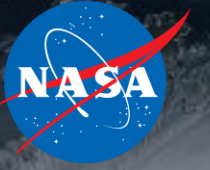


National Aeronautics and  
Space Administration



# EXPLORE EARTH

## **The Role of Space in Understanding Climate Change and Informing Decisions**

Dr. Karen St. Germain

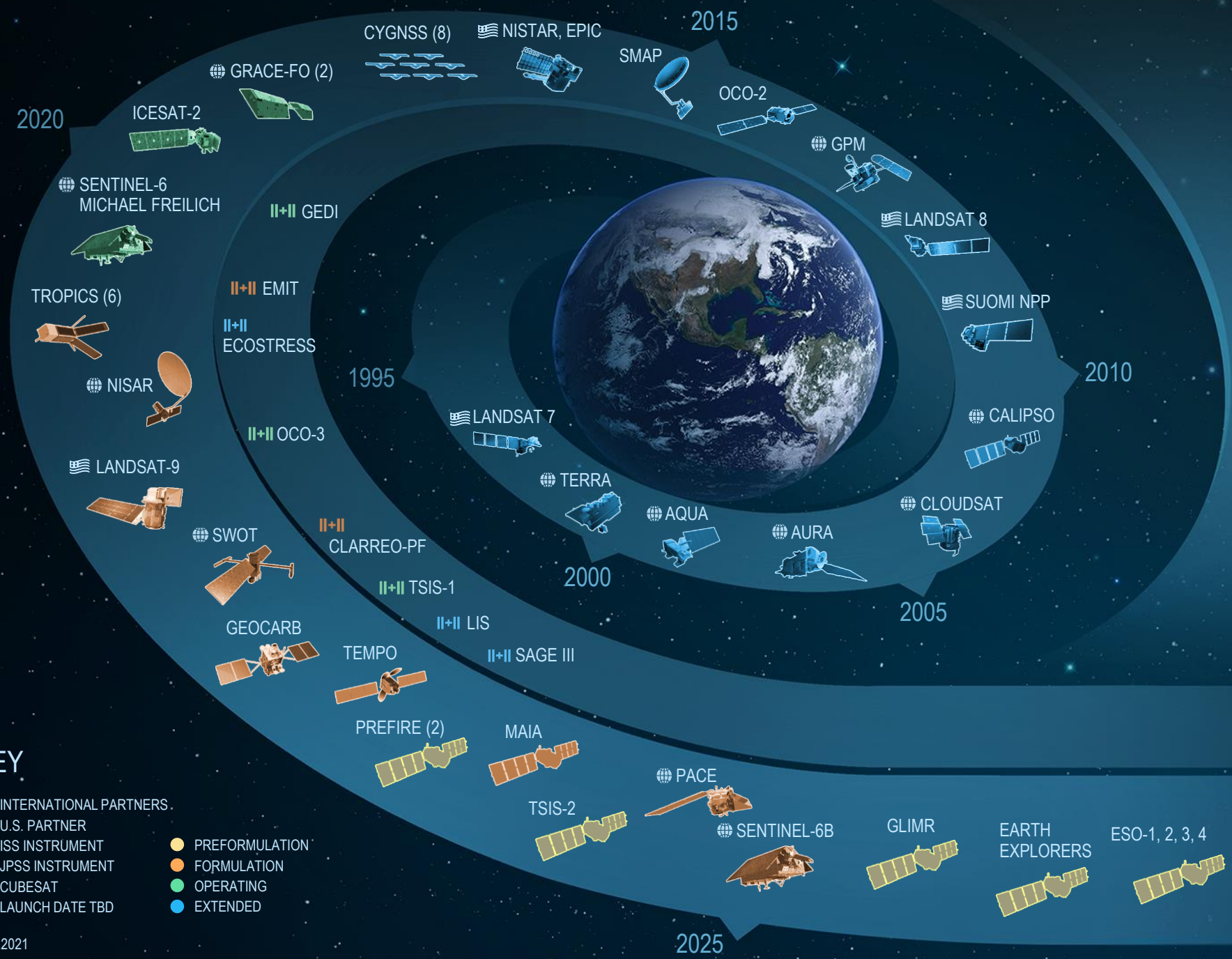
Director, NASA Earth Science Division, Science Mission Directorate

Aug. 27, 2021





# EARTH FLEET



## INVEST/CUBESATS

- TEMPEST-D 2021
- CSIM-FD 2023
- HARP 2022
- CIRIS 2023
- CTIM\* 2022
- HYTI\* 2022
- SNOOPI\* 2022
- NACHOS\* 2022
- NACHOS2\* 2022

## JPSS INSTRUMENTS

- OMPS-LIMB 2022
- LIBERA 2027

## ISS INSTRUMENTS

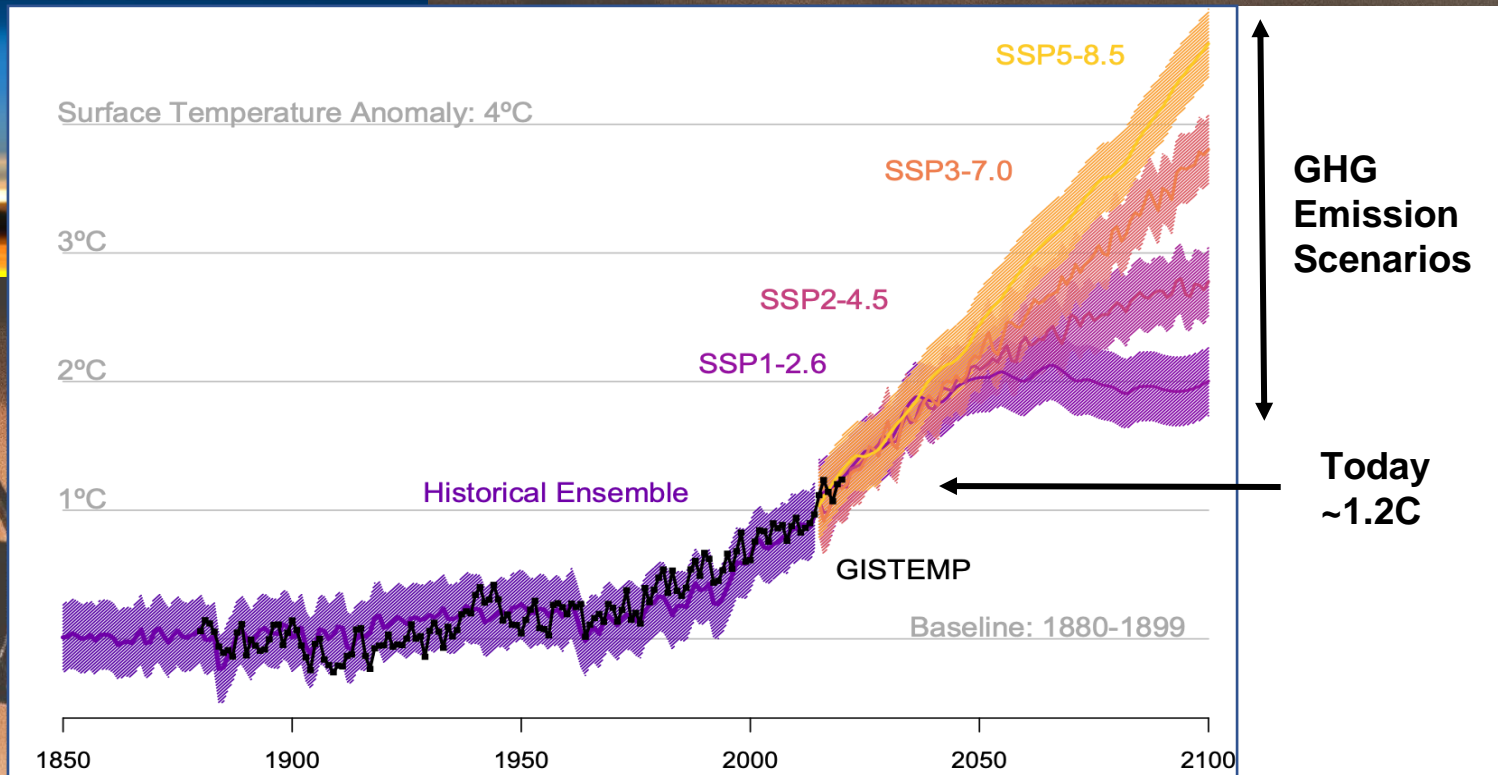
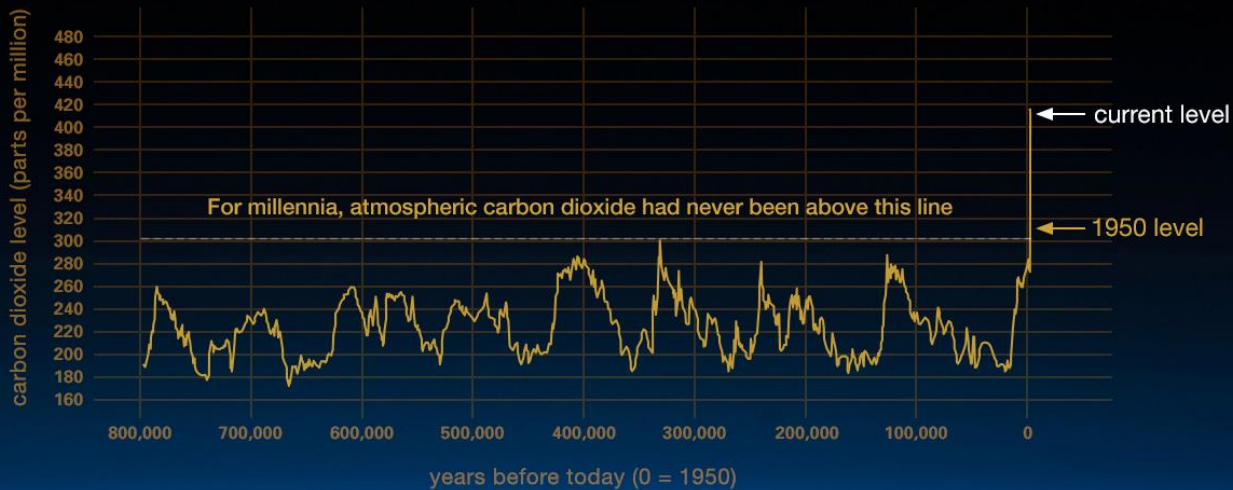
## MISSIONS

### KEY

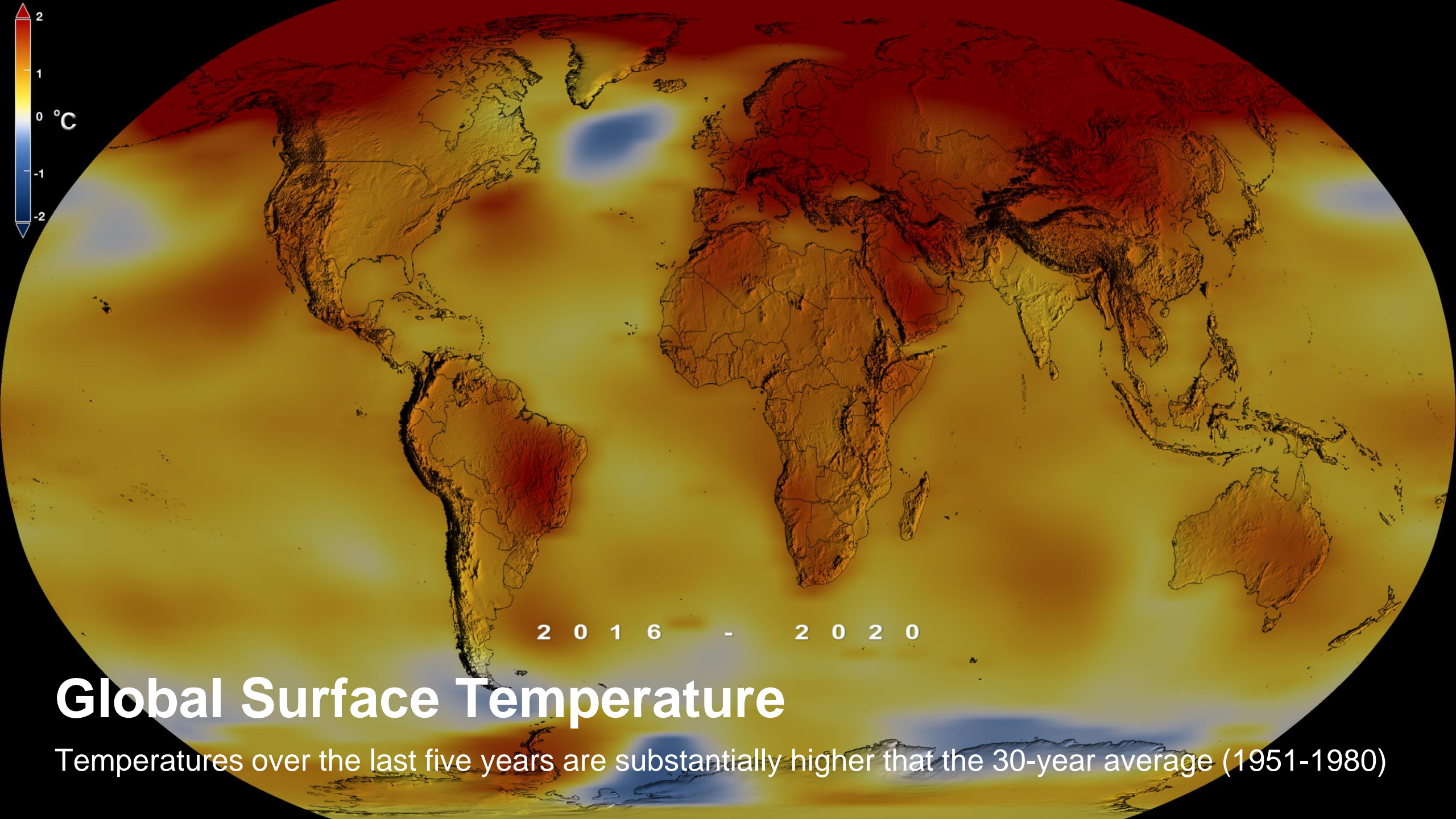
- INTERNATIONAL PARTNERS
- U.S. PARTNER
- ISS INSTRUMENT
- JPSS INSTRUMENT
- CUBESAT
- LAUNCH DATE TBD
- PREFORMULATION
- FORMULATION
- OPERATING
- EXTENDED



# Human-produced Greenhouse Gases are Driving to a New Climate Regime







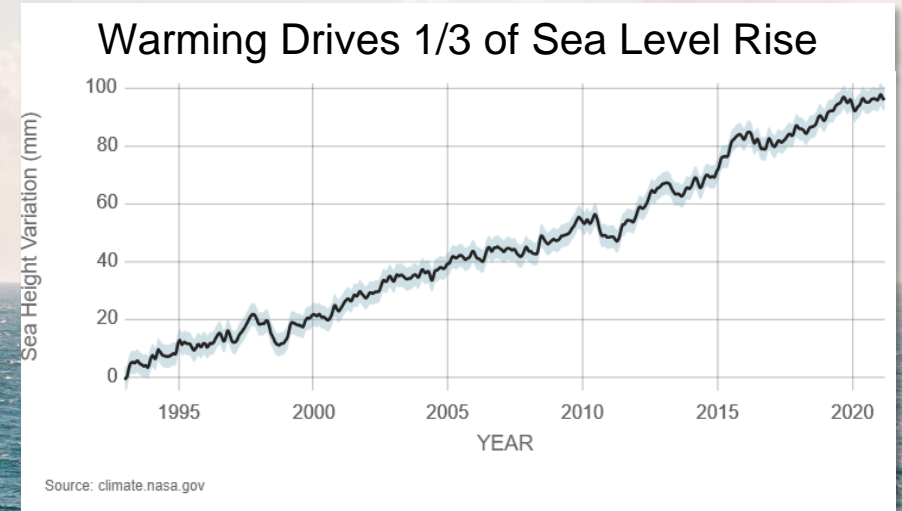
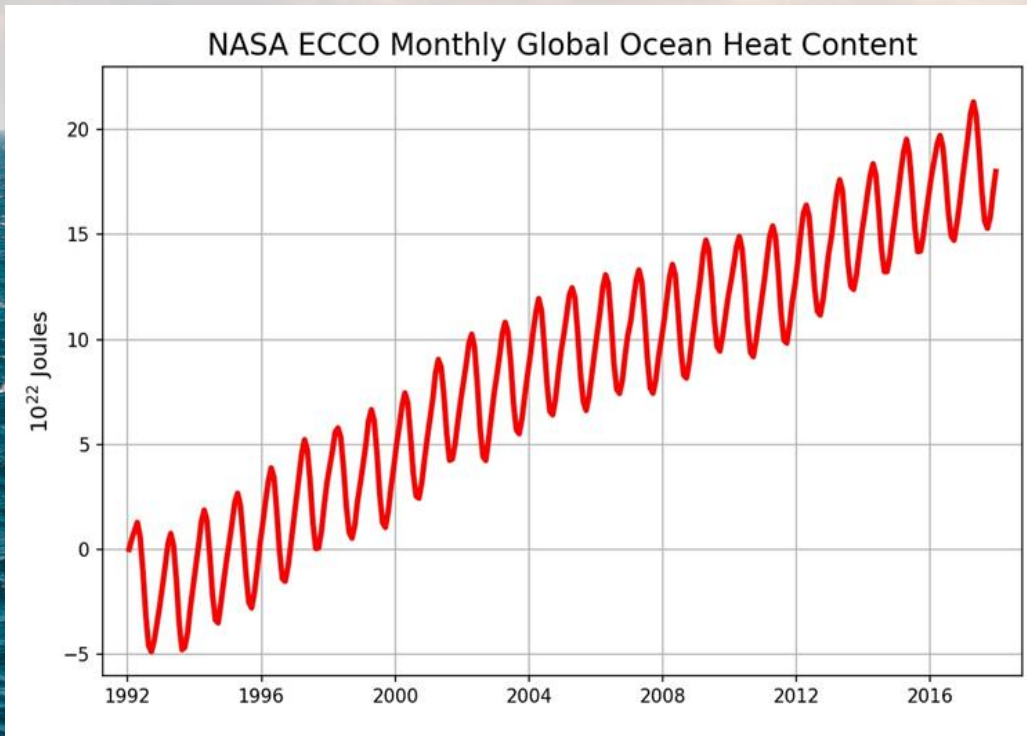
2 0 1 6 - 2 0 2 0

# Global Surface Temperature

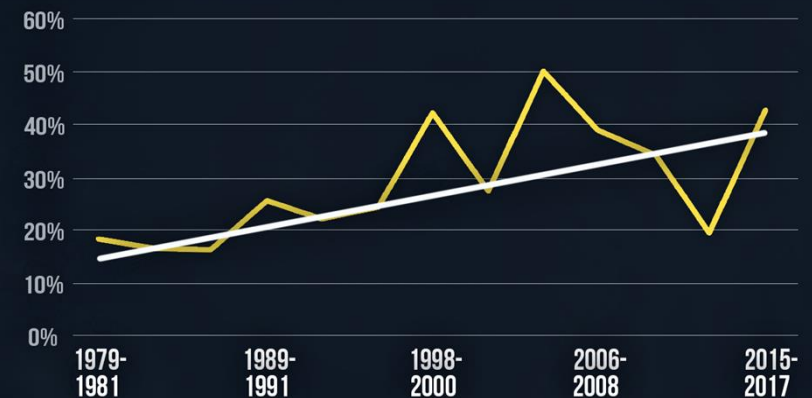
Temperatures over the last five years are substantially higher than the 30-year average (1951-1980)



# 94% of Global Warming Heat is Absorbed By the Oceans, Driving Sea Level Rise and Fueling Tropical Storms



## Warming Drives Frequency and Intensity of Tropical Storms



Based on 6-hour observations for major tropical cyclones (Cat 3-5 compared to all Cat 1+ tropical cyclones). Data collected into 3-year periods. Source: Kossin et al. (2020)

# Rising sea levels increase likelihood and severity of “high-tide flooding” for coastal communities

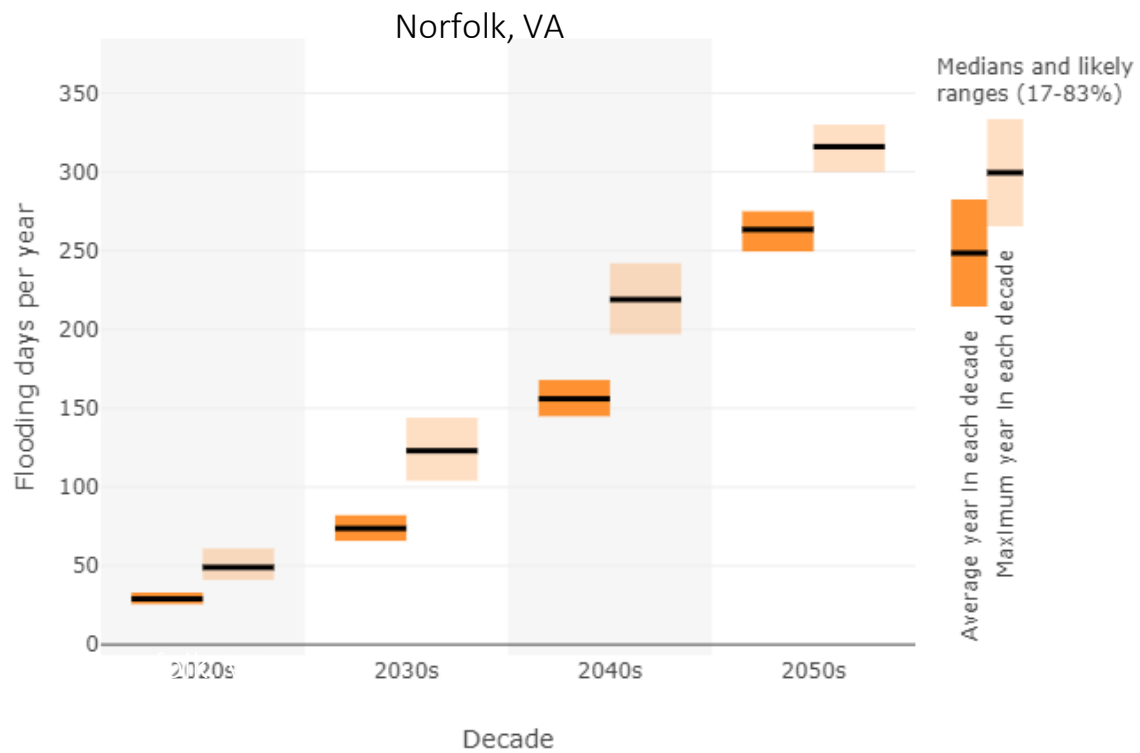
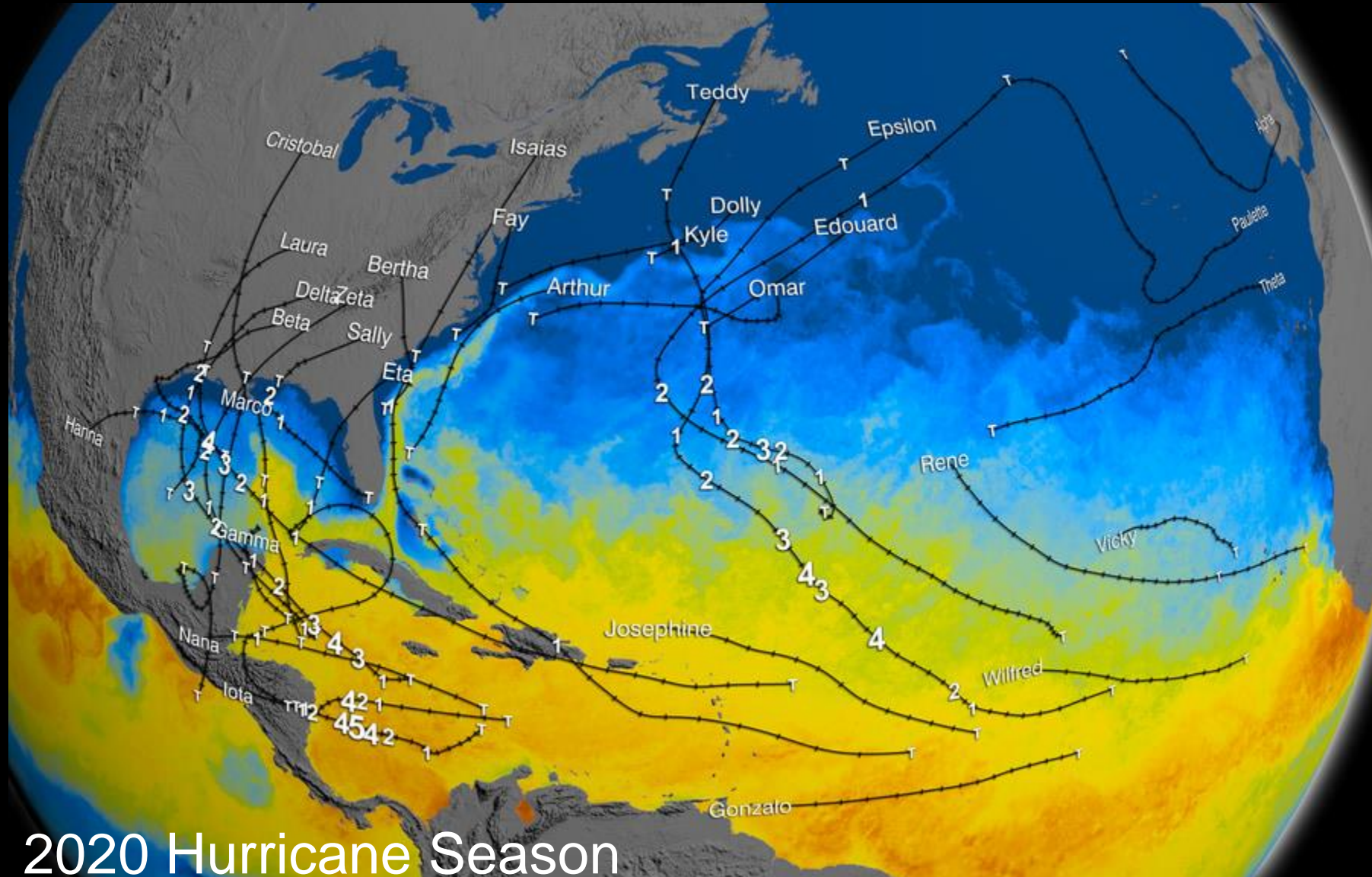


Photo Credit: City of Norfolk, Va.



# Warmer Oceans Drive Extreme Precipitation and Hurricane Intensification



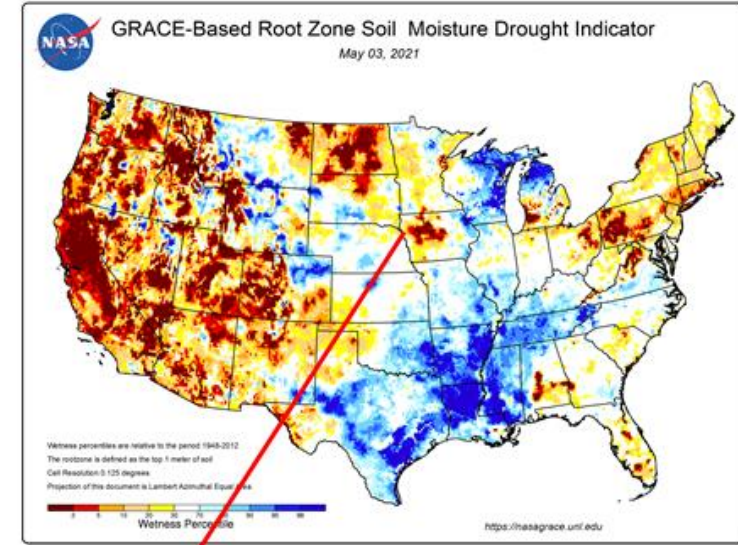
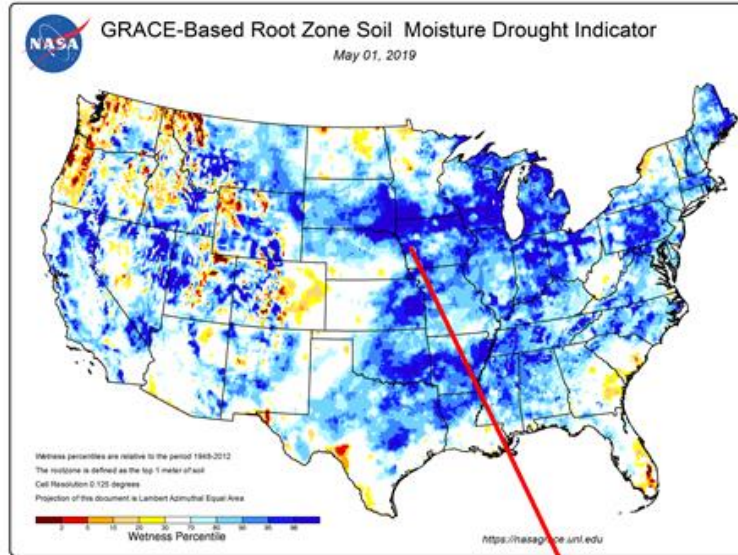
Dec 31  
2020

- Arthur
- Bertha
- Cristobal
- Dolly
- Edouard
- Fay
- Gonzalo
- Hanna
- Isaias
- Josephine
- Kyle
- Laura
- Marco
- Nana
- Omar
- Paulette
- Rene
- Sally
- Teddy
- Vicky
- Wilfred
- Alpha
- Beta
- Gamma
- Delta
- Epsilon
- Zeta
- Eta
- Theta
- Iota

2020 Hurricane Season



# Floods, Heat Waves and Drought Drive Food Prices in the U.S. and Worldwide



FROM FLOODS TO DROUGHT  
National and Global Monitoring of  
Climate Impacts on Food Prices



## CORN PRICES

Markets Insider

[Corn PRICE Today](#) | [Corn Spot Price Chart](#) | [Live](#)

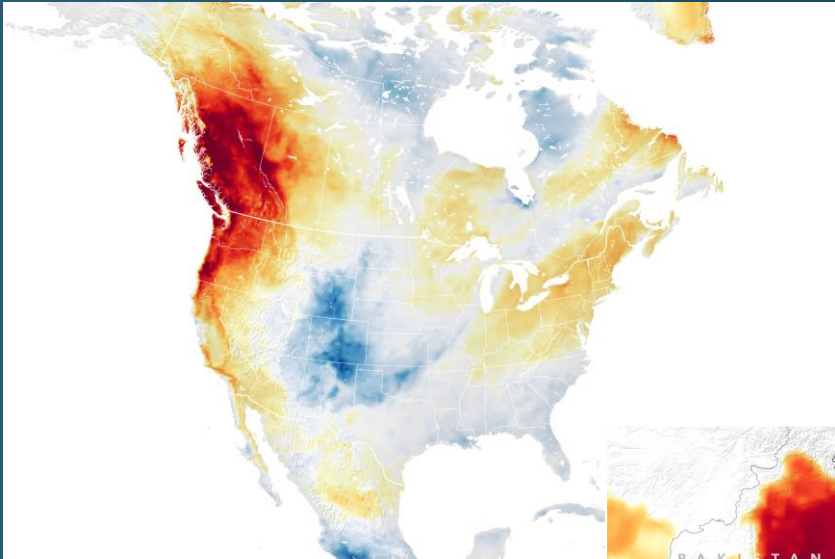
[Price of Corn per Ounce](#) | [Markets Insider](#)

[businessinsider.com](https://www.businessinsider.com)

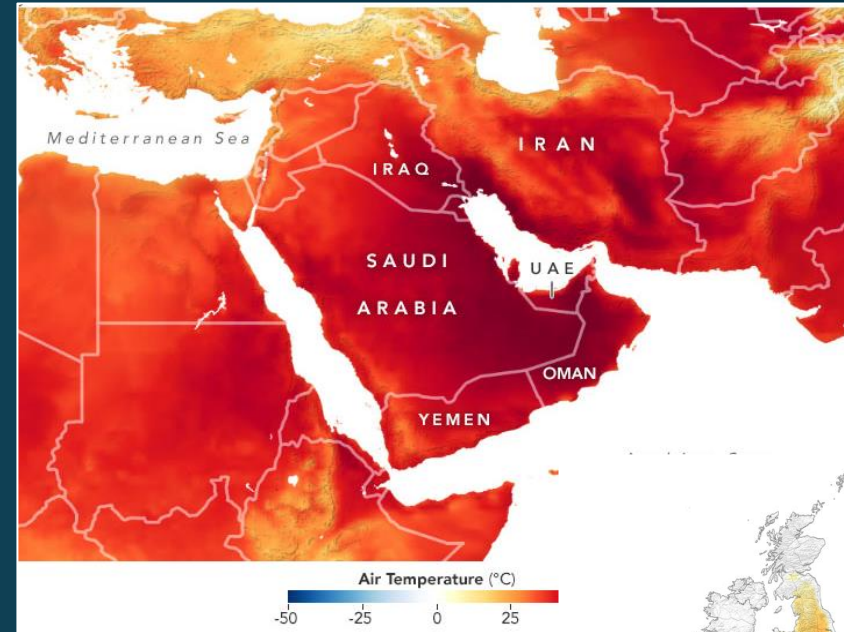


# Record-breaking Heatwaves Occurring Around the World

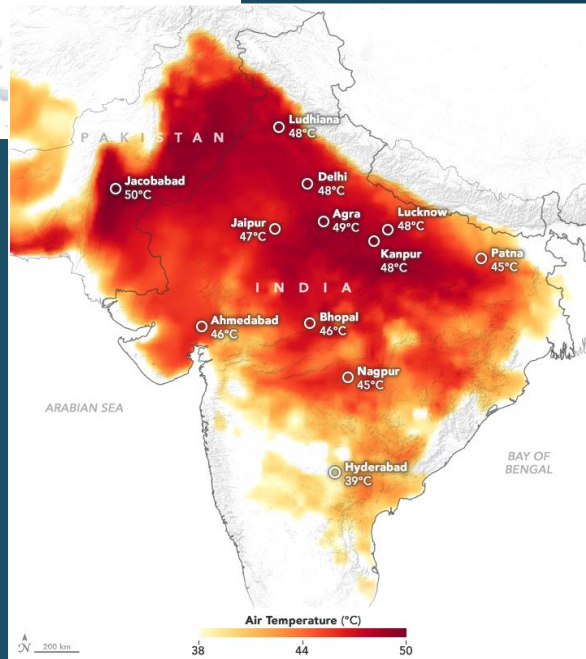
June 2021



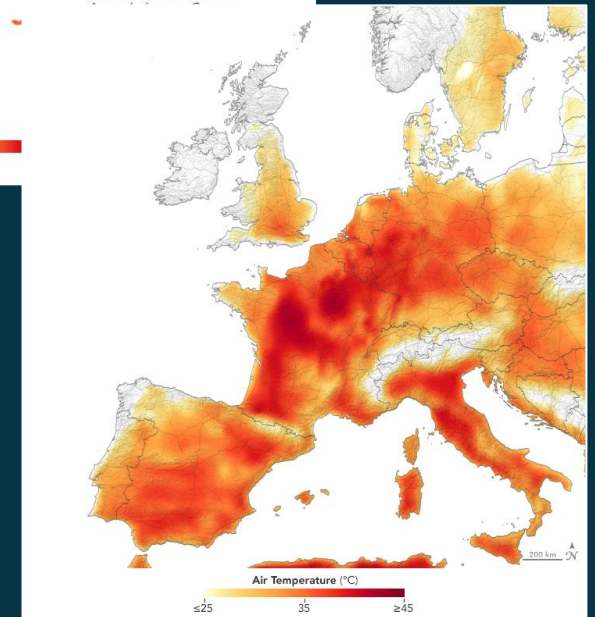
June 2021



June 2019

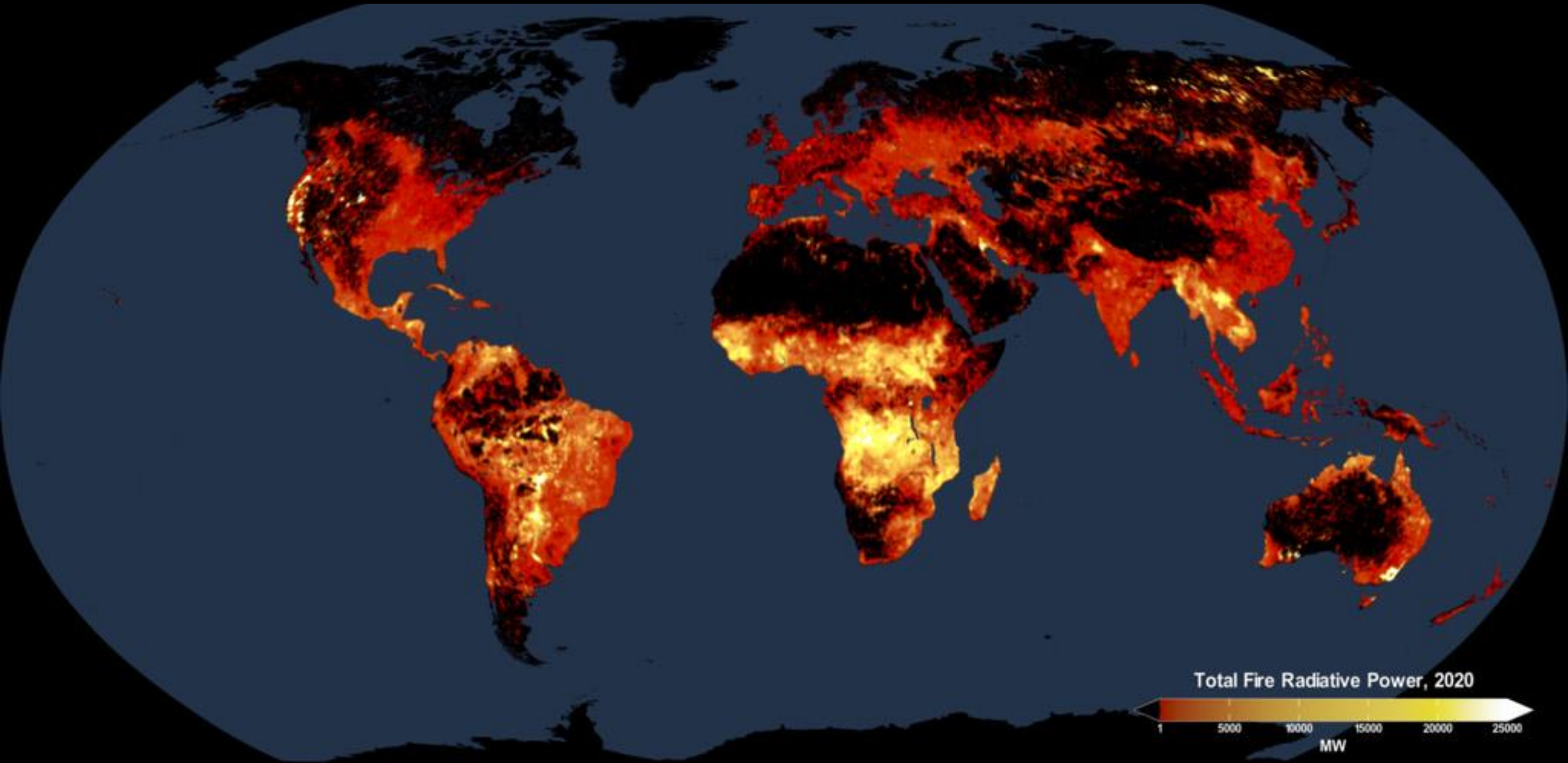


July 2019



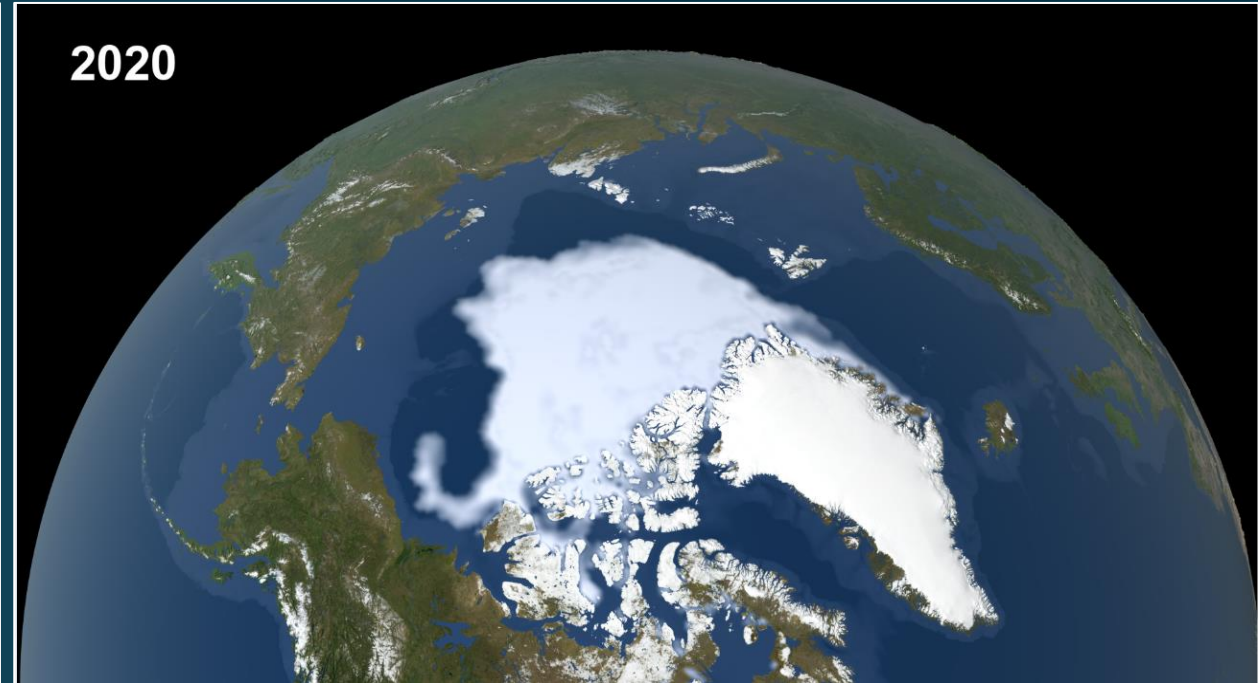
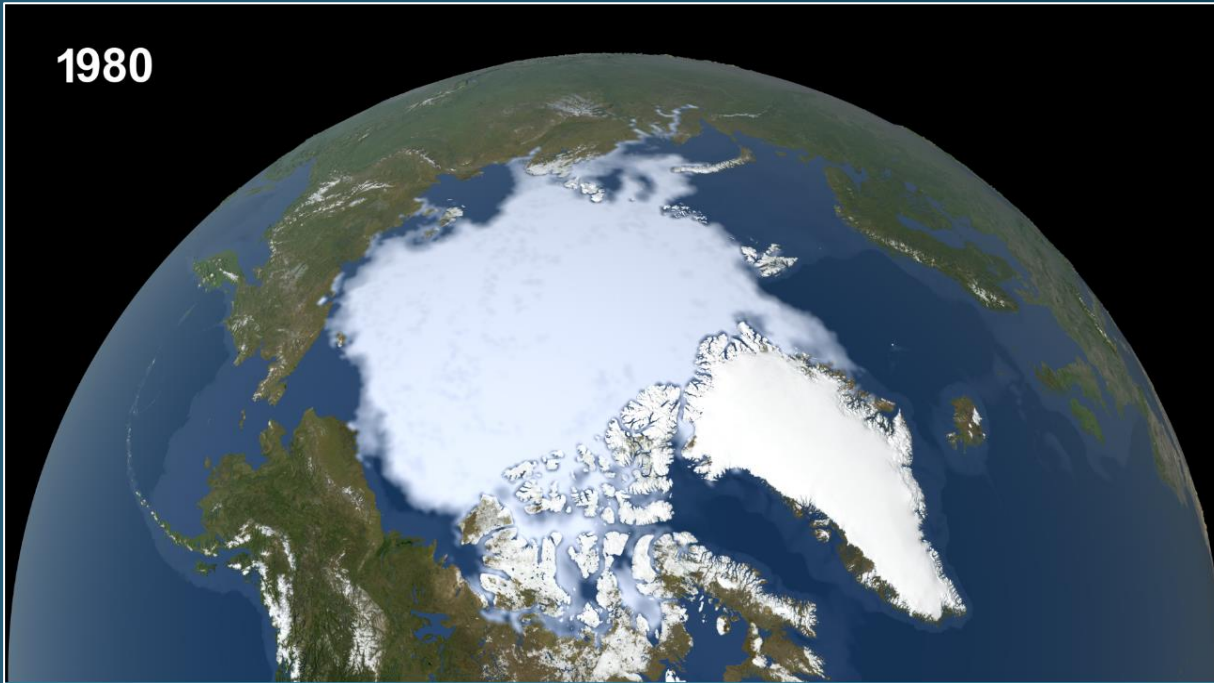


# Heat and Drought Fuel Wildland Fires Worldwide



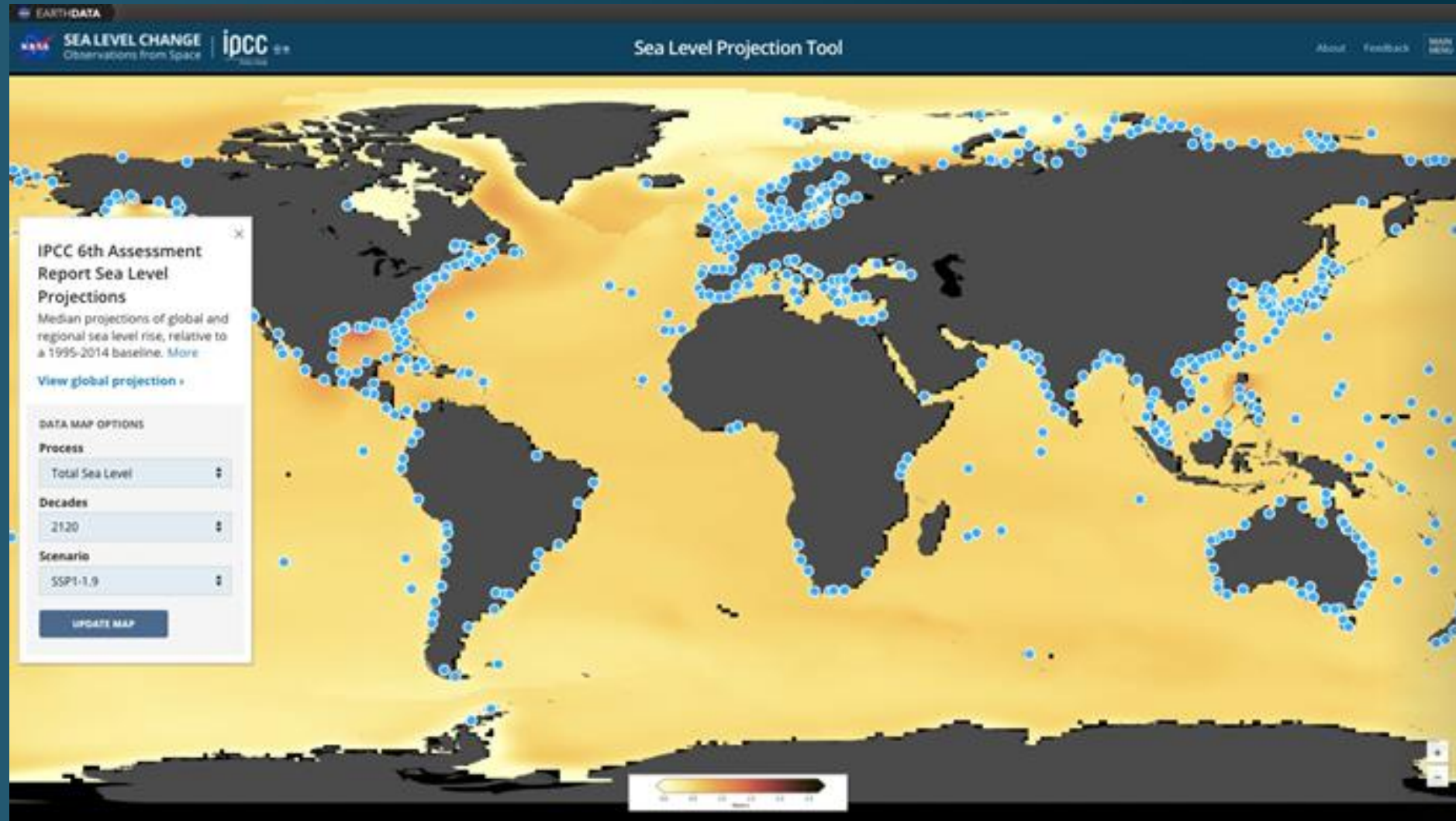


# Steep Decline in Summer Arctic Sea Ice Amplifies Climate Warming and Opens Arctic to Use and Challenges





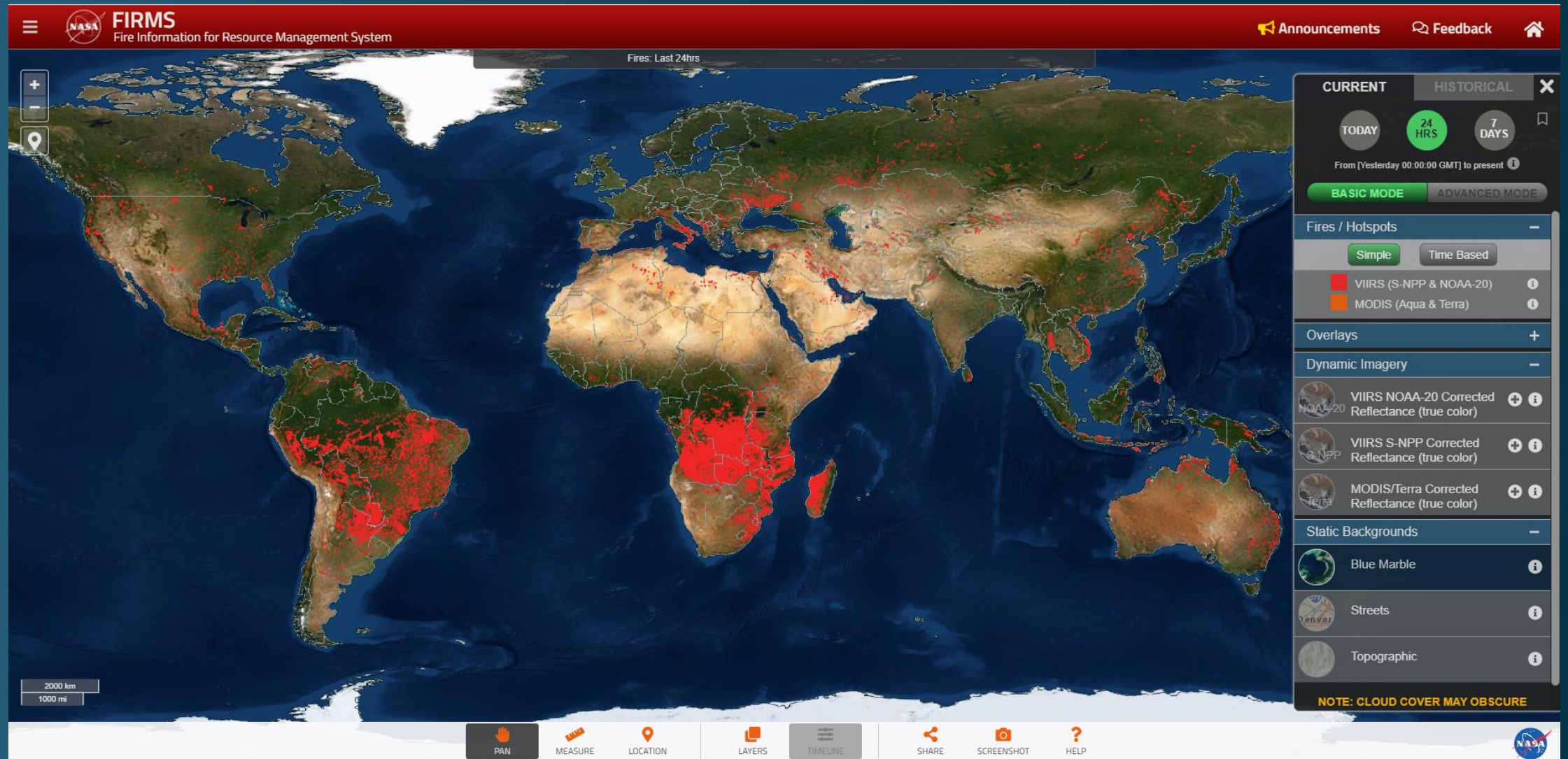
# NASA Delivers New IPCC-based Sea Level Projection Tool



<https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool>



# Tracking Wildland Fires Around the Globe



<https://firms.modaps.eosdis.nasa.gov/>





# Enabling Rapid Response for Food Aid during Covid-19 Pandemic



**Cina Lawson**  
*Togolese Minister of Post, Digital Economy and Technological Innovation*

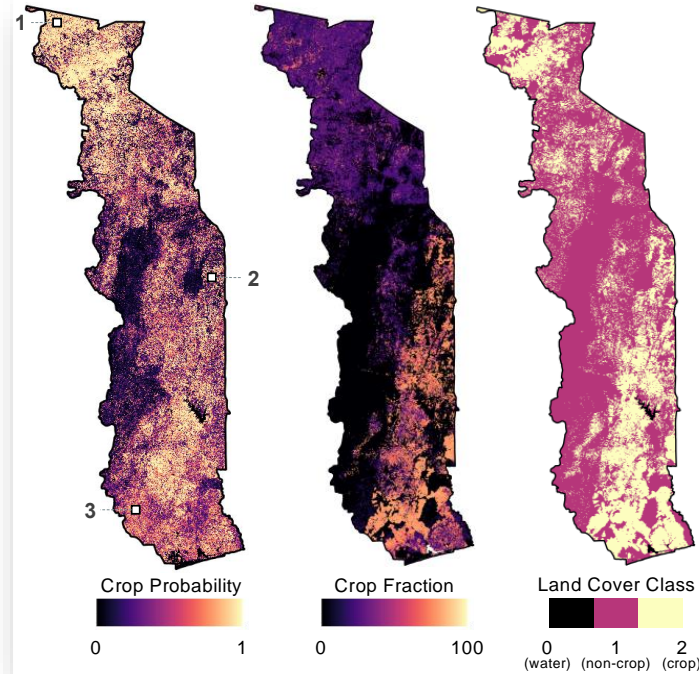
“We want to build on the success of the programme to improve the NOVISSI model and make the unified platform for all G2P social protection payments in the country.

The agricultural maps we have developed thanks to NASA Harvest data play a role in our process to determine which groups of people to target for the next batch of NOVISSI transfers.”



Covid-19: Lomé launches agricultural response plan to help farmers cope amidst the pandemic

AGRICULTURE Friday, 01 May 2020 12:01



10-m cropland maps of Togo



# Earth System Science Informs Global and Regional Solutions



**NATURAL HAZARD  
WARNING AND RECOVERY**



**SEA LEVEL RISE MITIGATION**



**ECONOMIC PROSPERITY**



**FOOD SECURITY AND  
WATER MANAGEMENT**