

# Tropical Disturbance Rainfall Exercise

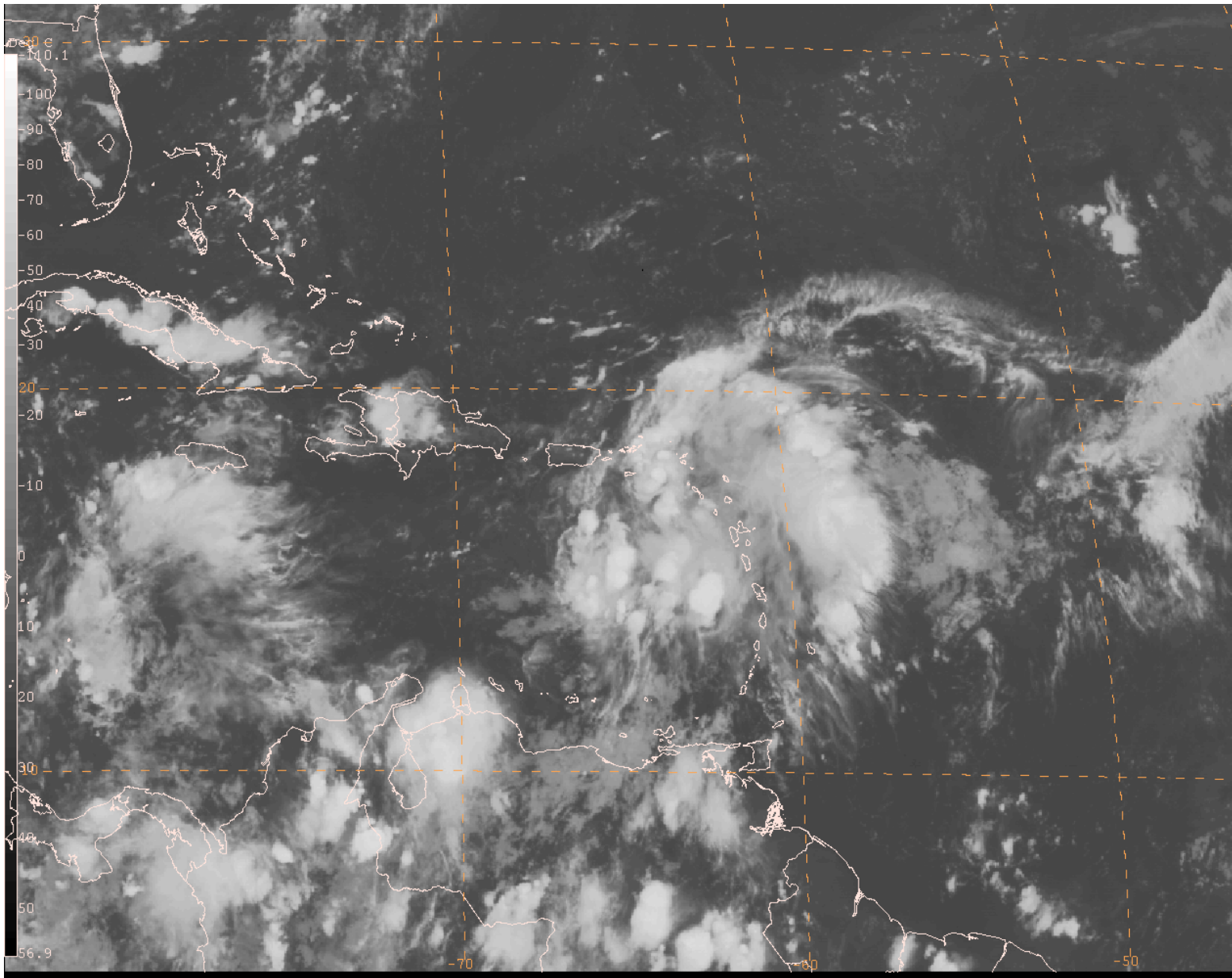
A tropical disturbance lies south of Puerto Rico at 0000 UTC on the 21<sup>st</sup> of the month

**You will draw a 72-hour quantitative precipitation forecast (QPF) for Puerto Rico for the period from 21/1200 UTC to 24/1200 UTC**

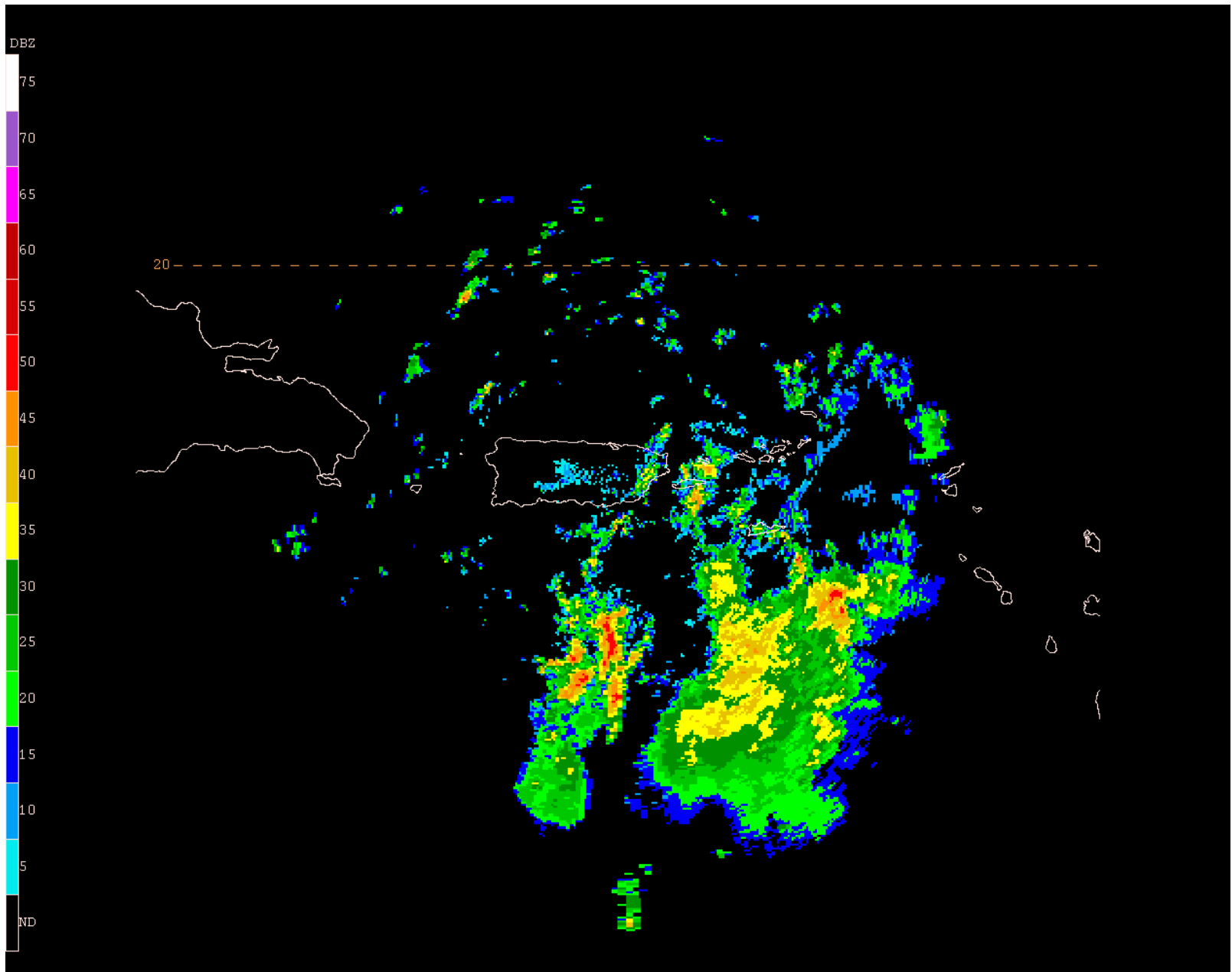
You will be provided:

- Infrared (IR) Satellite Loop through 21<sup>st</sup> at 1200 UTC
- San Juan Radar Loop through 21<sup>st</sup> at 1200 UTC
- San Juan soundings from 0000 and 1200 UTC on the 21<sup>st</sup>
- Water Vapor Satellite Loop through 21<sup>st</sup> at 1200 UTC
- ECMWF 250mb forecast initialized 21<sup>st</sup> at 1200 UTC
- Track guidance including the GFS and ECMWF
- GFS 850mb, MSLP, and QPF forecasts
- ECMWF 850mb, MSLP, and QPF forecast
- Puerto Rico topographic map

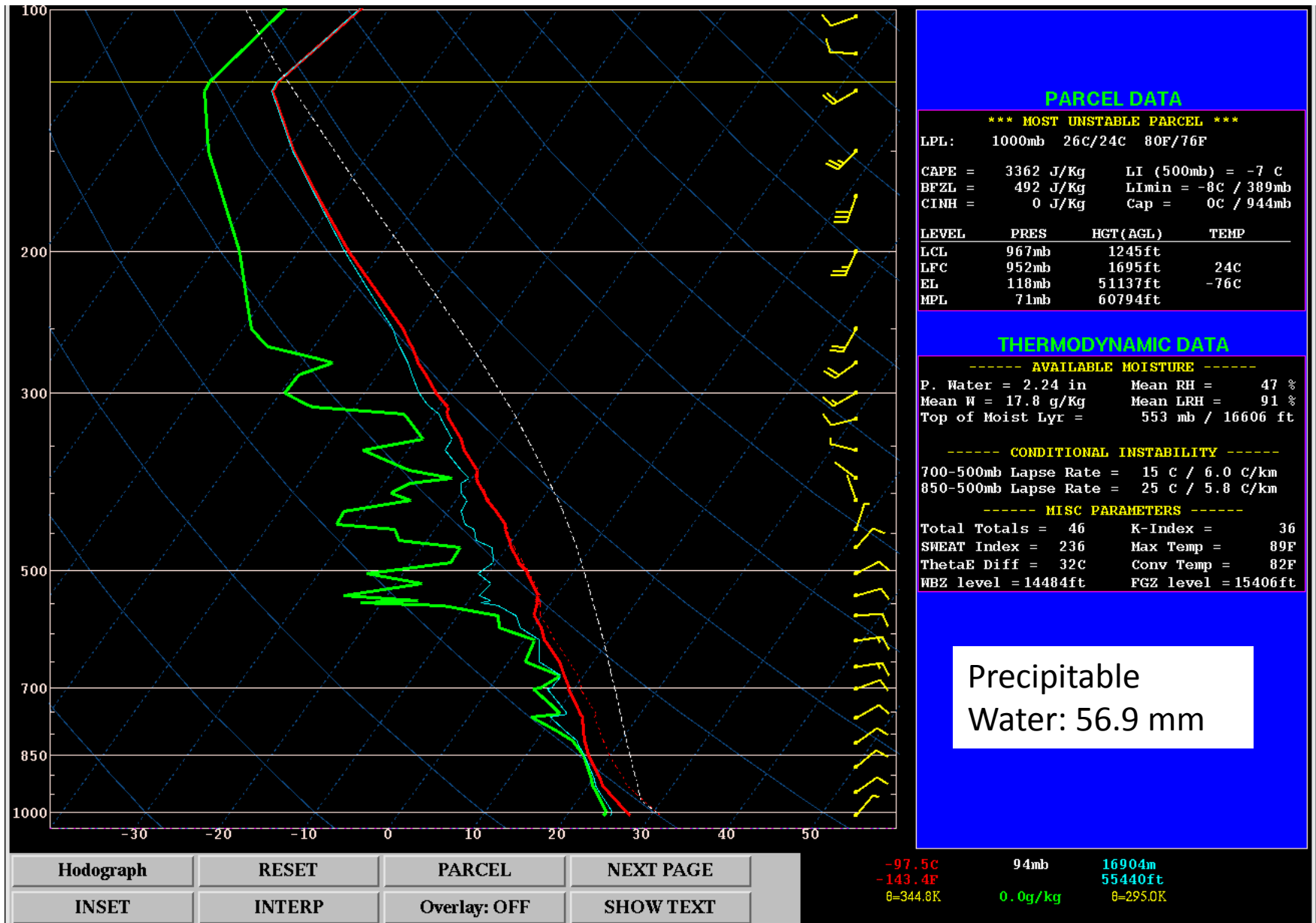
# Infrared Satellite Loop



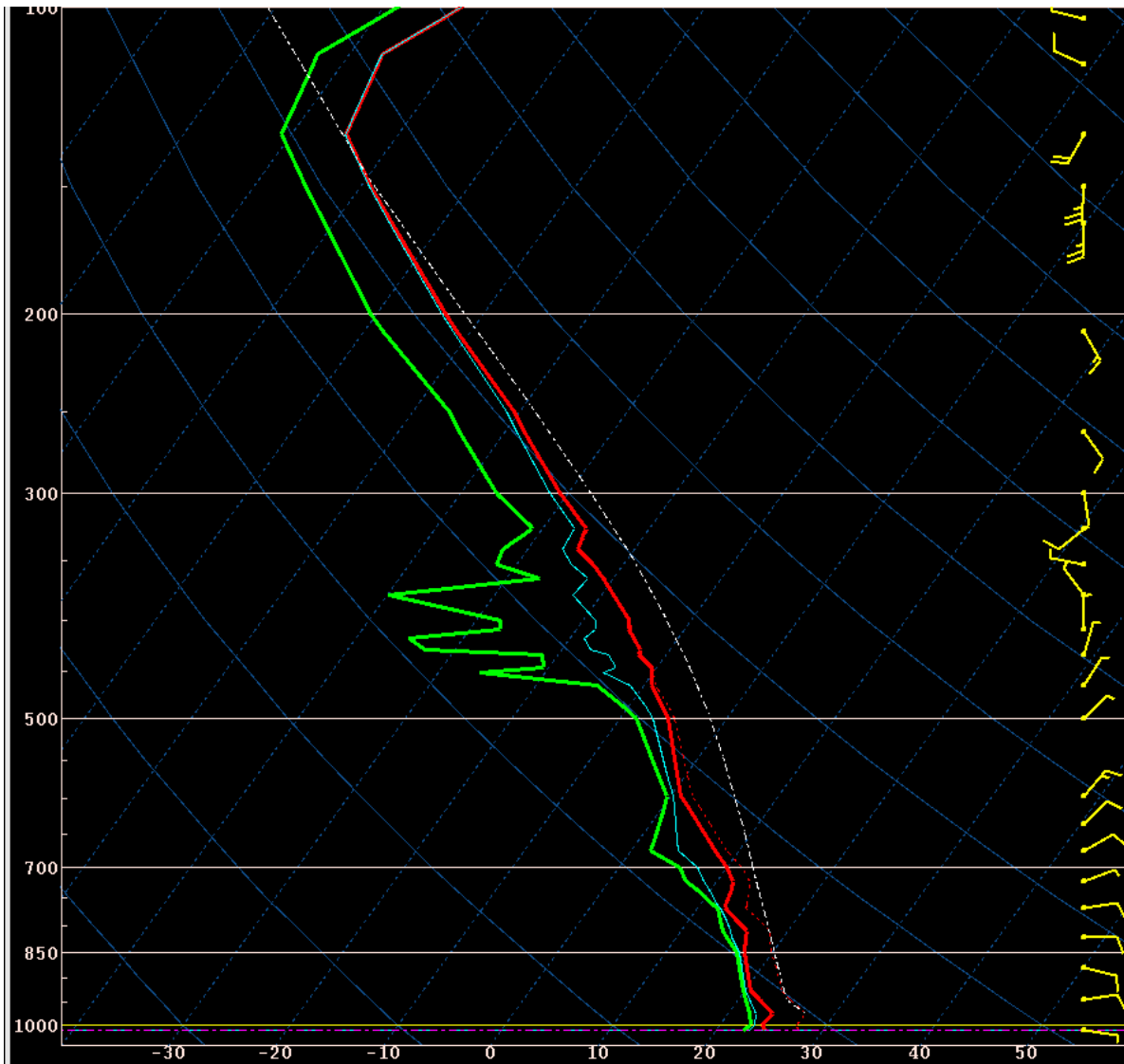
# San Juan Radar Loop



# San Juan Radiosonde – 00Z 21<sup>st</sup>



# San Juan Radiosonde – 12Z 21<sup>st</sup>



## PARCEL DATA

\*\*\* MOST UNSTABLE PARCEL \*\*\*

LPL: 977mb 24C/22C 75F/71F  
CAPE = 1190 J/Kg LI (500mb) = -4 C  
BFZL = 224 J/Kg LImix = -4C / 341mb  
CINH = -1 J/Kg Cap = 0C / 945mb

LEVEL	PRES	HGT(AGL)	TEMP
LCL	946mb	1899ft	
LFC	805mb	6457ft	16C
EL	140mb	47948ft	-72C
MPL	96mb	55163ft	

## THERMODYNAMIC DATA

----- AVAILABLE MOISTURE -----

P. Water = 2.30 in Mean RH = 60 %  
Mean W = 16.7 g/Kg Mean LRH = 93 %  
Top of Moist Lyr = H / H

----- CONDITIONAL INSTABILITY -----

700-500mb Lapse Rate = 16 C / 6.0 C/km  
850-500mb Lapse Rate = 25 C / 5.7 C/km

----- MISC PARAMETERS -----

Total Totals = 45 K-Index = 35  
SWEAT Index = 223 Max Temp = 88F  
ThetaE Diff = 16C Conv Temp = 80F  
WBZ level = 14815ft FGZ level = 15342ft

Precipitable  
Water: 58.4 mm

Hodograph

RESET

PARCEL

NEXT PAGE

INSET

INTERP

Overlay: OFF

SHOW TEXT

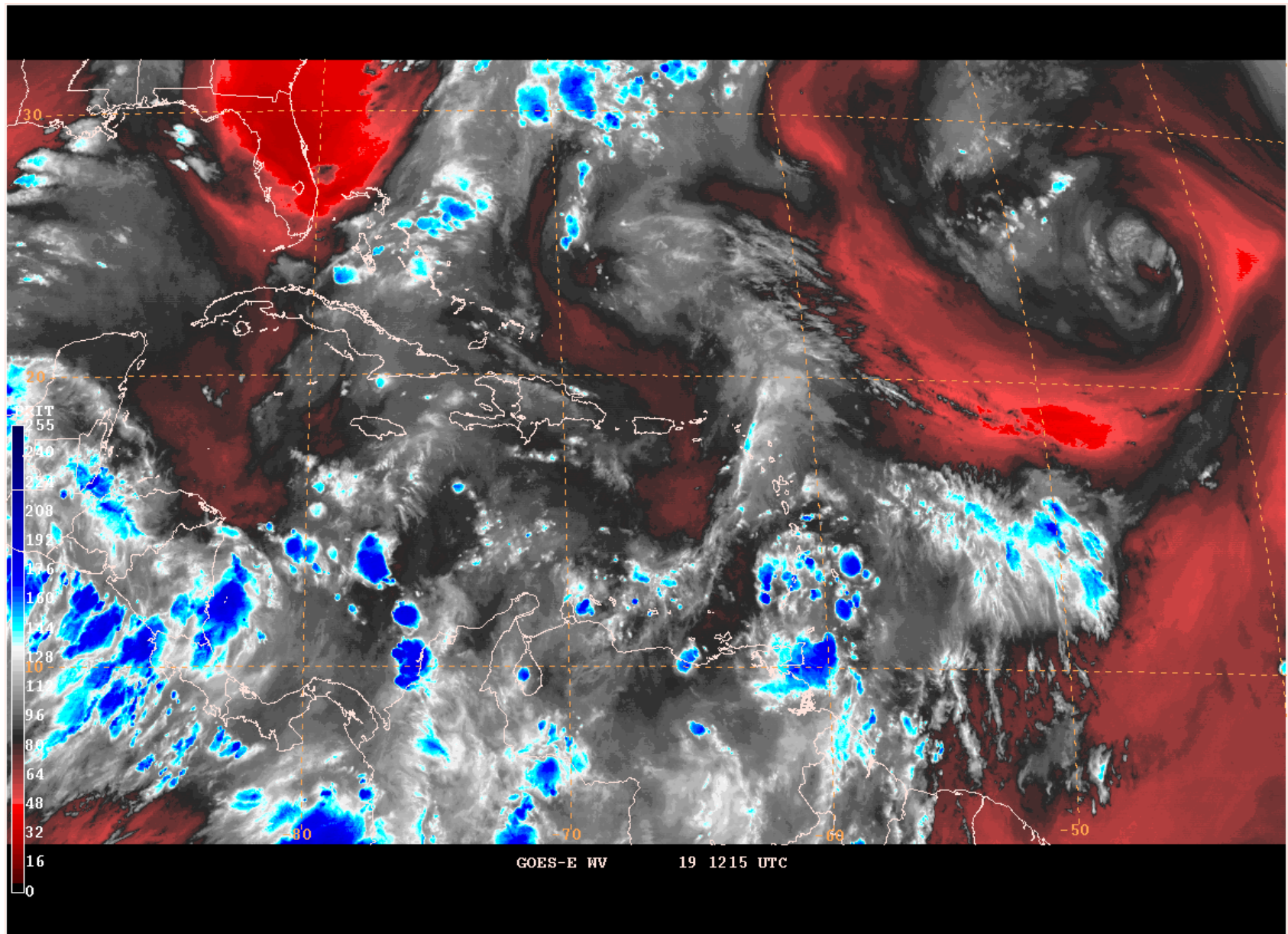
-84.2C  
-119.6F  
θ=276.1K

265mb  
0.0g/kg

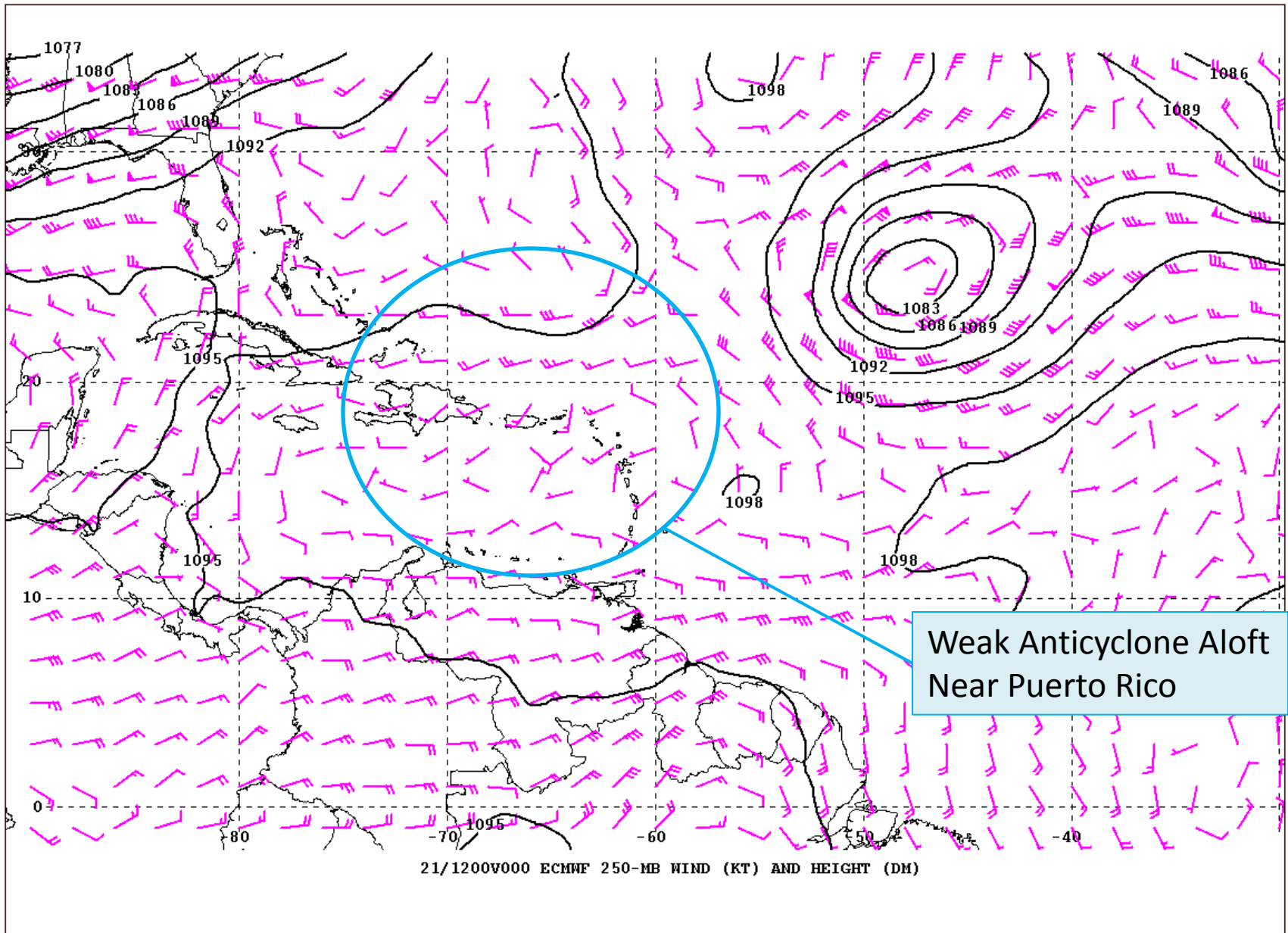
10556m  
34623ft  
θ=268.7K



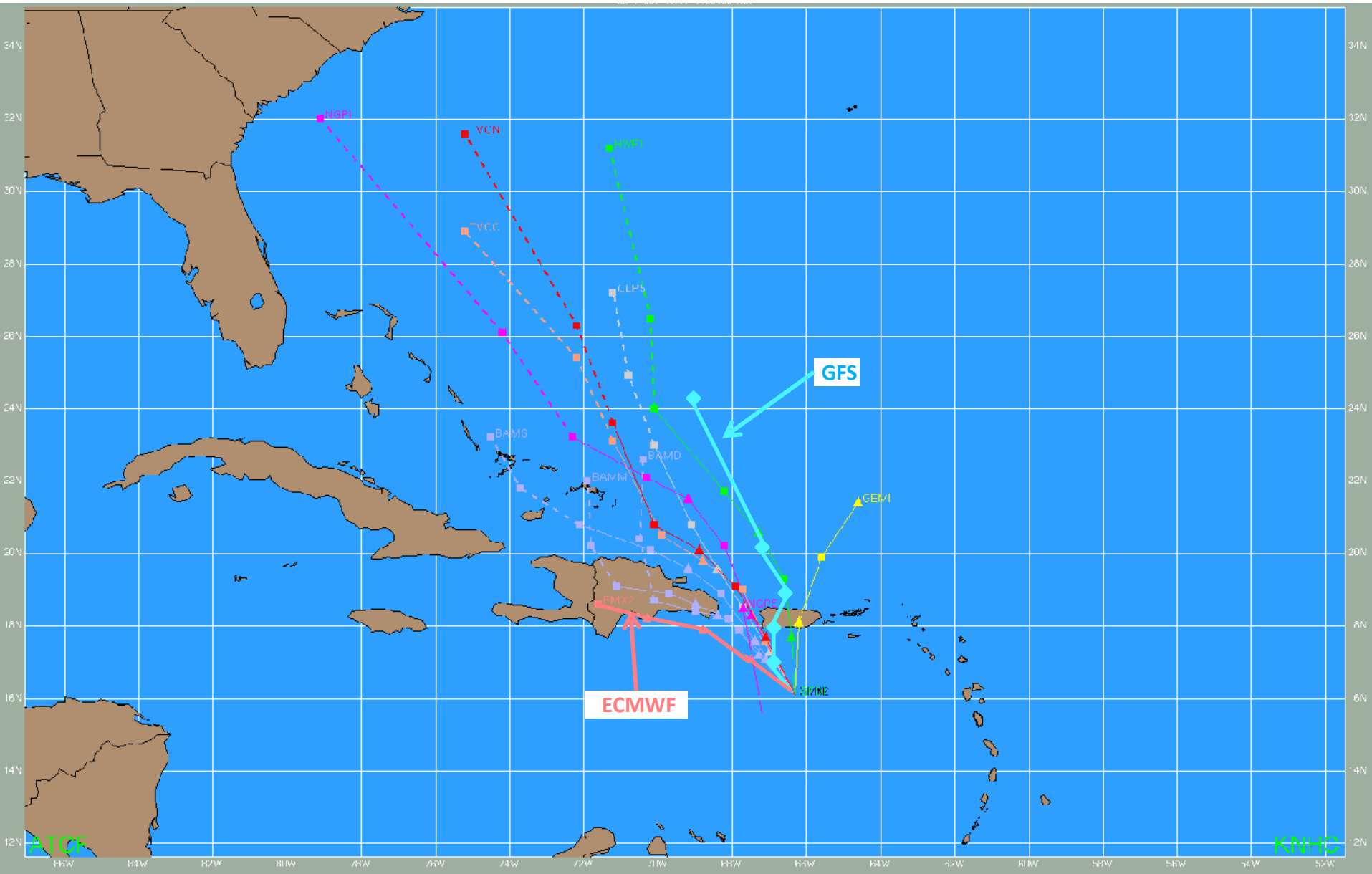
# Water Vapor Satellite Loop



# ECMWF 250mb Height and Wind Forecast

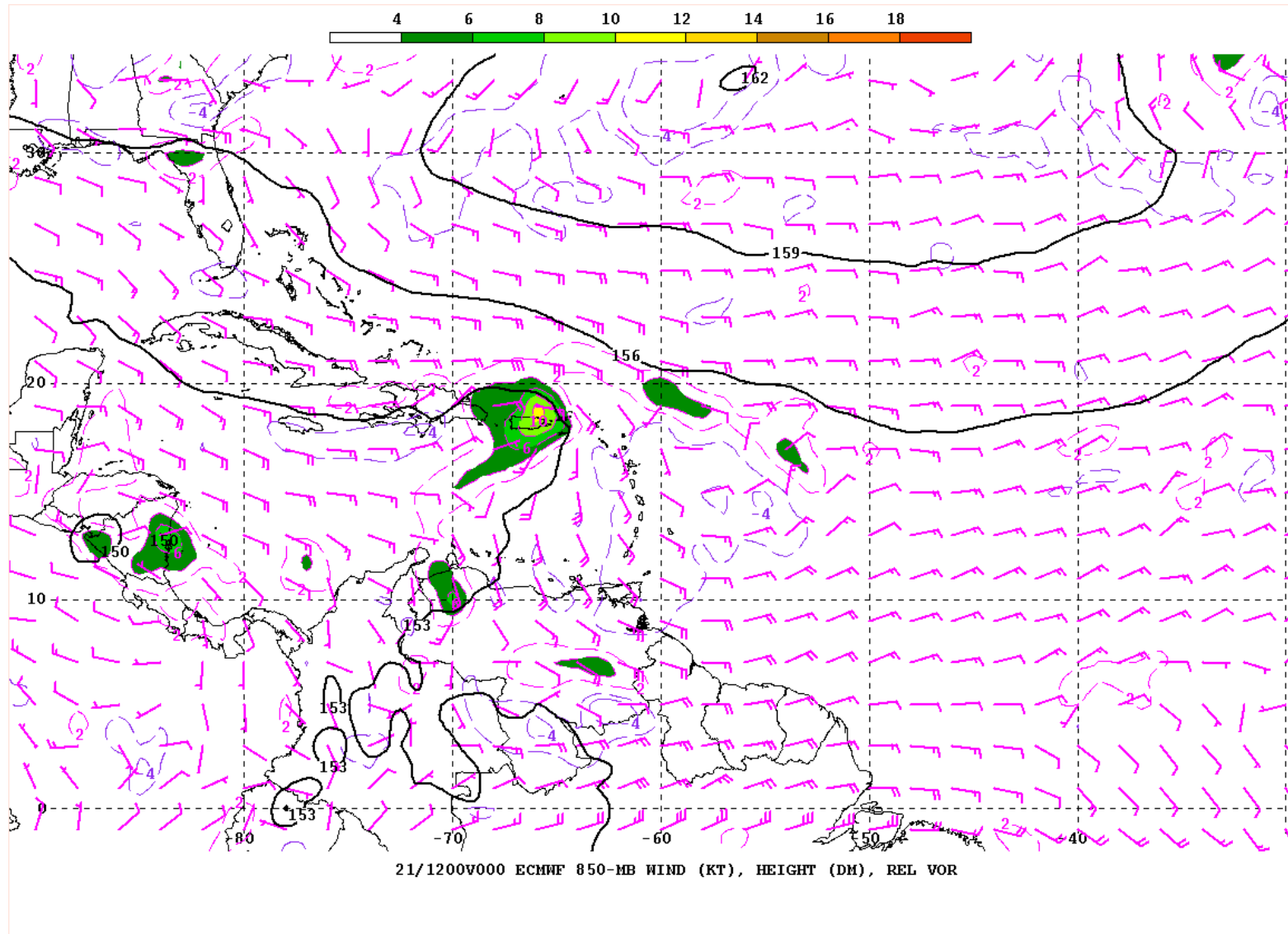


# ATCF Track Guidance

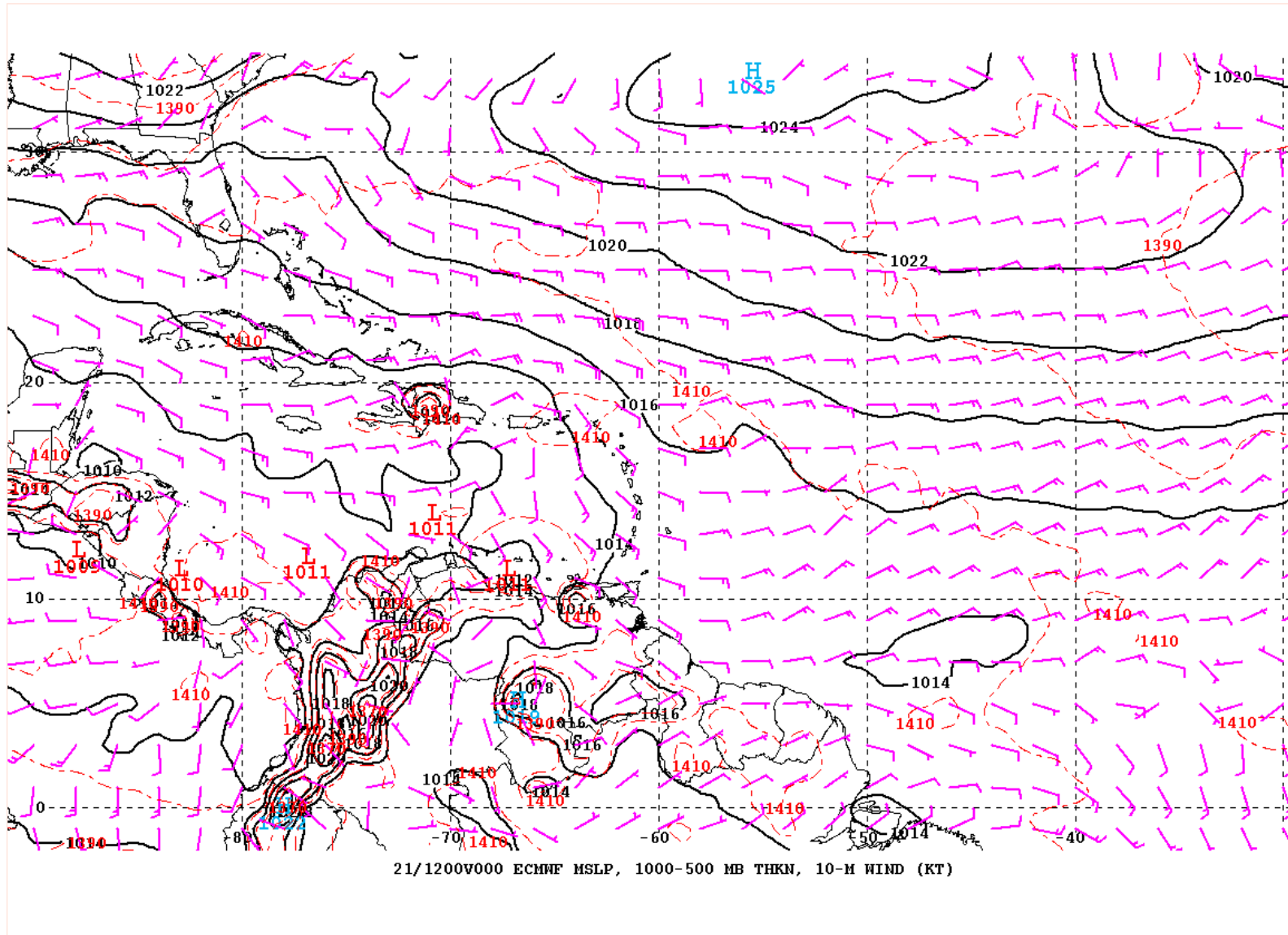




# ECMWF 850mb Height, Wind, Relative Vorticity Forecast

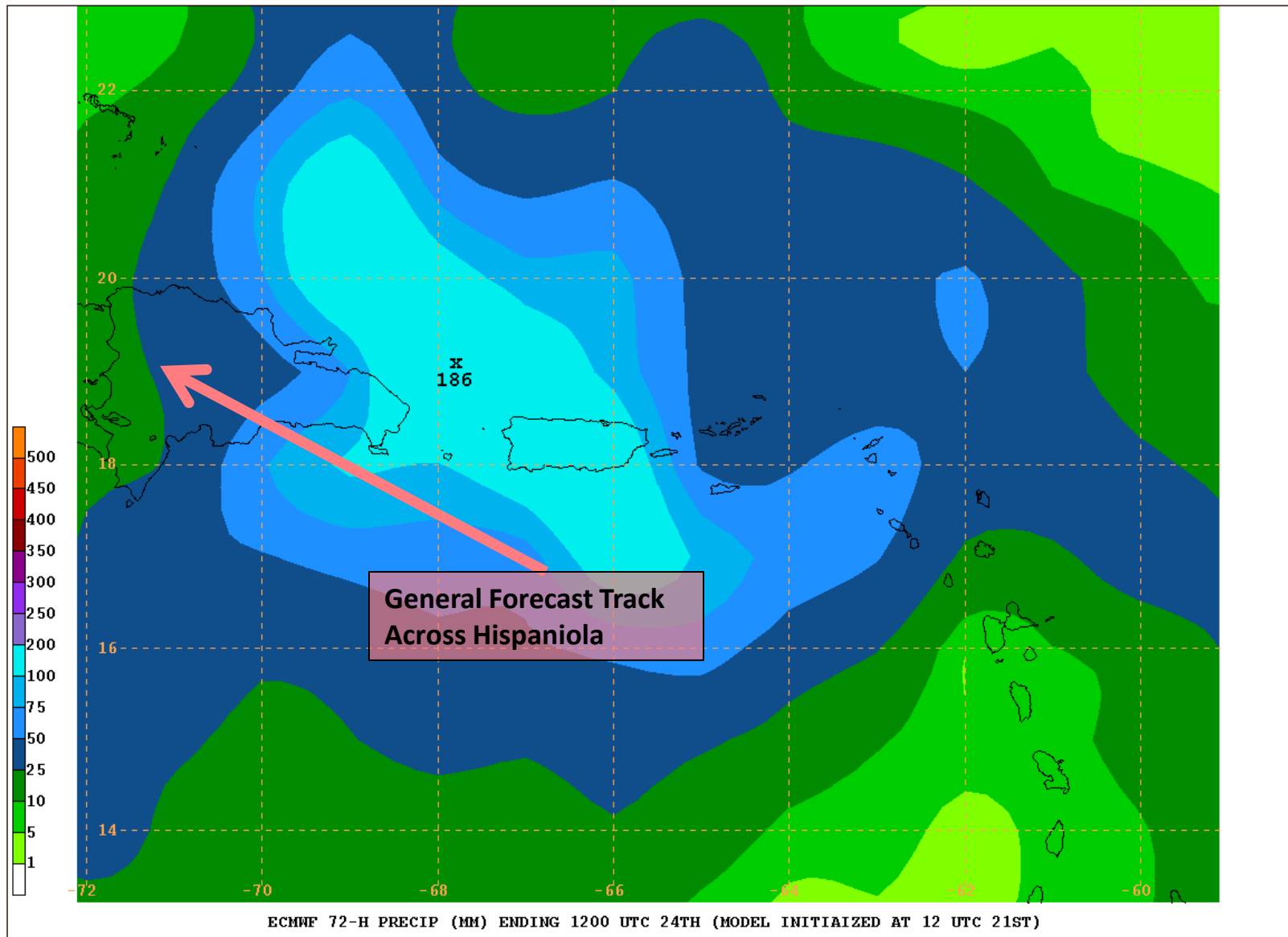


# ECMWF MSLP, 1000-500 Thickness, & 10-m Wind Forecast

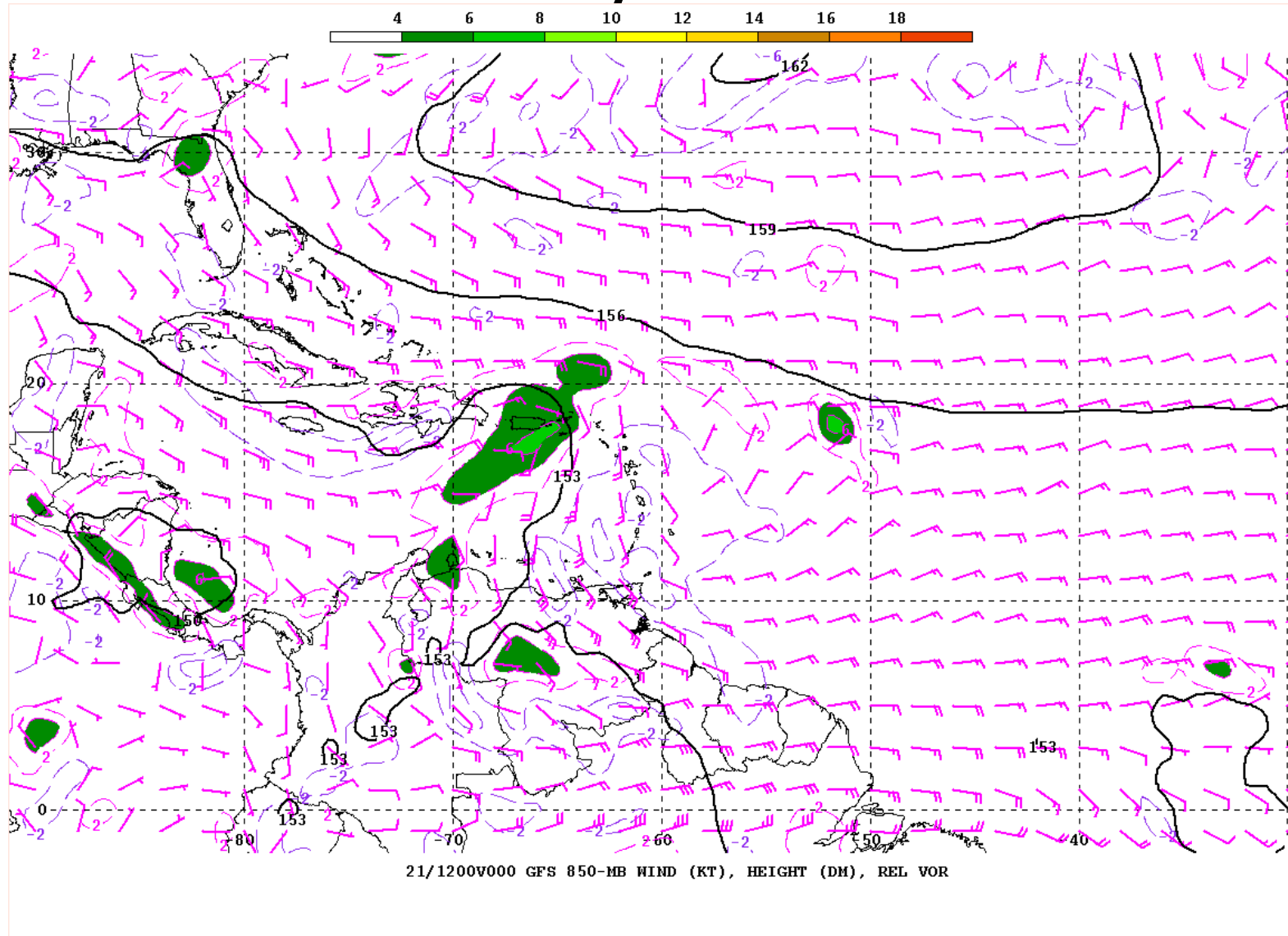


# ECMWF 72-h QPF ending 1200 UTC 24<sup>th</sup>

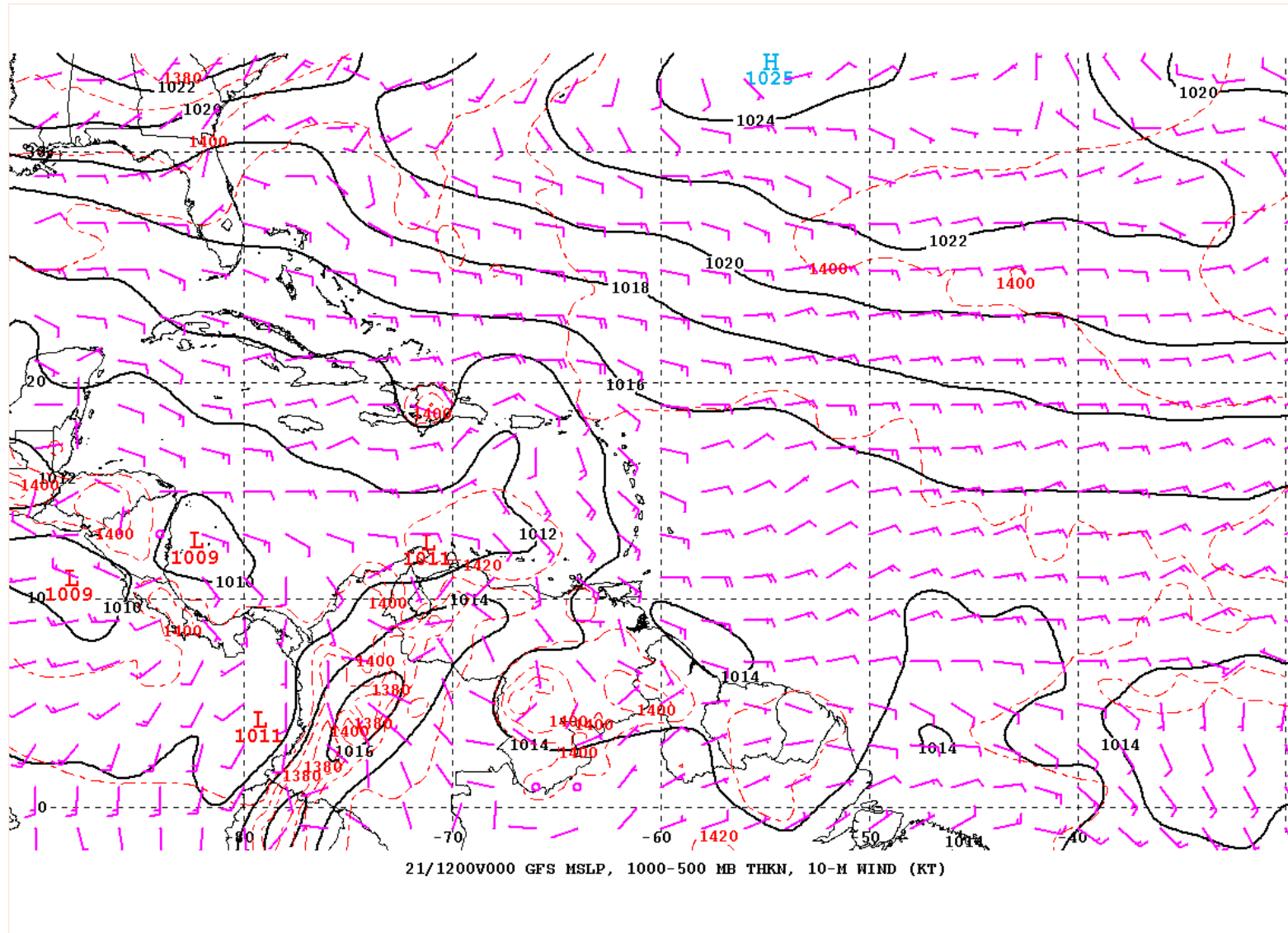
## Initialized 1200 UTC 21<sup>st</sup>



# GFS 850mb Height, Wind, Relative Vorticity Forecast

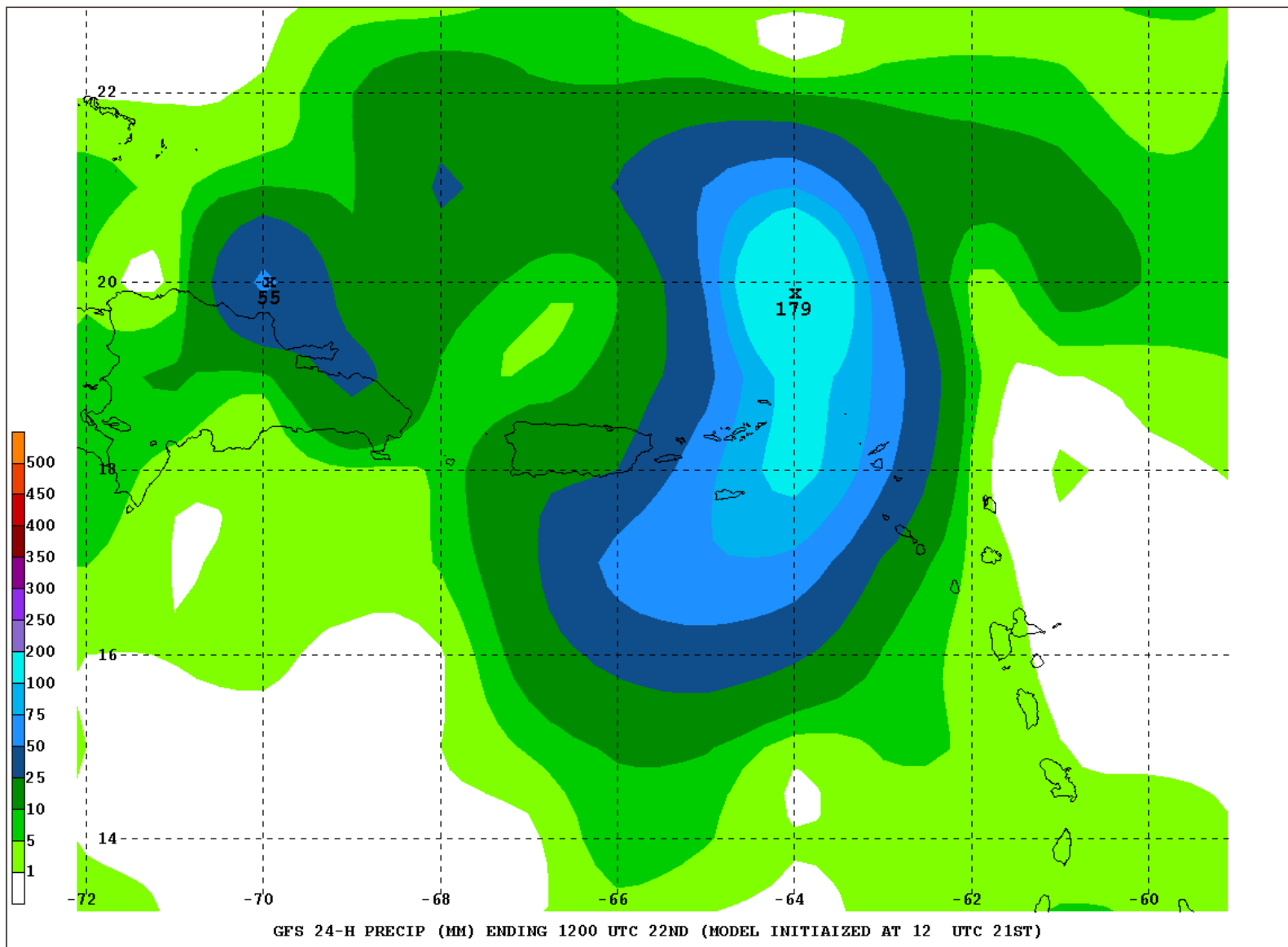


# GFS MSLP, 1000-500 Thickness, and 10-m Wind Forecast



# GFS 24-h QPF ending 1200 UTC 22<sup>nd</sup>

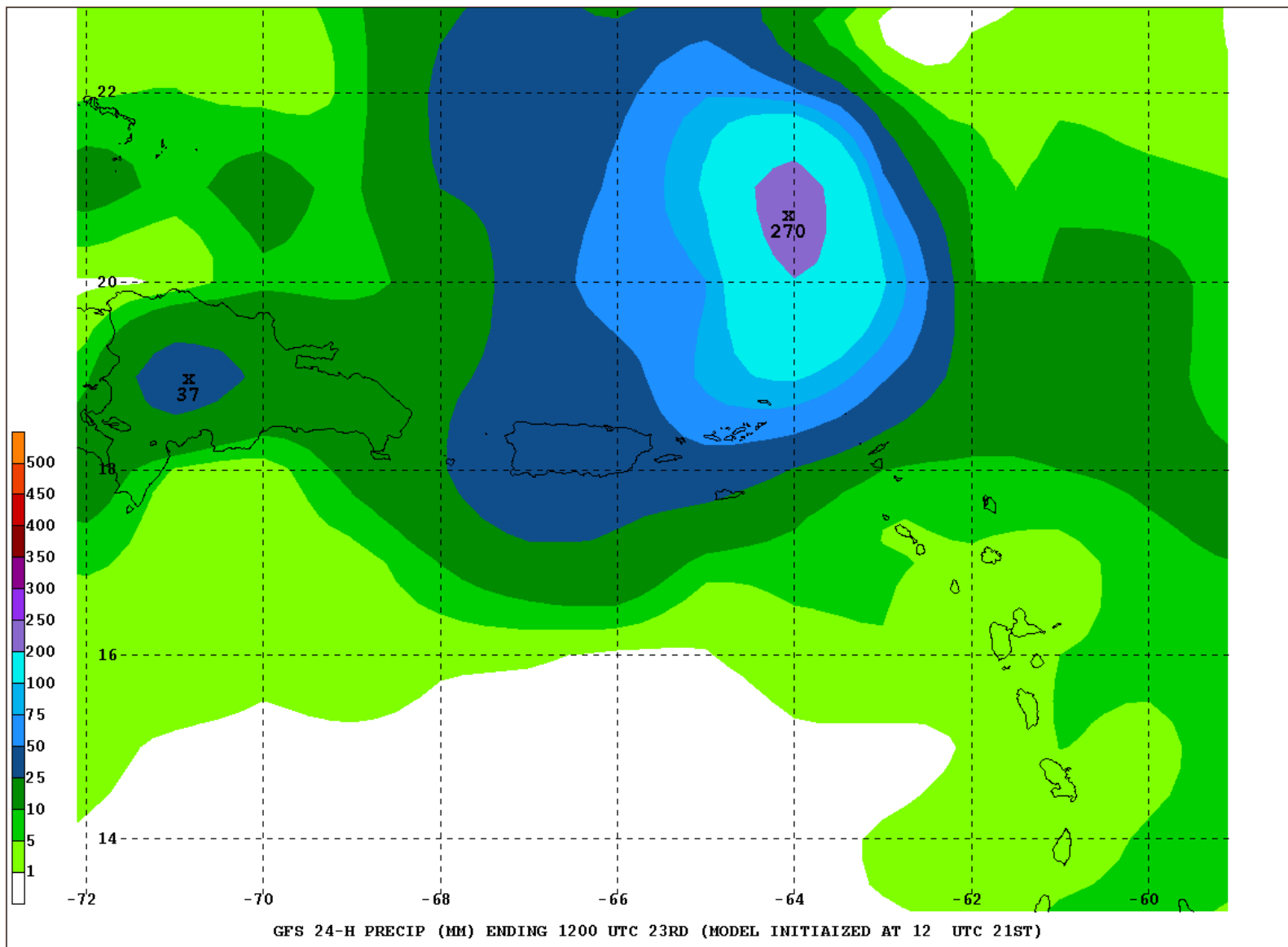
Initialized 1200 UTC 21<sup>st</sup>





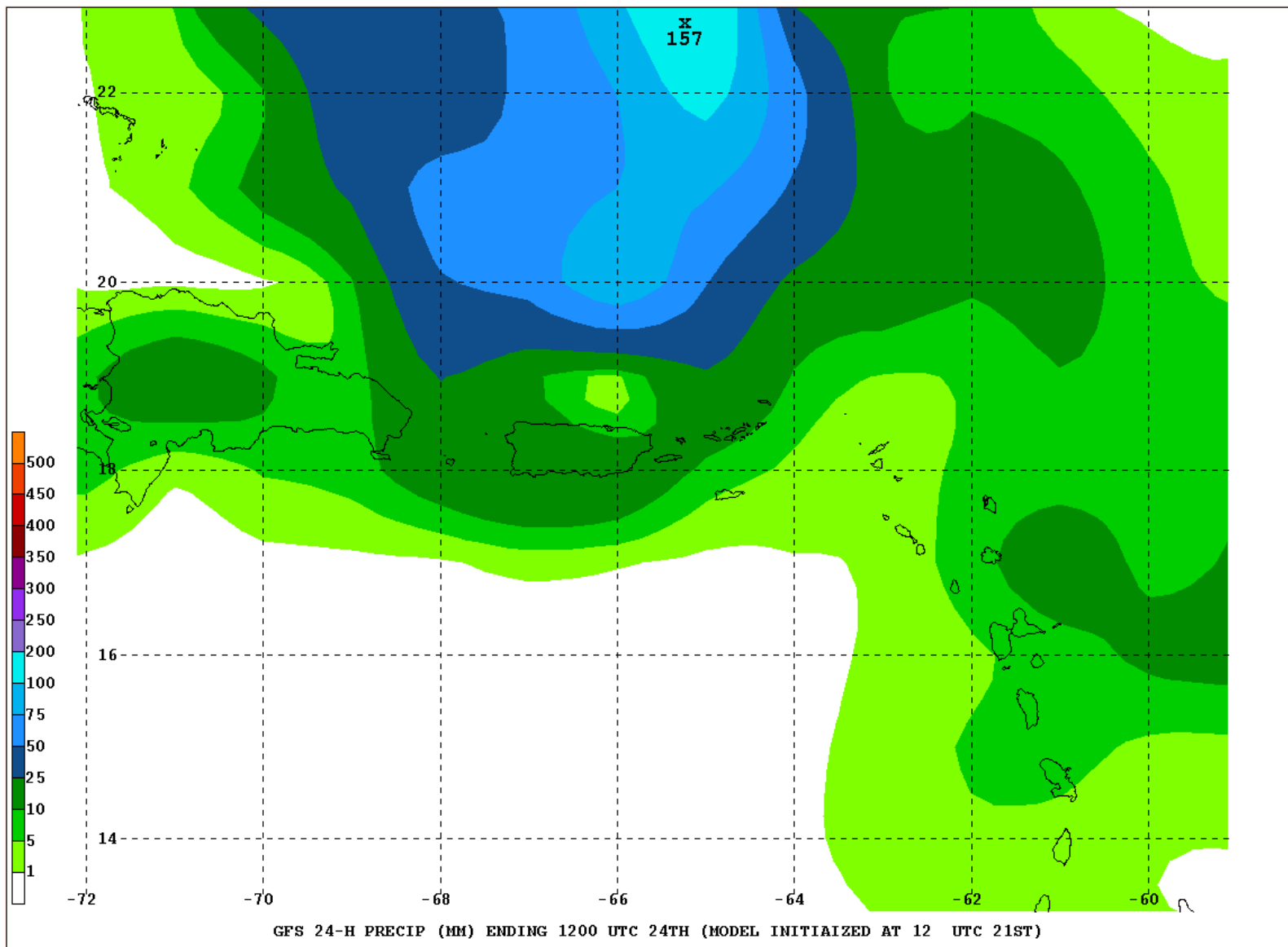
# GFS 24-h QPF ending 1200 UTC 23<sup>rd</sup>

Initialized 1200 UTC 21<sup>st</sup>



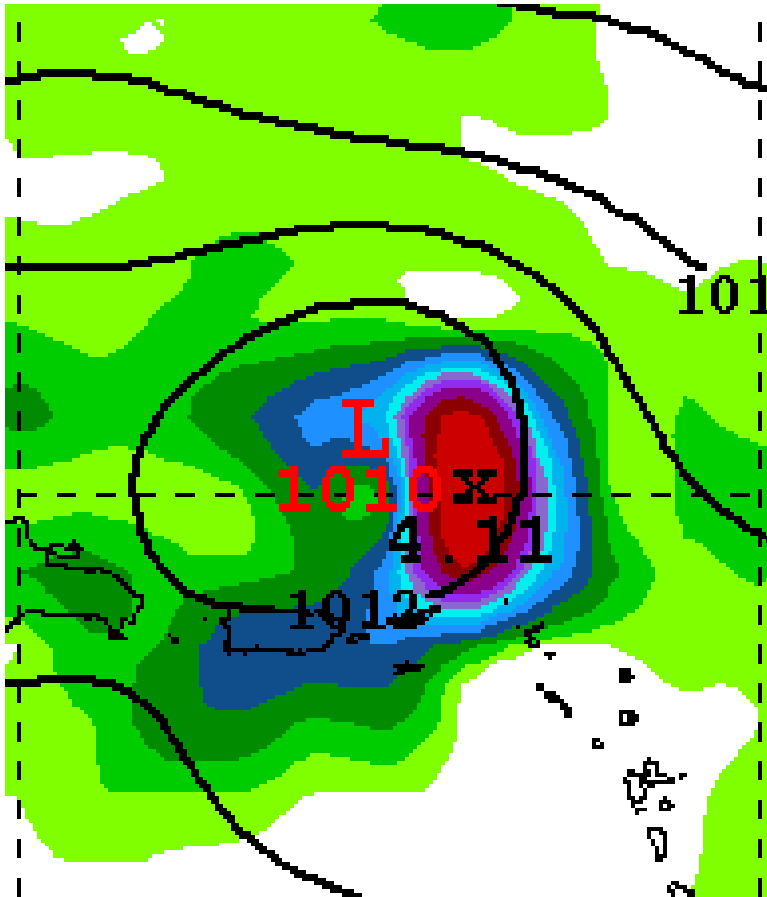
# GFS 24-h QPF ending 1200 UTC 24<sup>th</sup>

Initialized 1200 UTC 21<sup>st</sup>

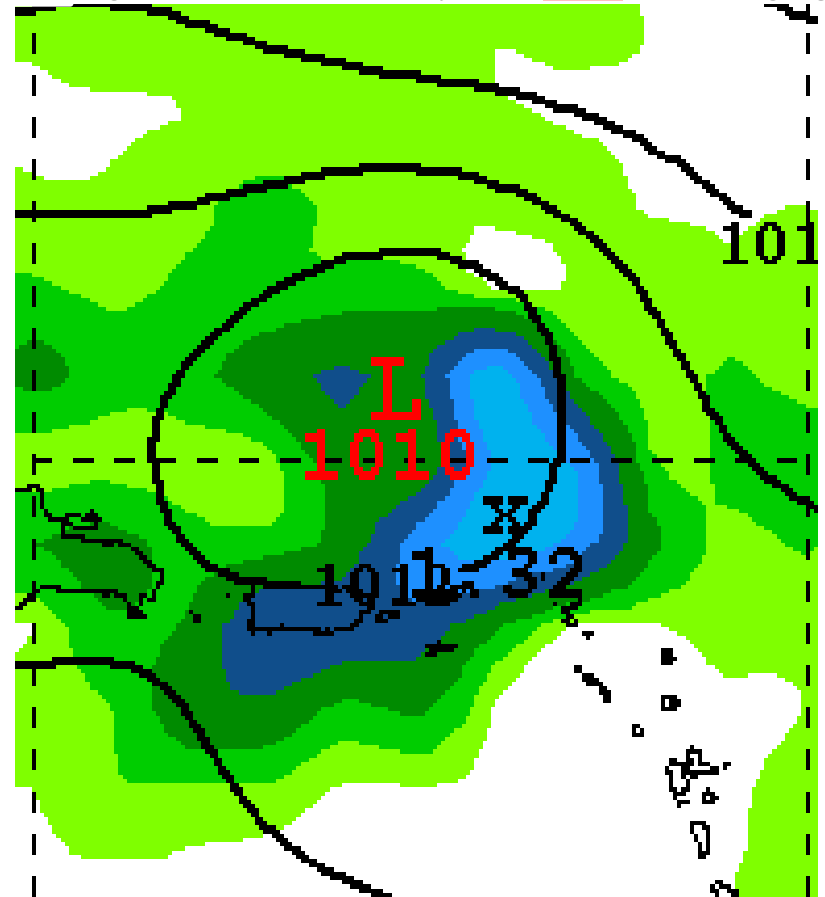


# Convective Feedback?

22/1800V030 GFS MSLP, 6-H PRECIP (IN)



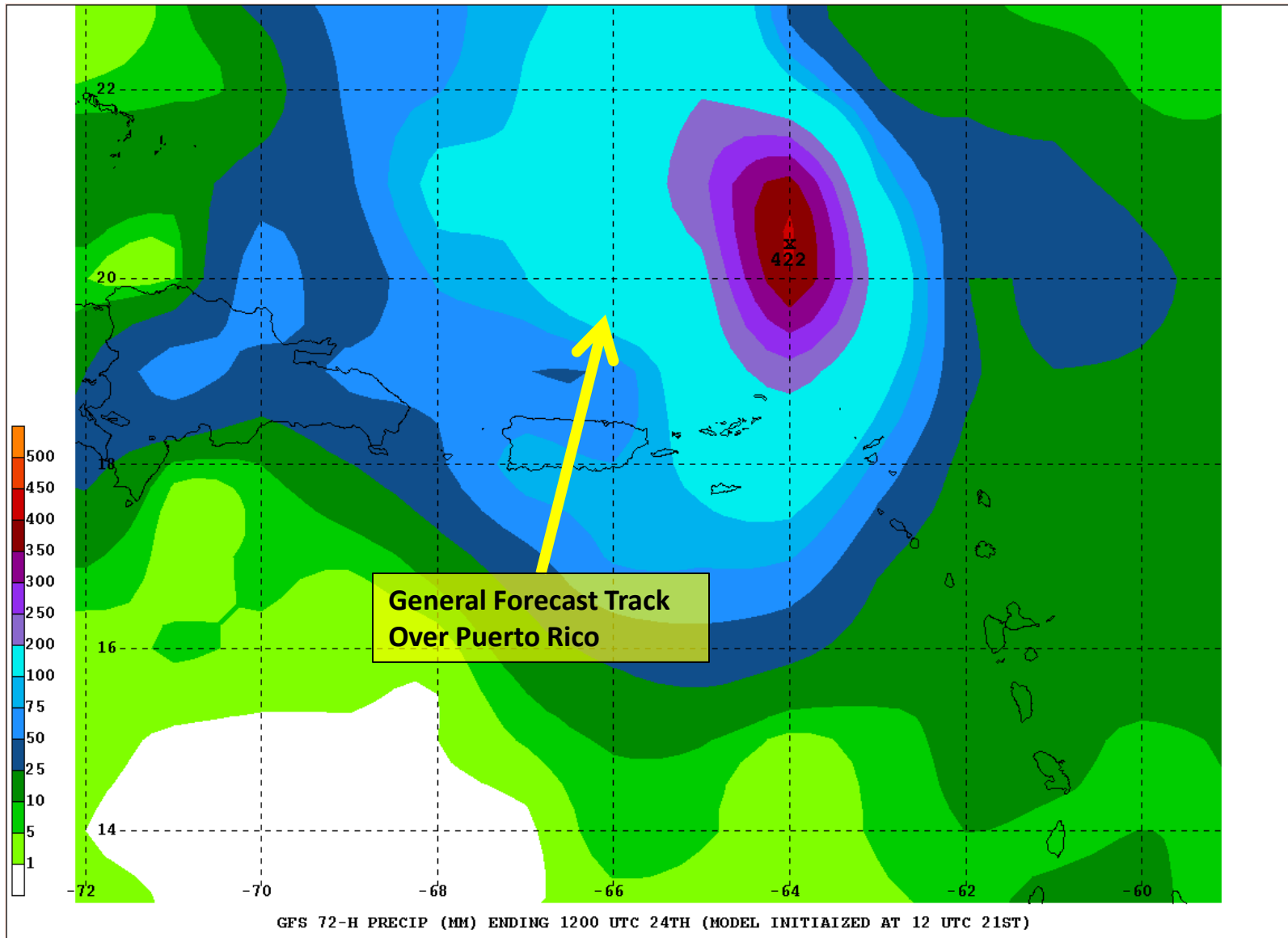
22/1800V030 GFS MSLP, 6-H CONV PRECIP (IN)



At FHR 30, the convective component (right) was less than 1/3 of the total precipitation (left). This means that most of the QPF was produced by the model on the grid scale and not by the convective scheme.

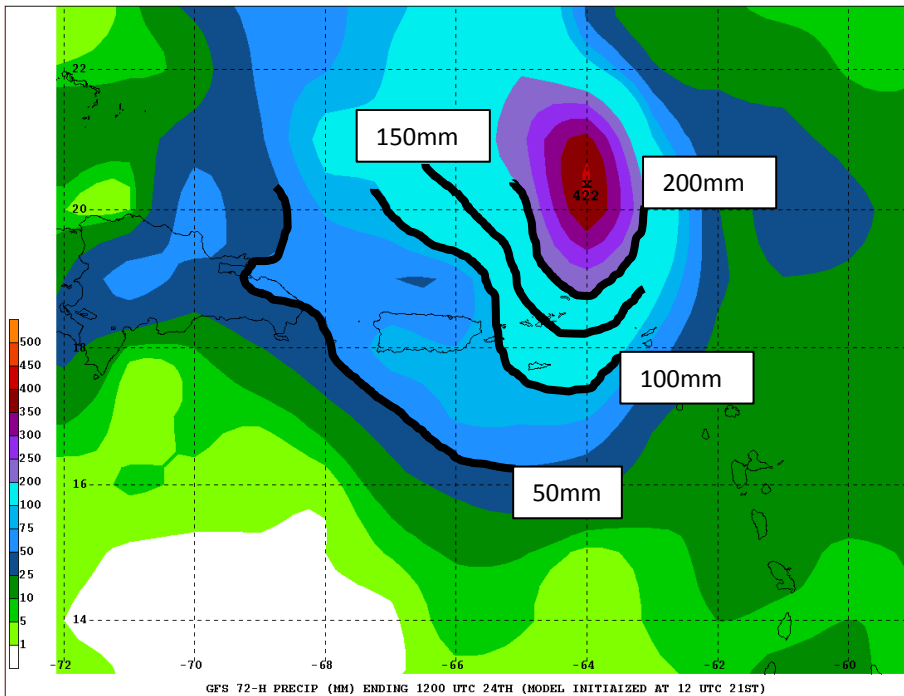
# GFS 72-h QPF ending 1200 UTC 24<sup>th</sup>

Initialized 1200 UTC 21<sup>st</sup>

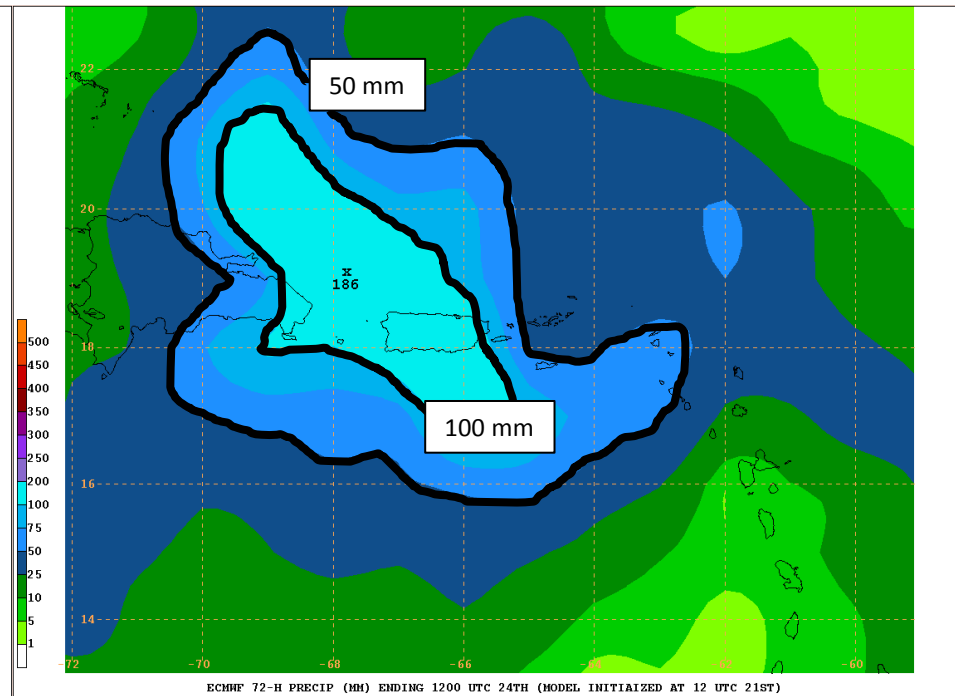


# 72-h QPFs ending 1200 UTC 24<sup>th</sup> Initialized 1200 UTC 21<sup>st</sup>

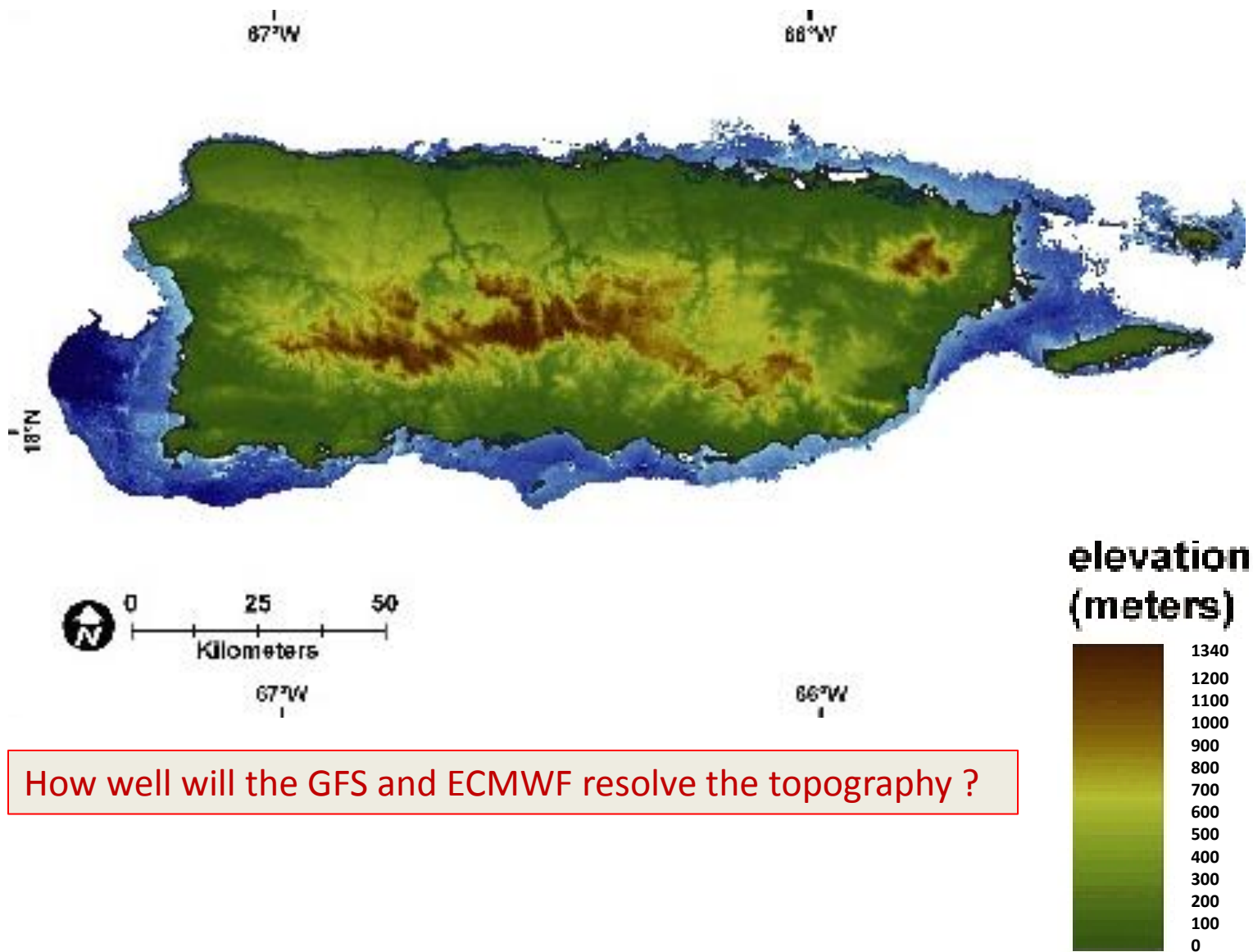
## GFS



## ECMWF



Black contours = 50 mm isohyets

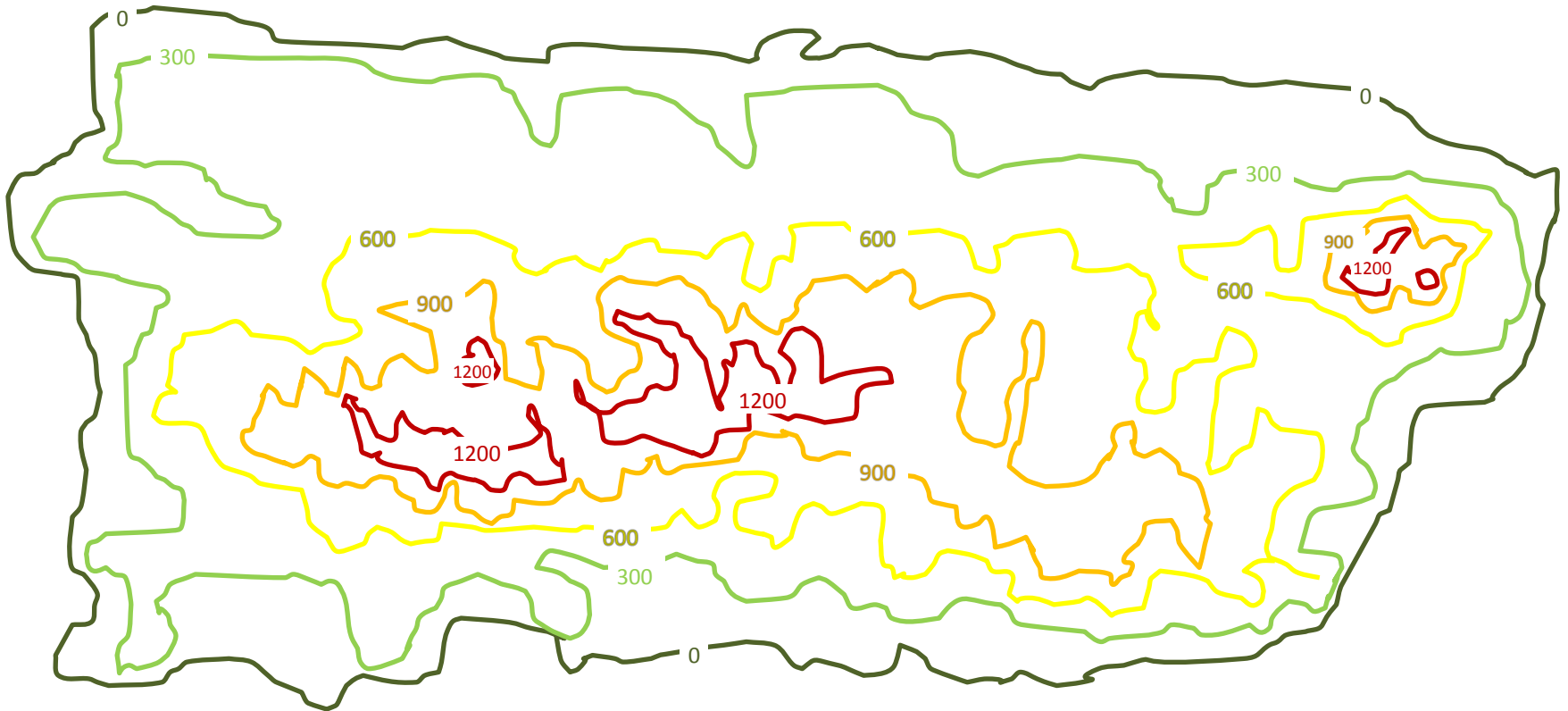


How well will the GFS and ECMWF resolve the topography ?



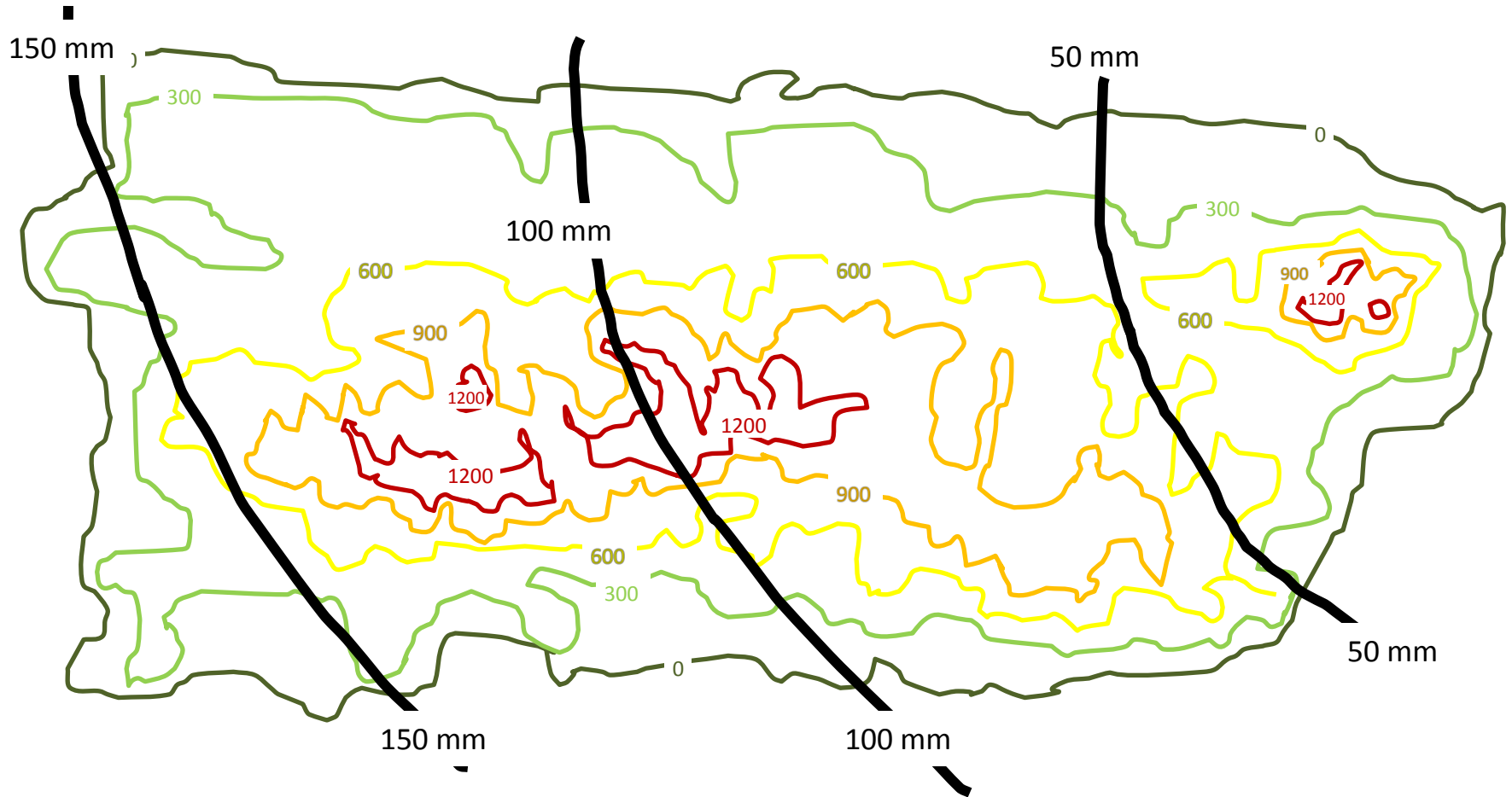
# Terrain Map of Puerto Rico

Draw your 50 mm isohyets on this topographic map



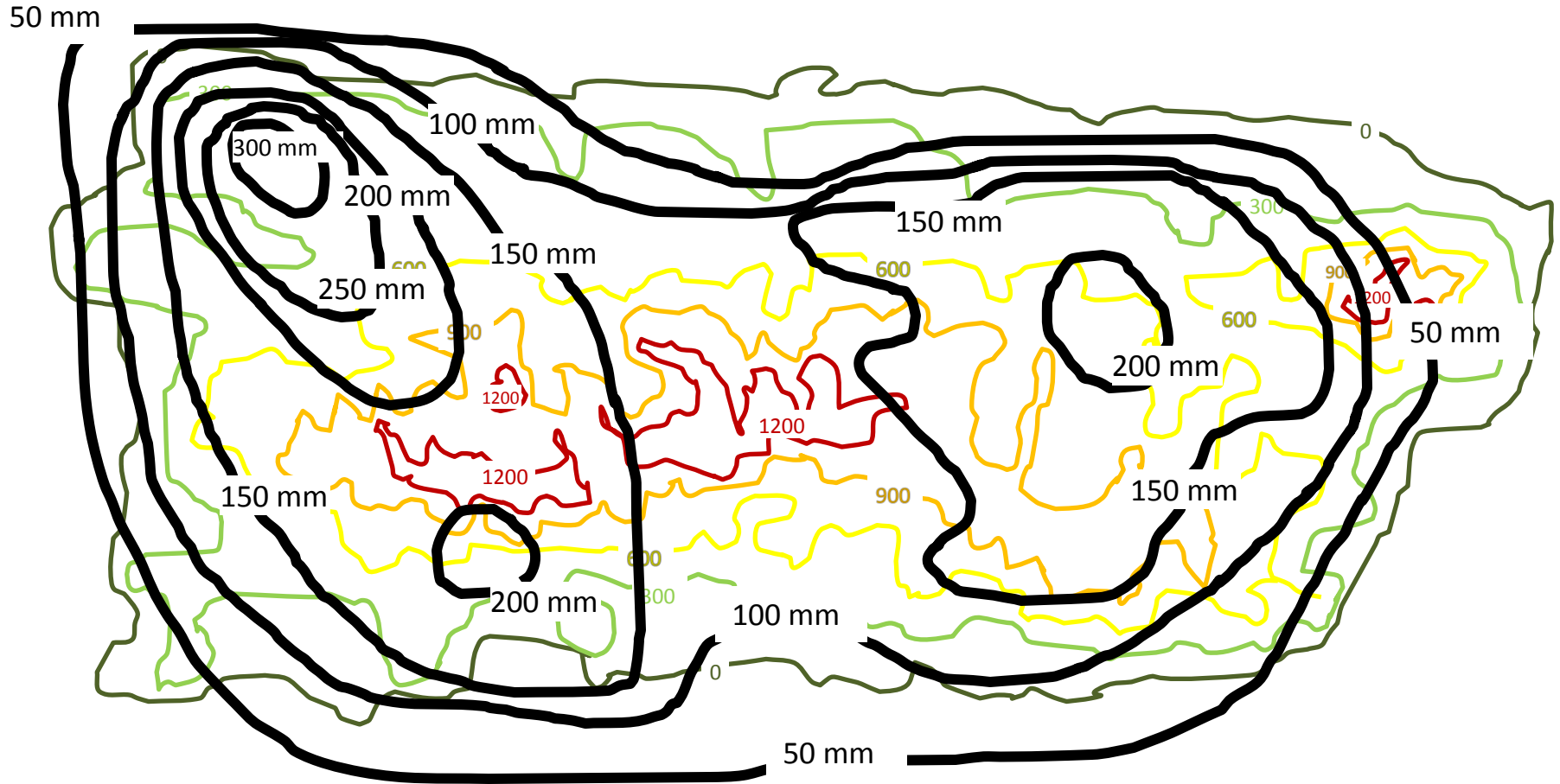
# Terrain Map of Puerto Rico

Draw your 50 mm isohyets on this topographic map



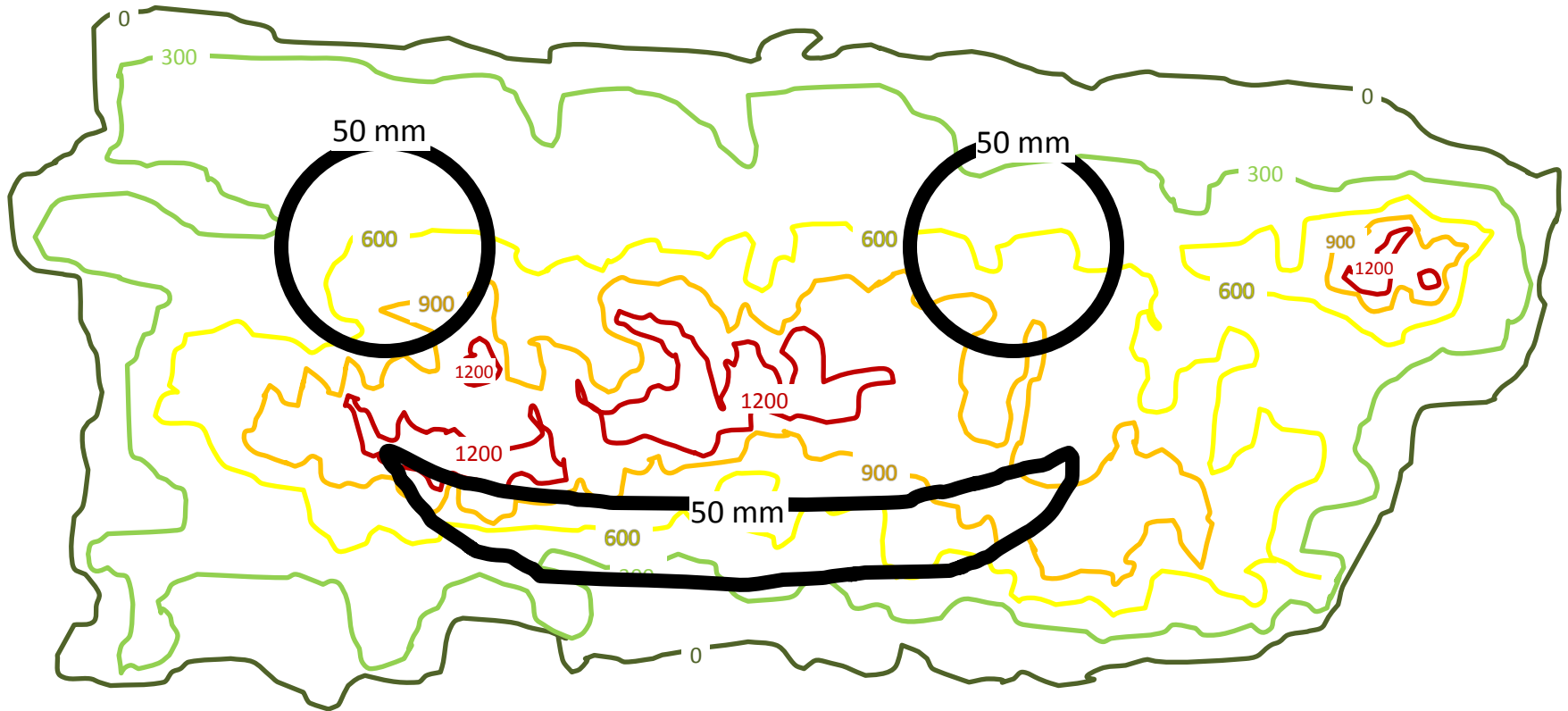
# Terrain Map of Puerto Rico

Draw your 50 mm isohyets on this topographic map



# Terrain Map of Puerto Rico

Draw your 50 mm isohyets on this topographic map



# Instructions

**Draw a 72-hour QPF for Puerto Rico ending 1200 UTC on the 24<sup>th</sup> with 50 mm isohyets**

- **Since there is no official NHC forecast, you will need to determine a forecast track for the system**
  - How will forecast track impact the distribution of precipitation?
- **How well are the models handling the current conditions?**
  - Do you think the ECMWF and GFS are too high or too low with their QPF amounts? How well do they incorporate orographic lift?
  - Are they placing the heaviest rainfall where you would expect it to fall relative to the forecast track?
- **What factors will help enhance precipitation?**
- **What factors will diminish precipitation?**

**Provide a forecast for the maximum rainfall amount expected during this 72-hour period and its location**