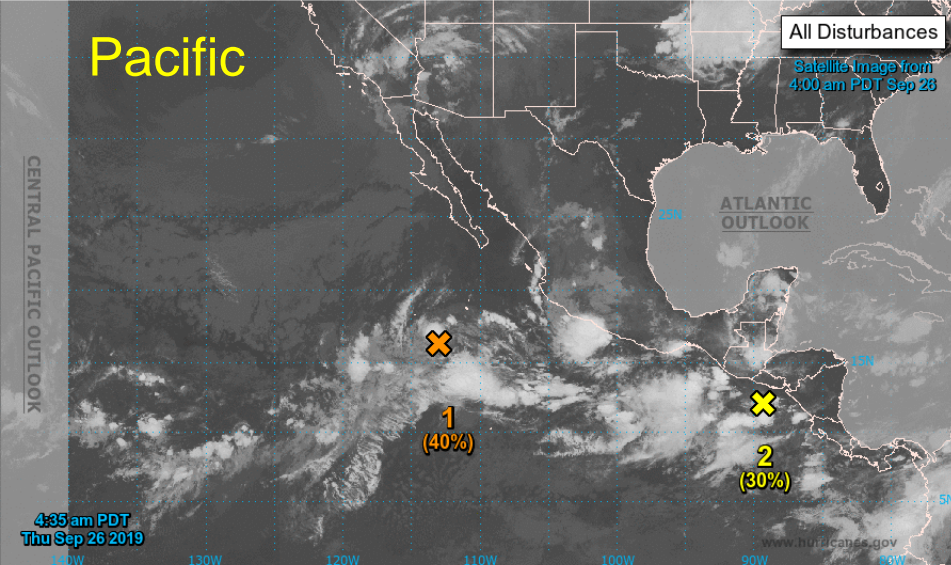
Hurricane track forecast



Two-Day Graphical Tropical Weather Outlook
National Hurricane Center Miami, Florida



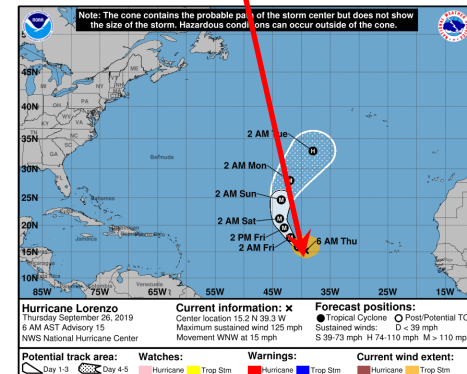
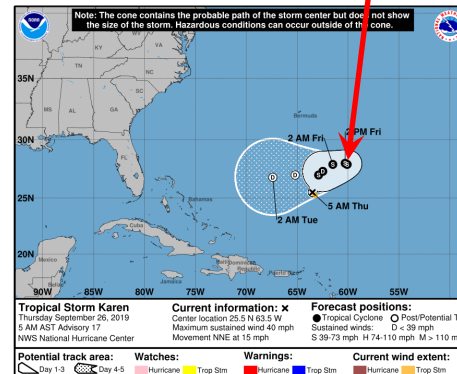
Two-Day Graphical Tropical Weather Outlook
National Hurricane Center Miami, Florida



Current Disturbances and Two-Day Cyclone Formation Chance:
 Tropical or Sub-Tropical Cyclone: ○ Depression ○ Storm ○ Hurricane
 Post-Tropical Cyclone or Remnants ○

Current Disturbances and Two-Day Cyclone Formation Chance:
 Tropical or Sub-Tropical Cyclone: ○ Depression ○ Storm ○ Hurricane
 Post-Tropical Cyclone or Remnants ○

The National Hurricane Center (NHC)'s storm forecasts enable to evaluate potential impacts from 1-5 days in advance

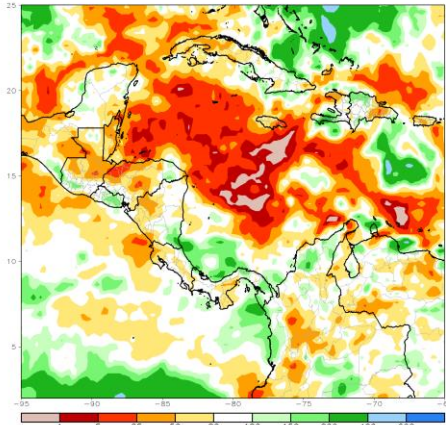


Latest hazards

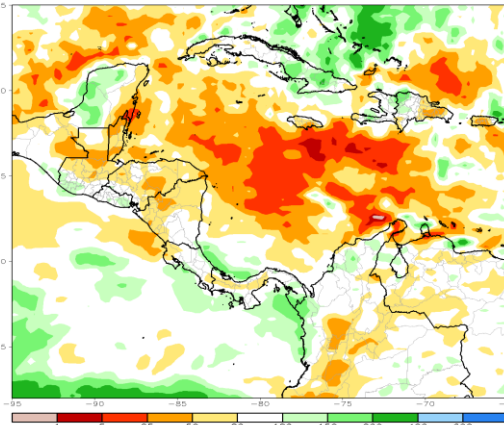
Flooding and abnormal dryness

Climate monitoring

CMORPH 30-Day Percent of Normal Rainfall (%)
Period: 22Aug2019 - 20Sep2019

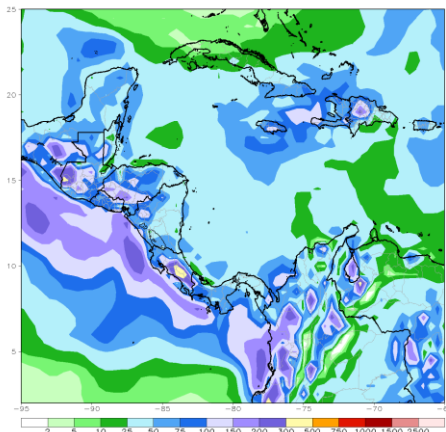


CMORPH 90-Day Percent of Normal Rainfall (%)
Period: 23Jun2019 - 20Sep2019



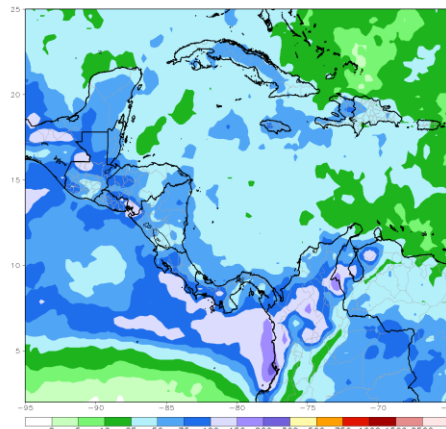
Forecasts

GEFS week1 Ensemble Mean Total Rainfall (mm)
Ending: 06s01Oct2019

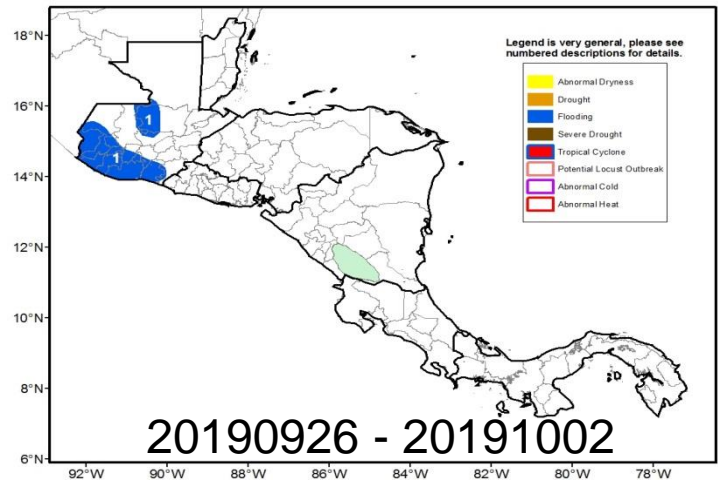
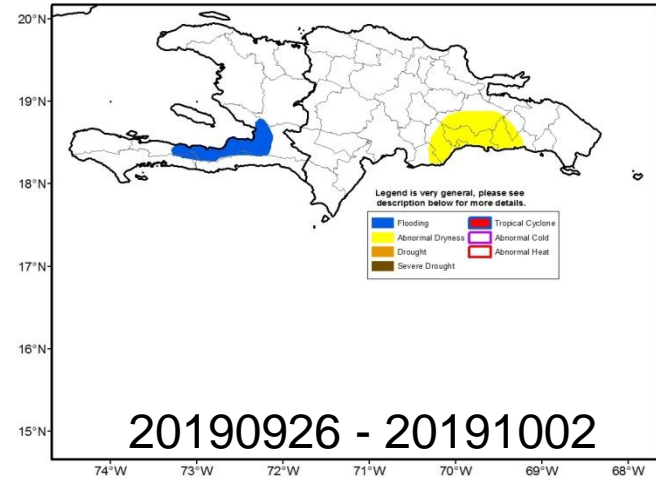


Climatology

CMORPH week1 Climatological Rainfall (mm)
Period: 23SEP - 29SEP



Hazards outlooks



Use of the hazards outlooks

FEWS NET food security outlook

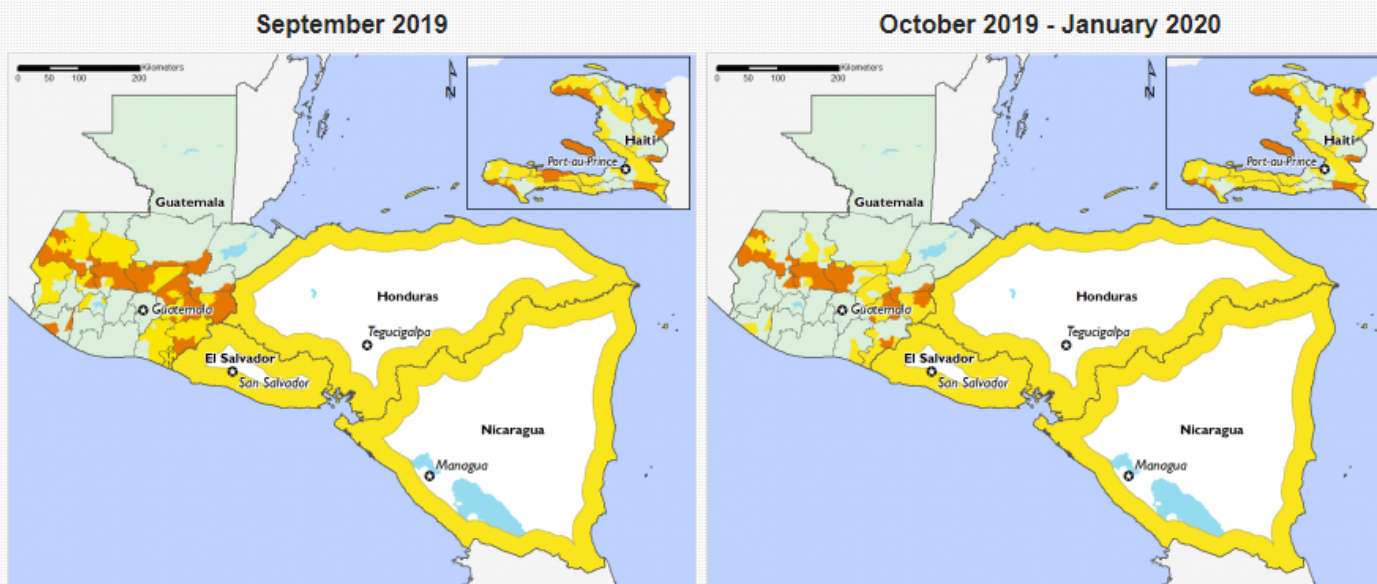
Central America and Caribbean

Key Message Update

Rainfall irregularities affect basic grains harvest

September 2019

FEWS NET incorporates the hazards outlooks among other indicators to produce food security outlooks



IPC v3.0 Acute Food Insecurity Phase

Presence countries: 1: Minimal (light green) 2: Stressed (yellow) 3: Crisis (orange) 4: Emergency (red) 5: Famine (dark red)

Remote monitoring countries:

1: Minimal (light green) 2: Stressed (yellow) 3+: Crisis or higher (orange)

! Would likely be at least one phase worse without current or programmed humanitarian assistance

FEWS NET classification is IPC-compatible. IPC-compatible analysis follows key IPC protocols but does not necessarily reflect the consensus of national food security partners.

FEWS NET Remote Monitoring countries use a colored outline to represent the highest IPC classification in areas of concern.

Thank you