

GOES-9 Vis, IR &
Water Vapor.
9/25/97
2100 GMT



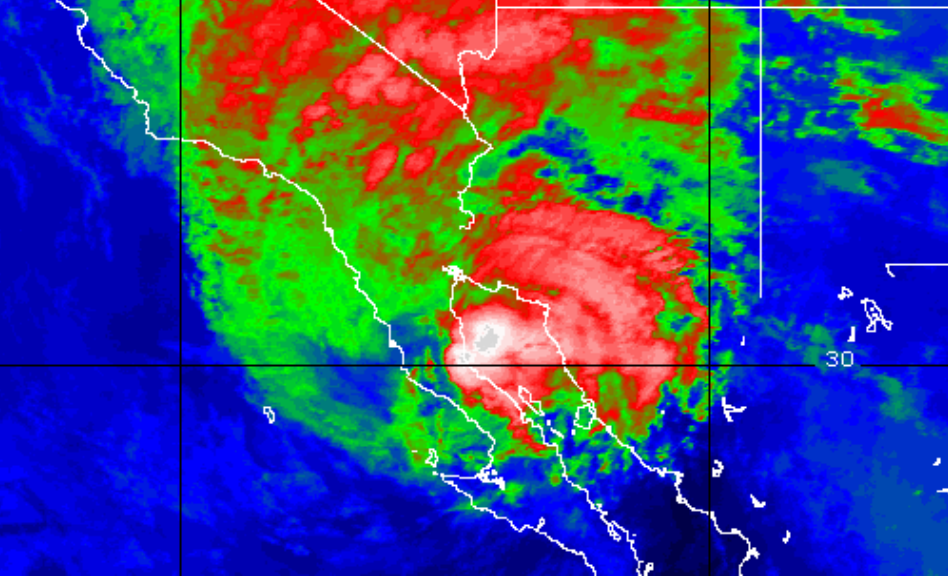
NOAA/NESDIS

Hurricane
Nora, etc.

Recurving Eastern North Pacific Tropical Cyclones

Kristen L. Corbosiero (NCAR)

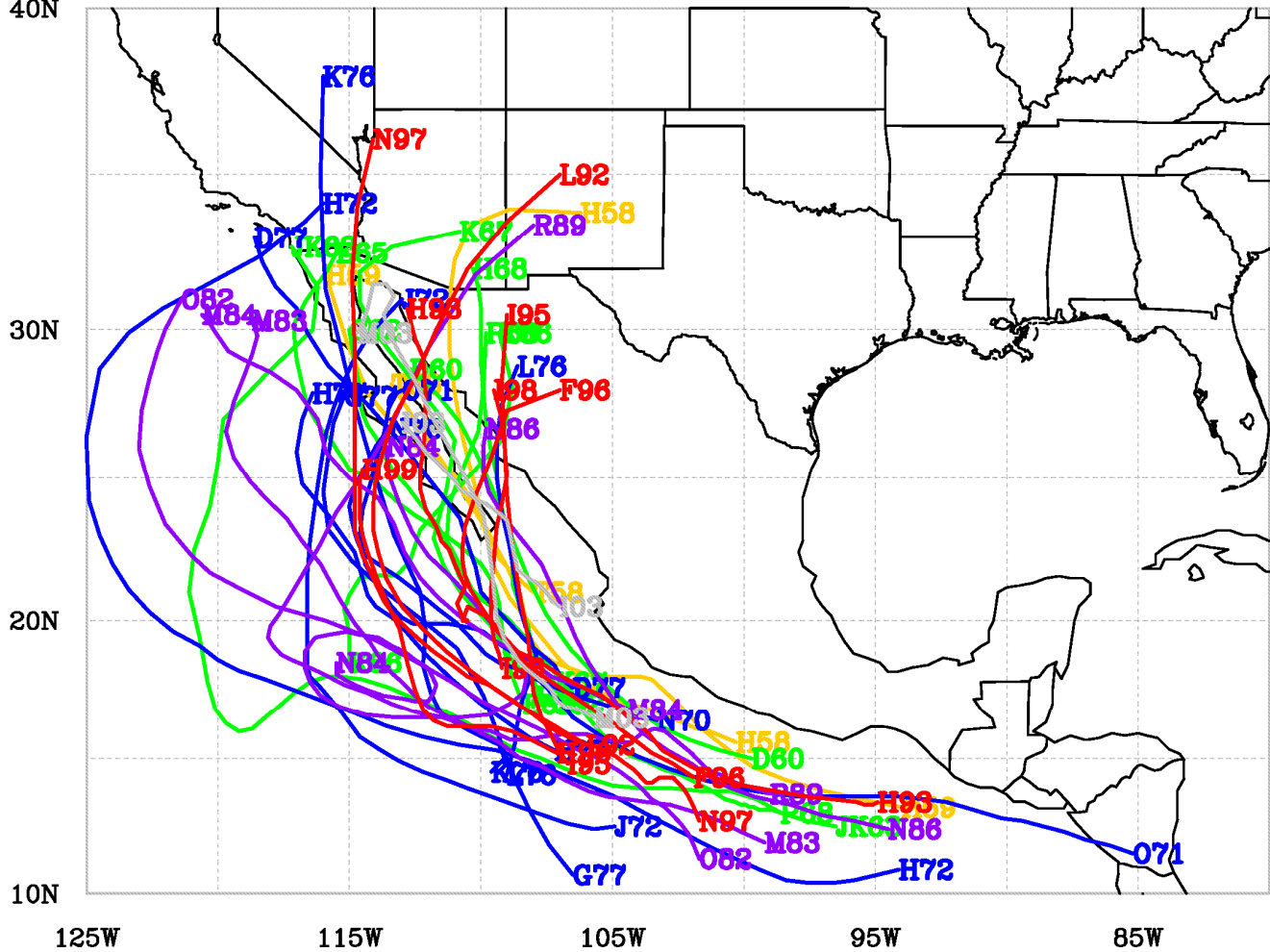
Michael Dickinson (AEF) and Lance Bosart (SUNY Albany)



Motivation:

- **The eastern North Pacific is the most active basin for TC genesis**
- **On average, 2-3 east Pacific TCs threaten the southwest US each year**
- **In 3 out of 4 years, an east Pacific TC brings significant rainfall to the southwest US and has significant effects on the downstream mid-latitude flow pattern**

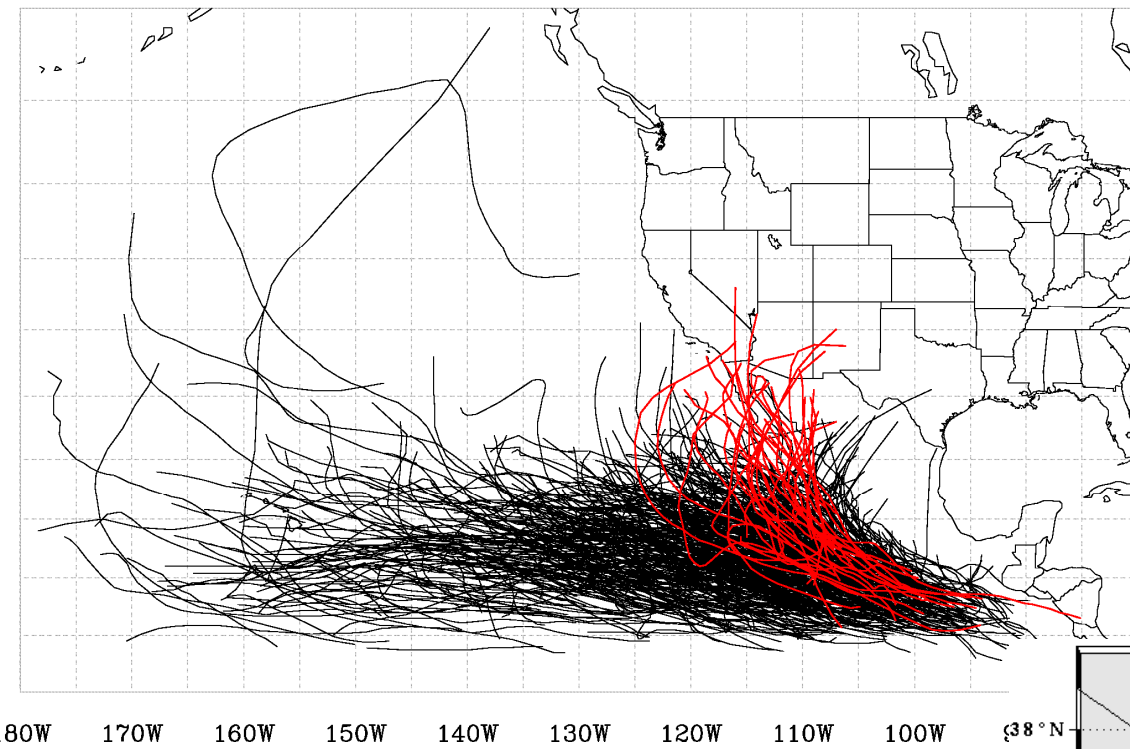
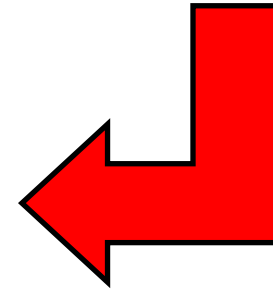
**NHC/TPC
Best Tracks
35 TCs
that affected
the SW US
1958-2003**



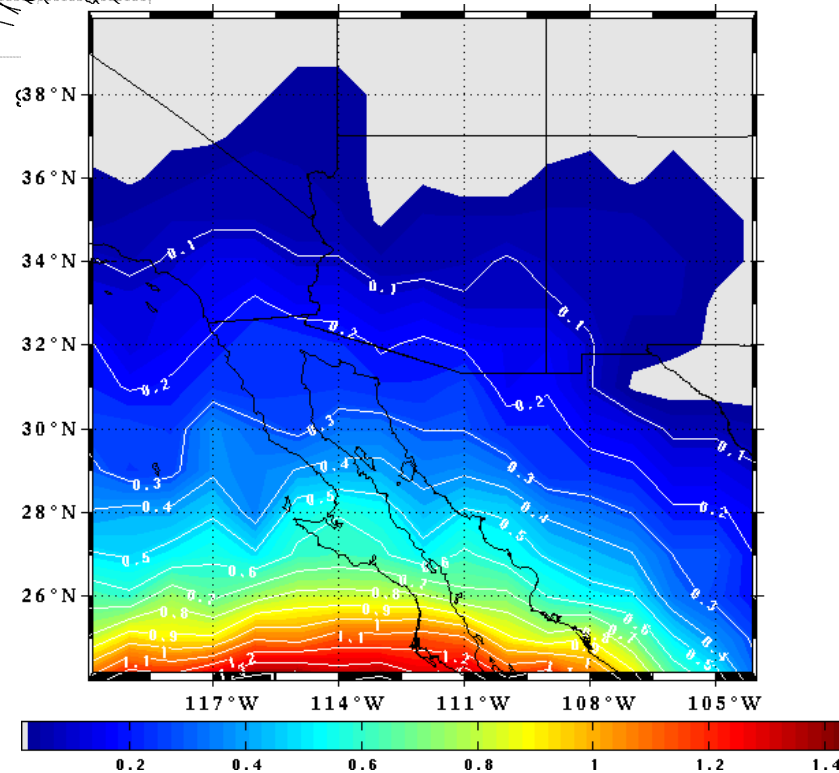
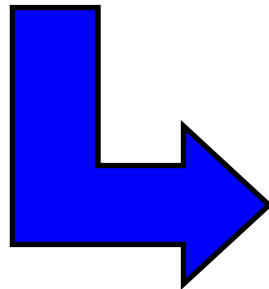
TS10 H11 H10

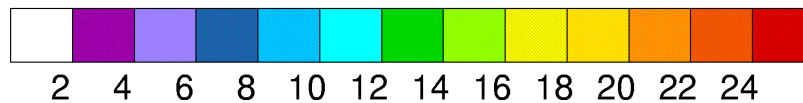
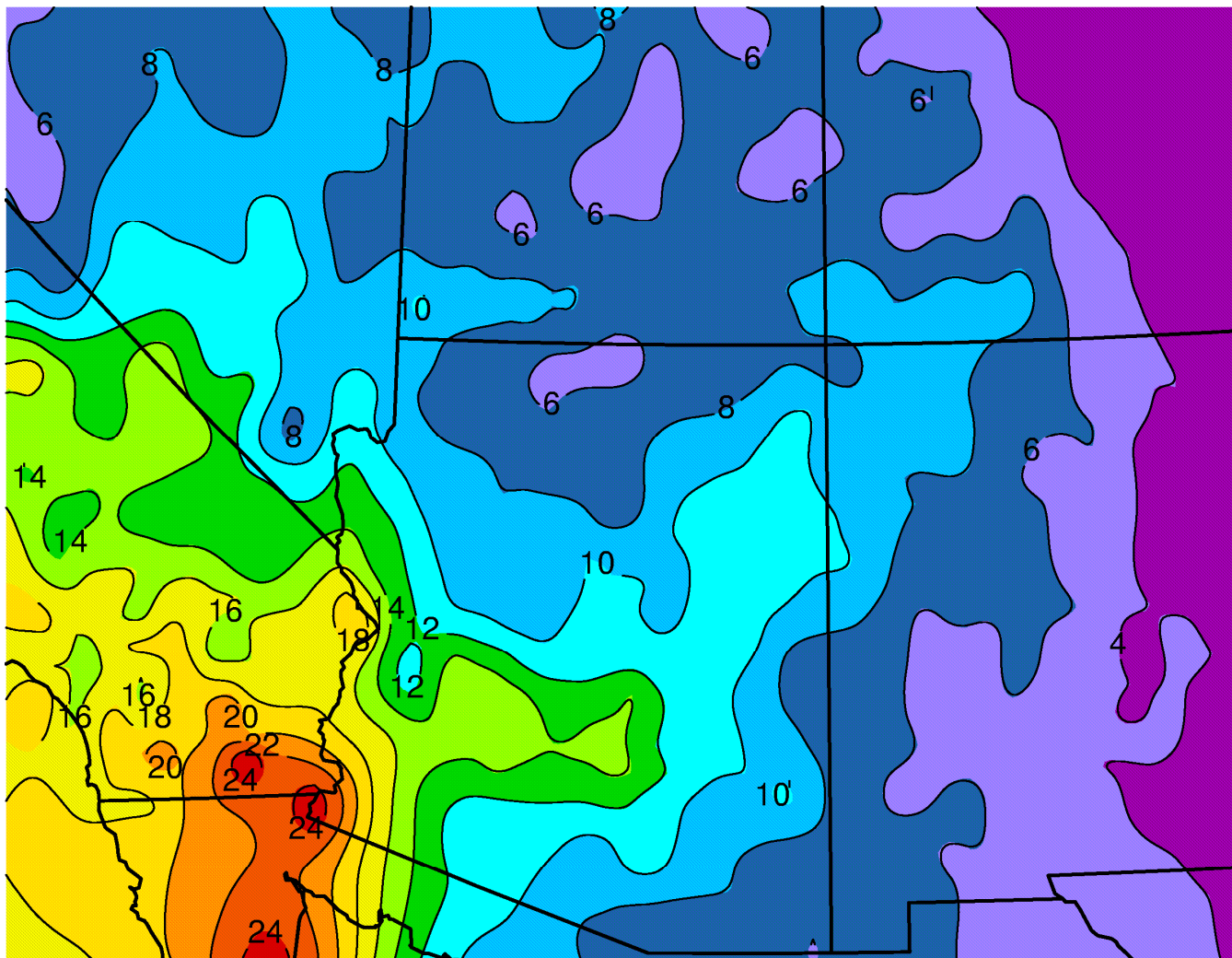
- Diana Claudia Jen-Kath Emily Kirsten Katrina Hyacinth Pauline**
- Norma Olivia Hyacinth Joanne Kathleen Liza Doreen Glenda Heather**
- Olivia Manuel Marie Norbert Newton Raymond**
- Lester Hilary Ismael Fausto Nora Isis Hilary**
- Ignacio Marty**

NHC/TPC Best Tracks All east Pacific TCs 1958-2003



Return rate of a TC of any intensity to the southwest US 1958-2003



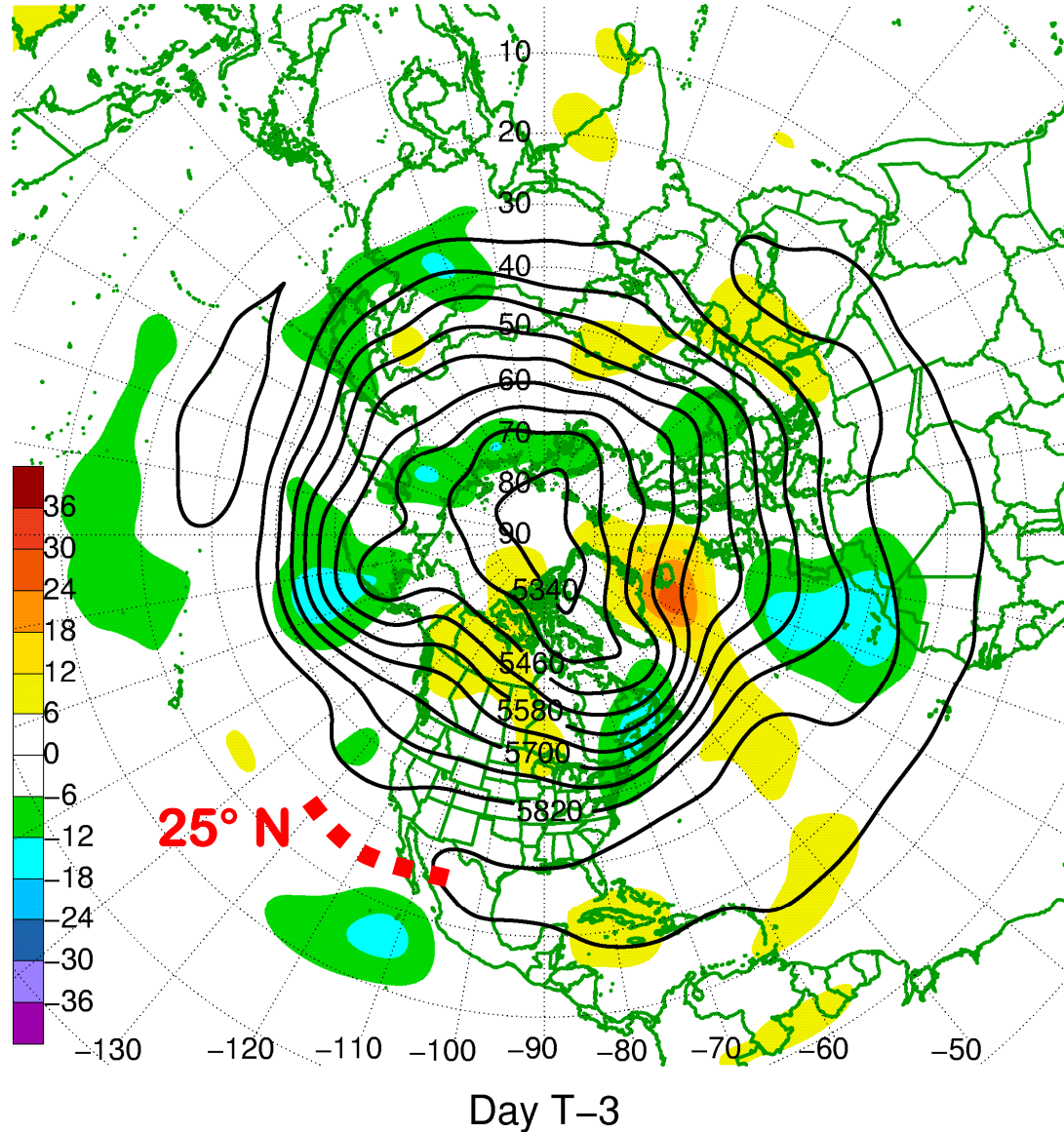


Average percentage of the warm season precipitation associated with east Pacific TCs

NCEP/NCAR Reanalysis

Mean and standardized anomaly

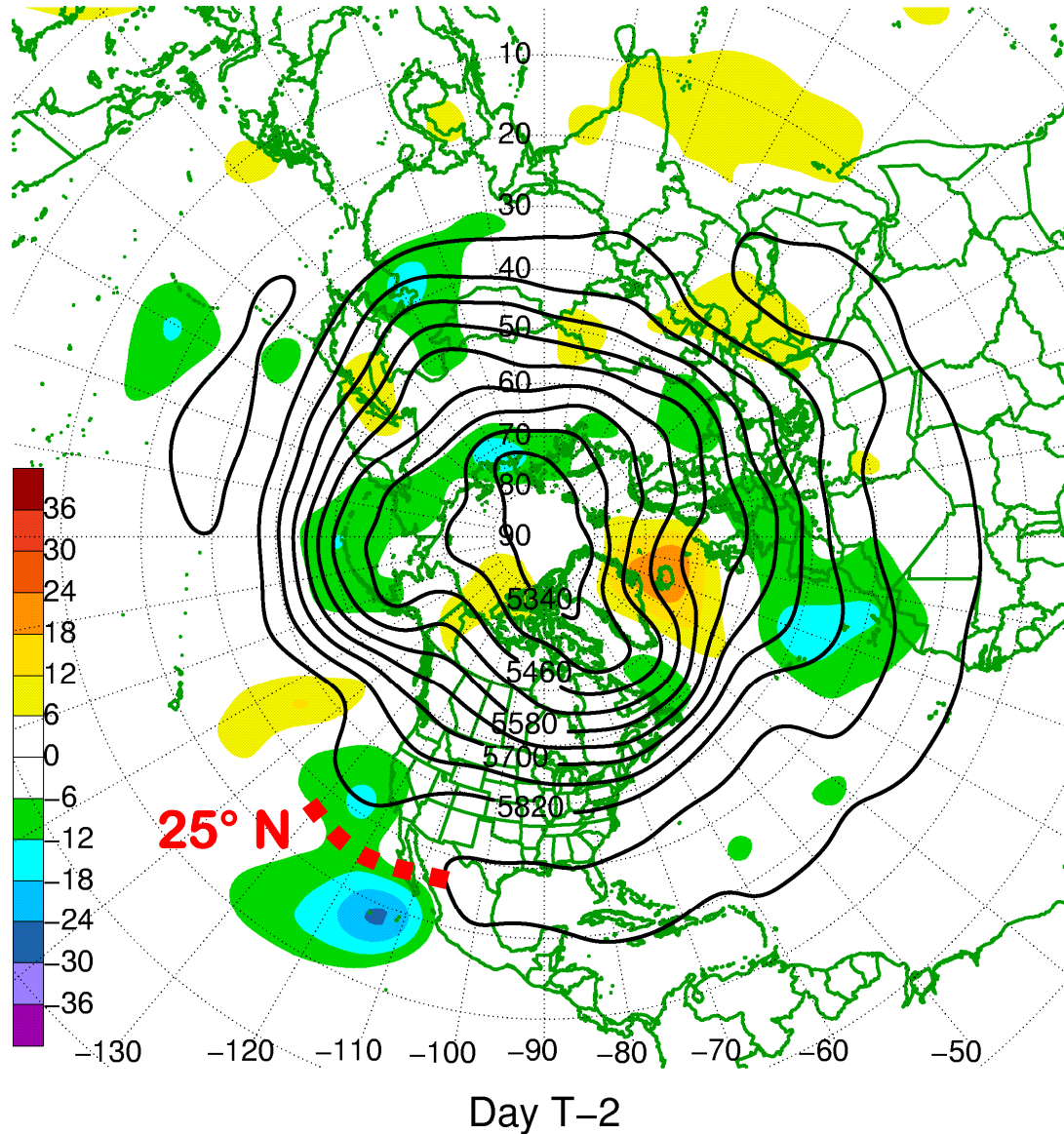
500 hPa heights (dam)



NCEP/NCAR Reanalysis

Mean and standardized anomaly

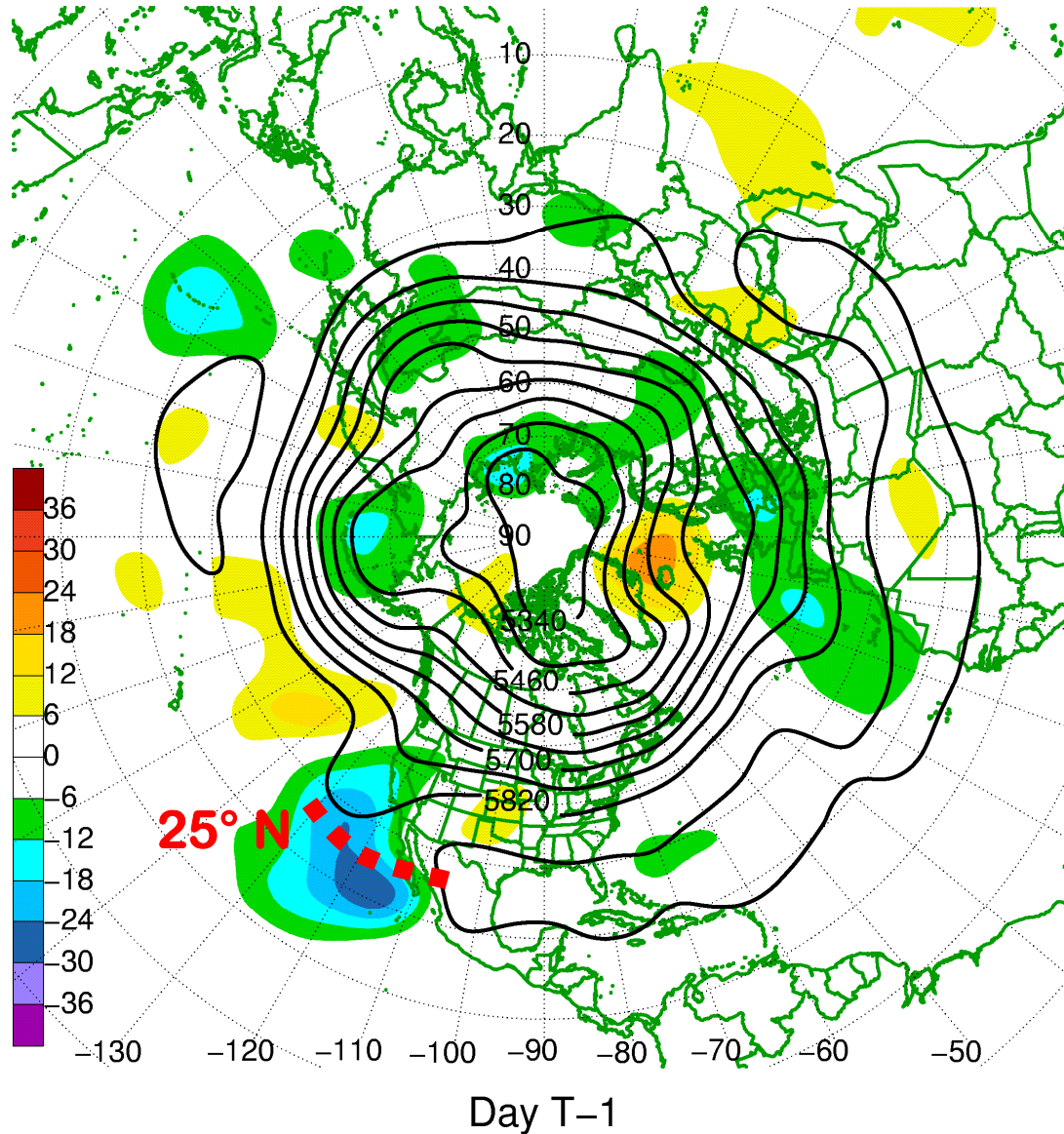
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NCEP/NCAR Reanalysis

Mean and standardized anomaly

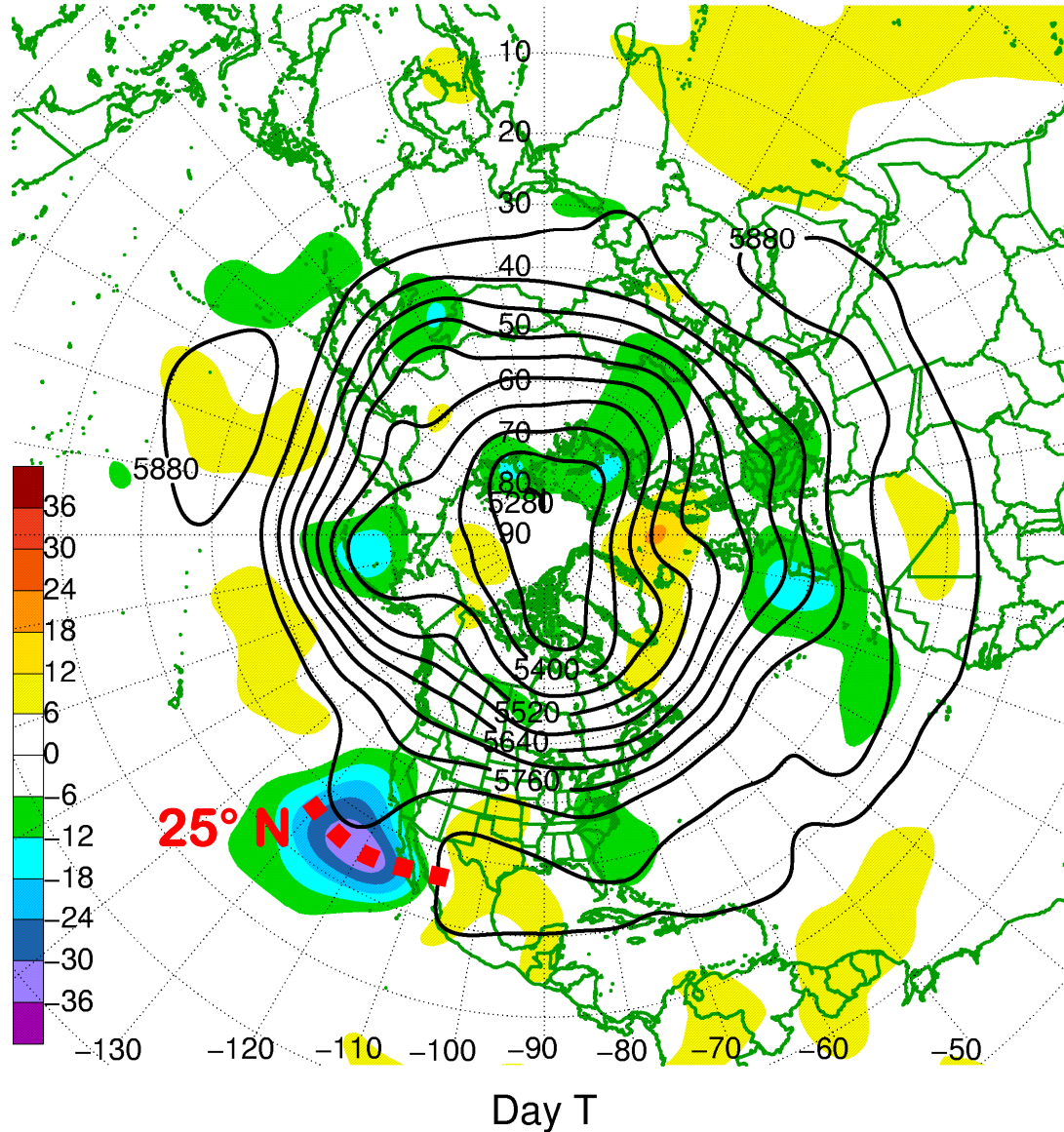
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NCEP/NCAR Reanalysis

Mean and standardized anomaly

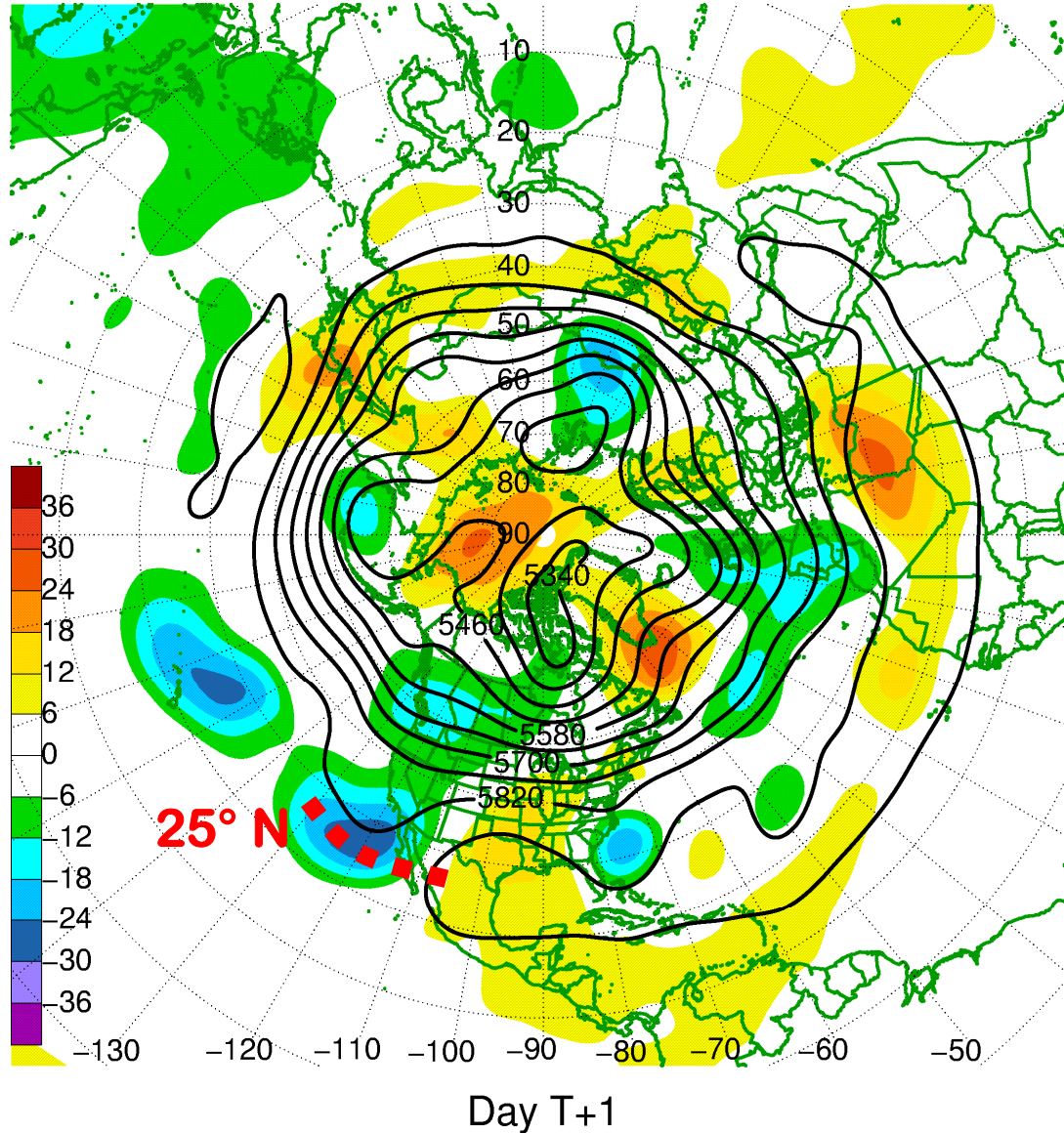
500 hPa heights (dam)

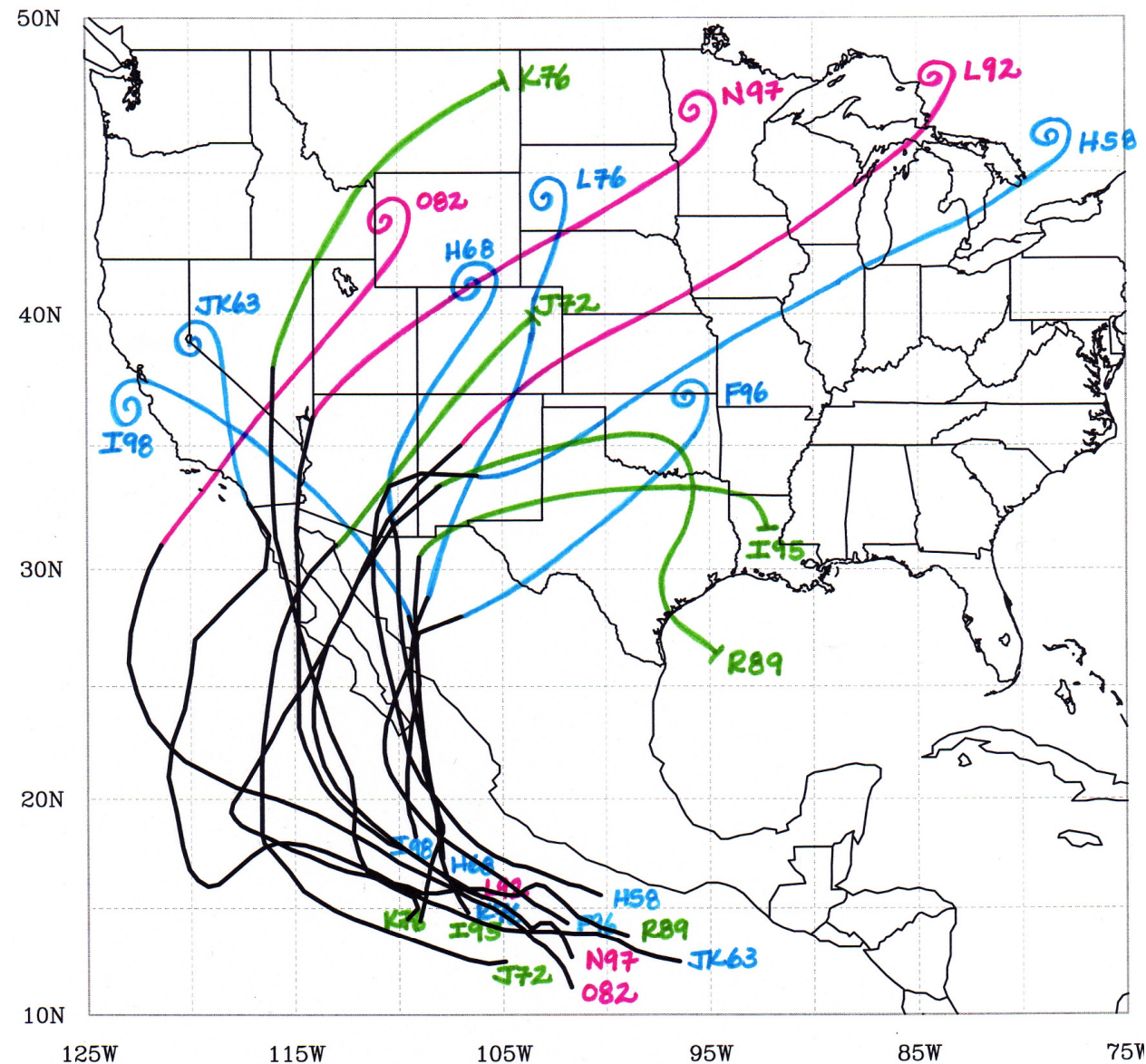


NCEP/NCAR Reanalysis

Mean and standardized anomaly

500 hPa heights (dam)

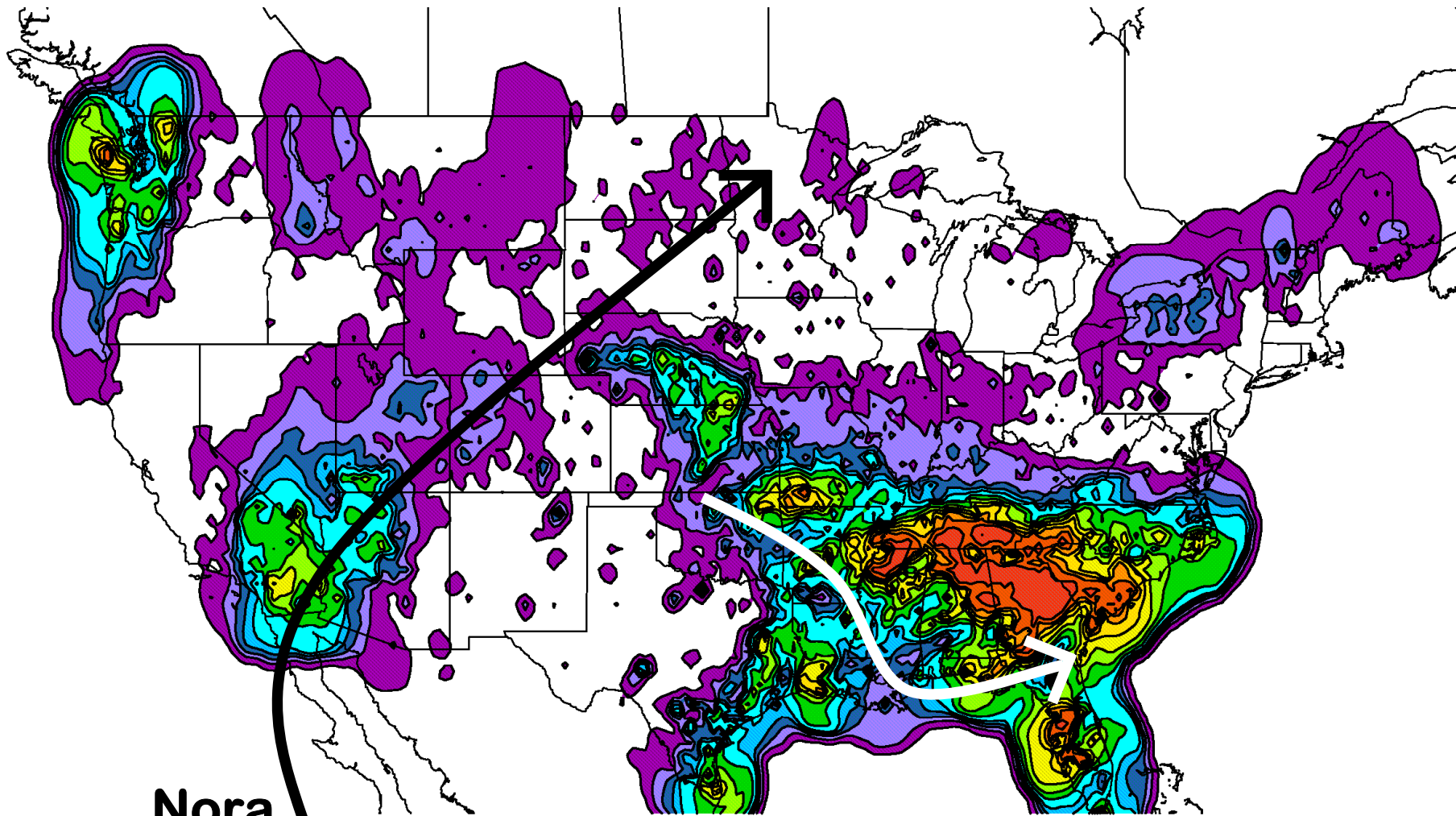




**NHC Best Tracks
(black)**

**ERA40 700 hPa
vorticity tracks
(colors)**

**14 long lived east
Pacific TCs**



Nora

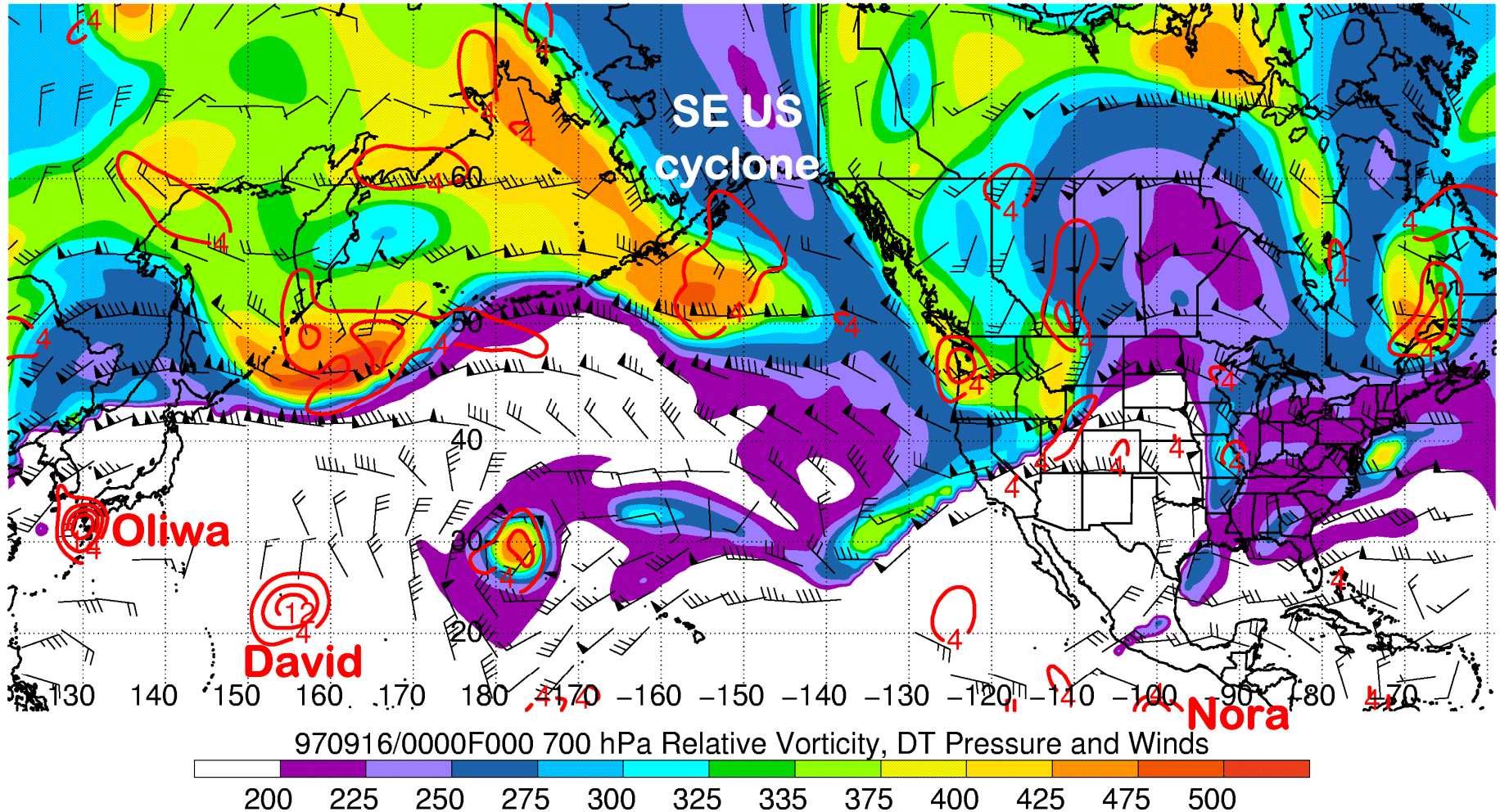
Hurricane Nora Total Precipitation (mm) 24–27 September 1997



1 5 10 15 20 30 40 50 60 70 80 100

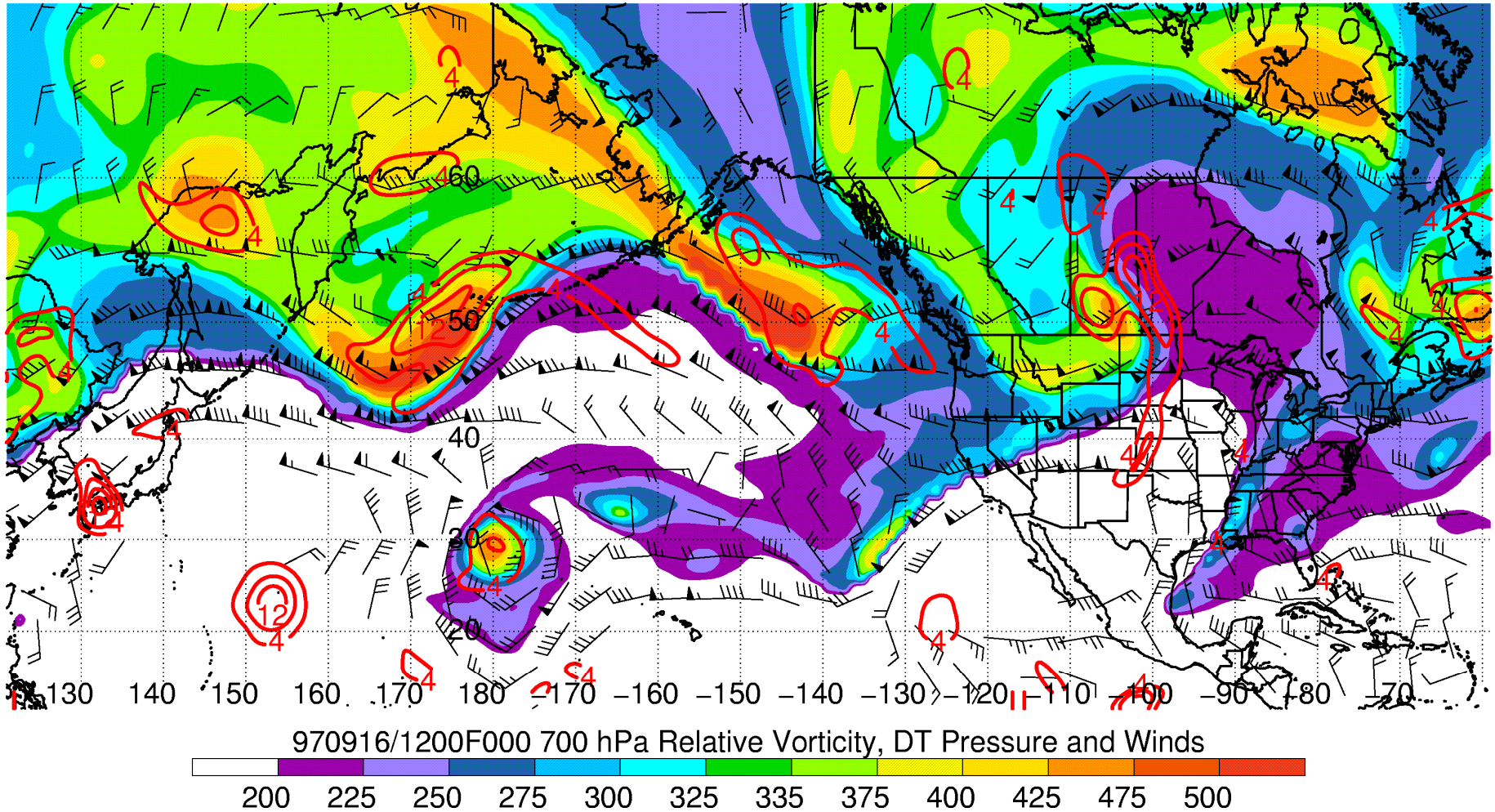
ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity



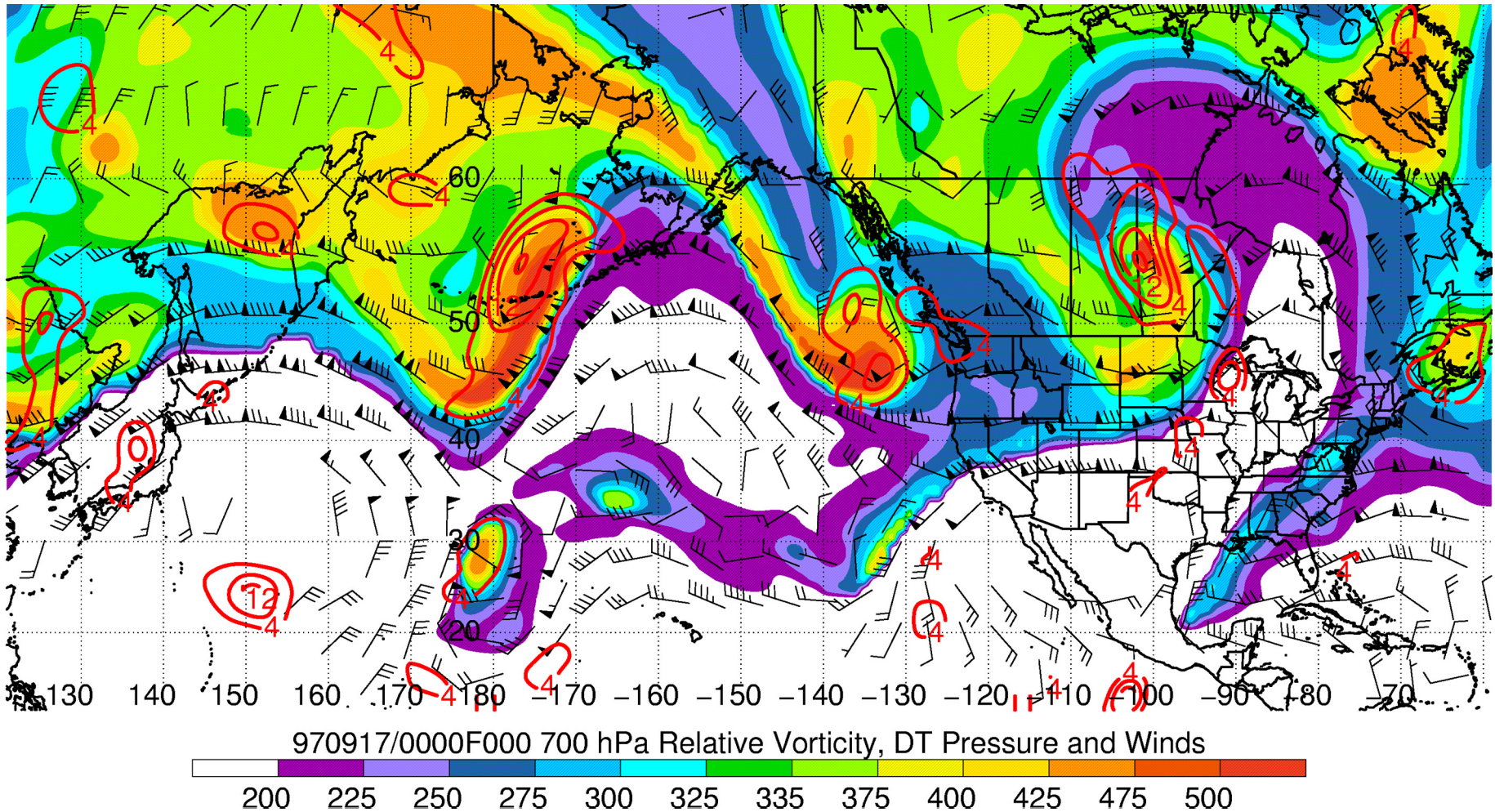
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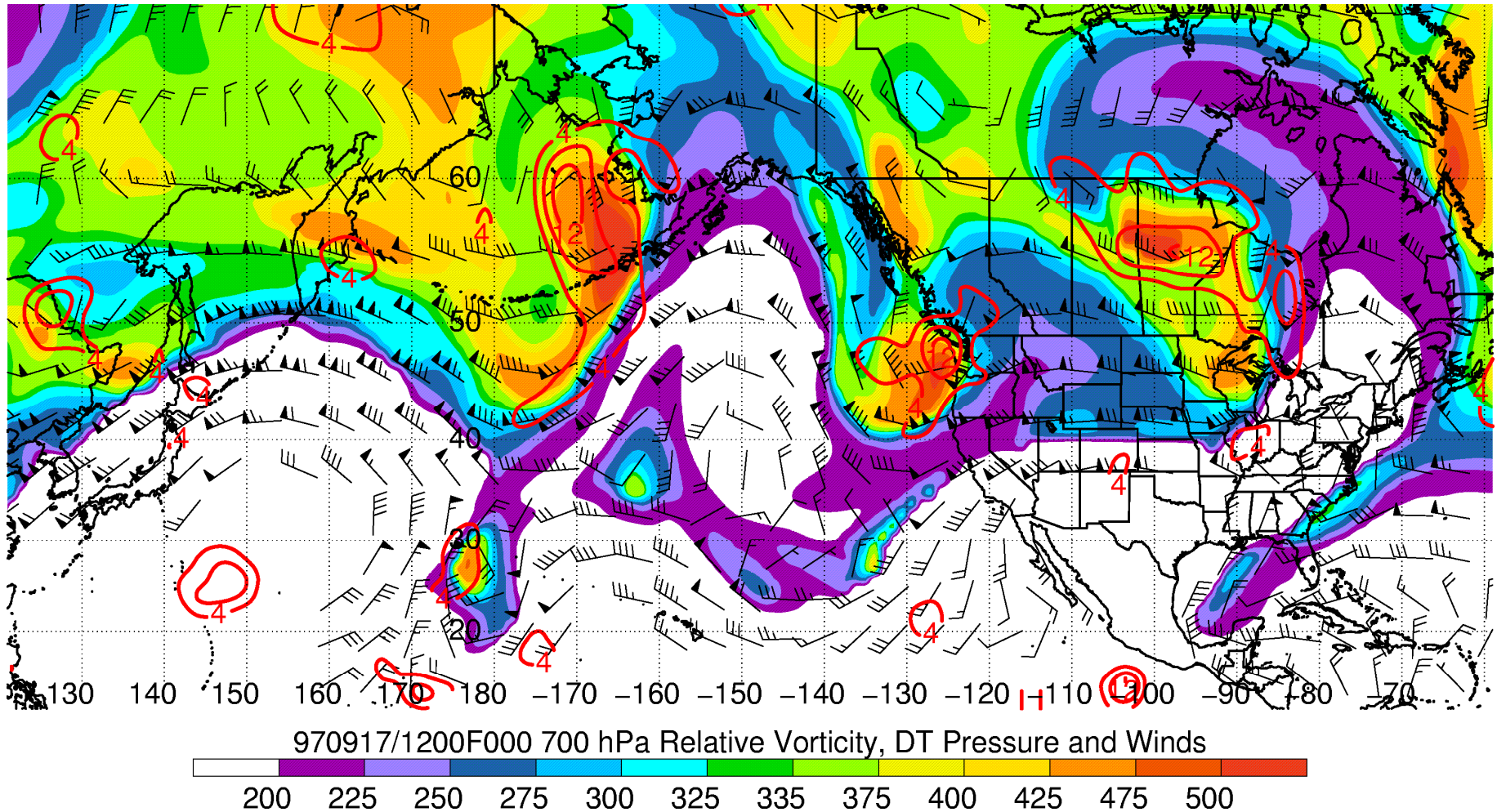
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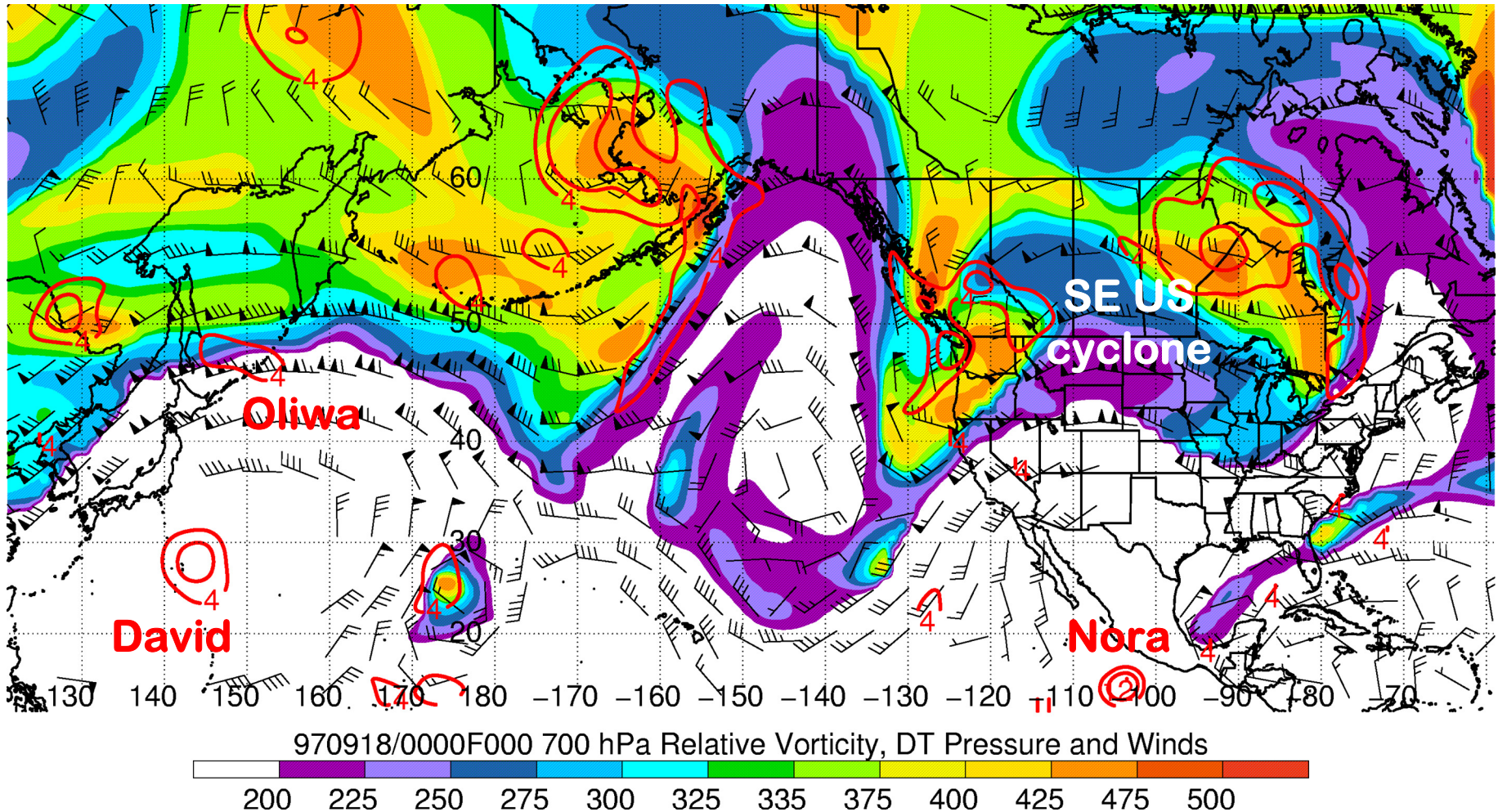


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DT pressure, DT winds, and 700 hPa relative vorticity

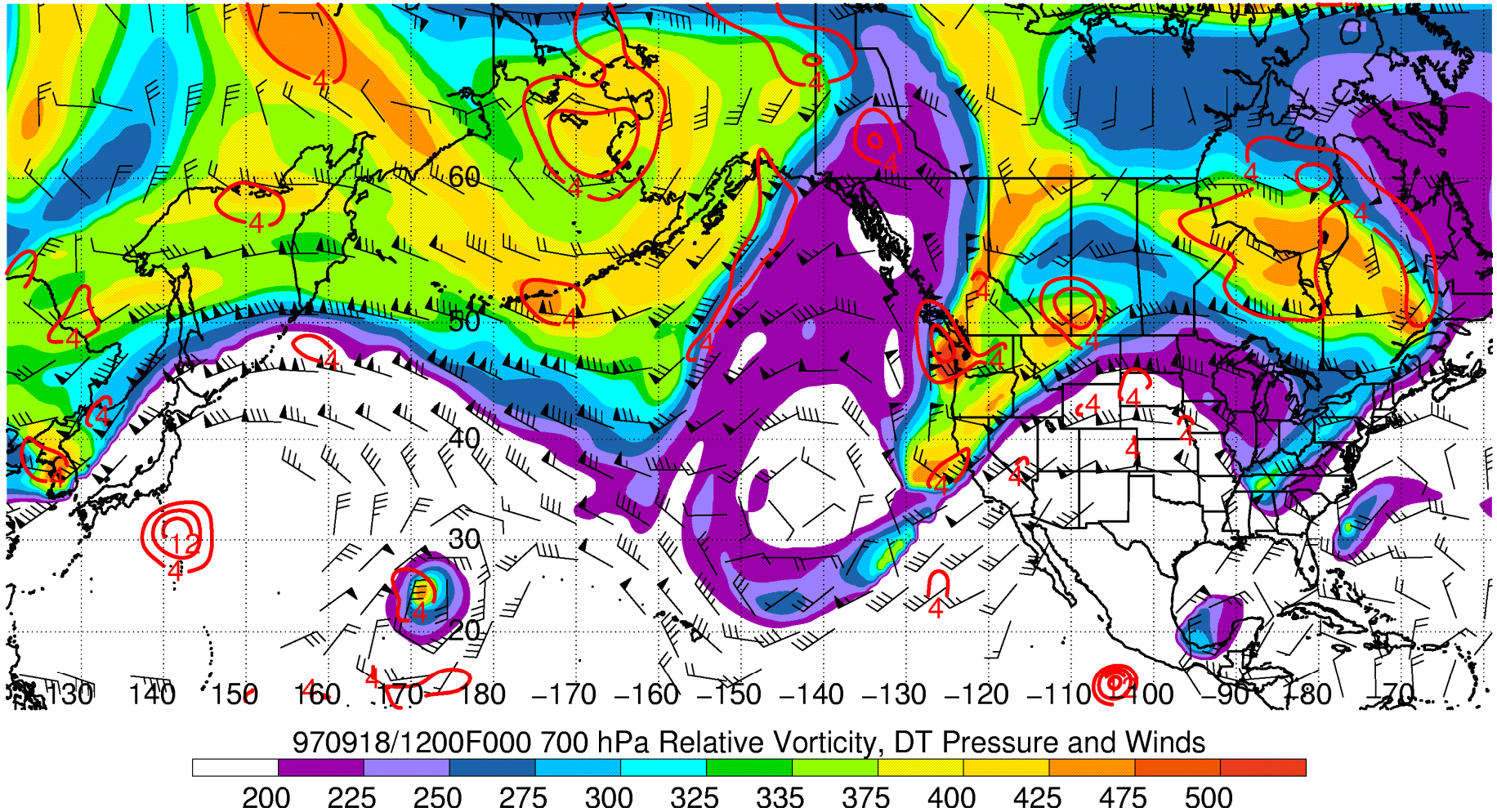


ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



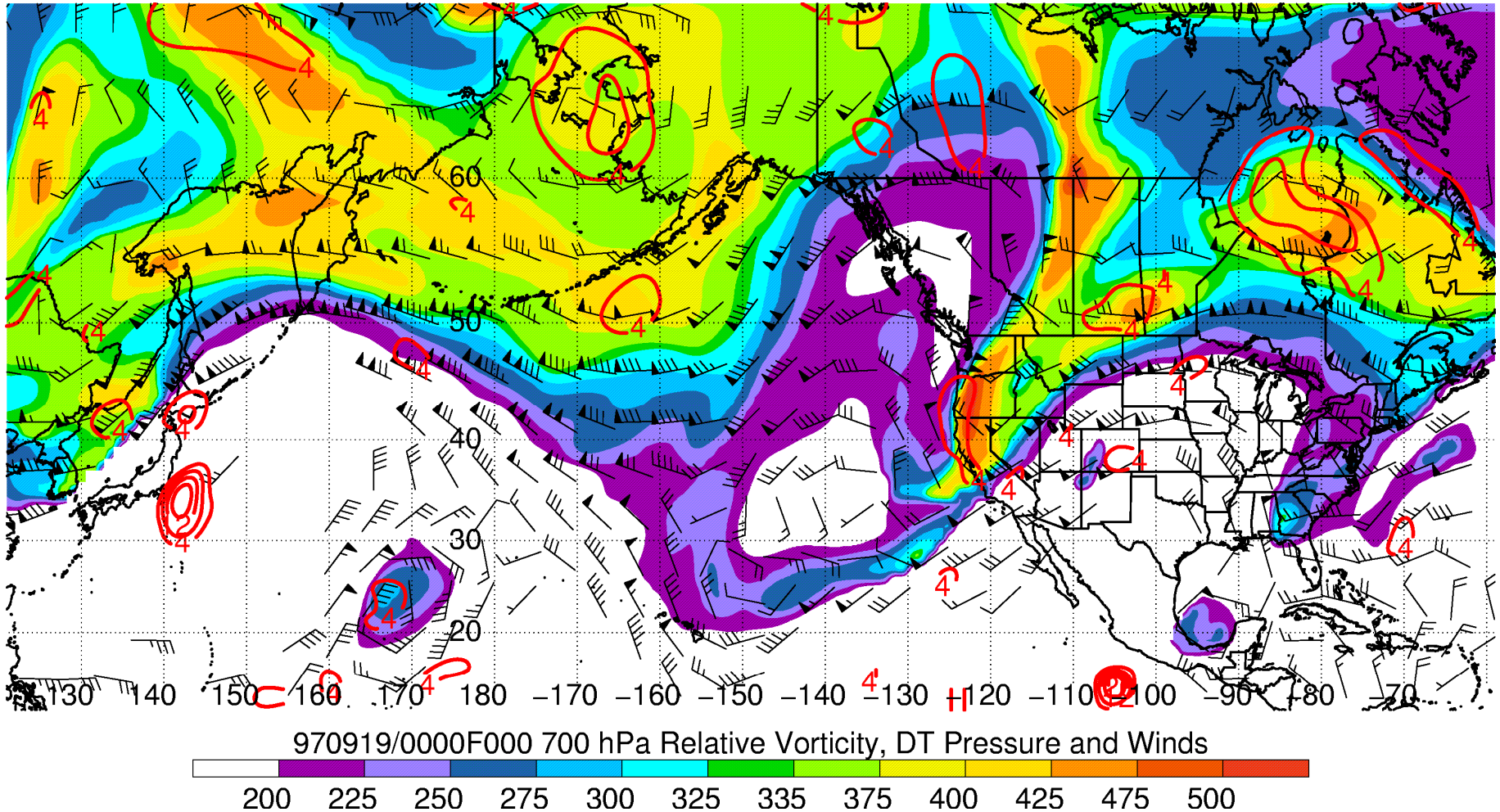
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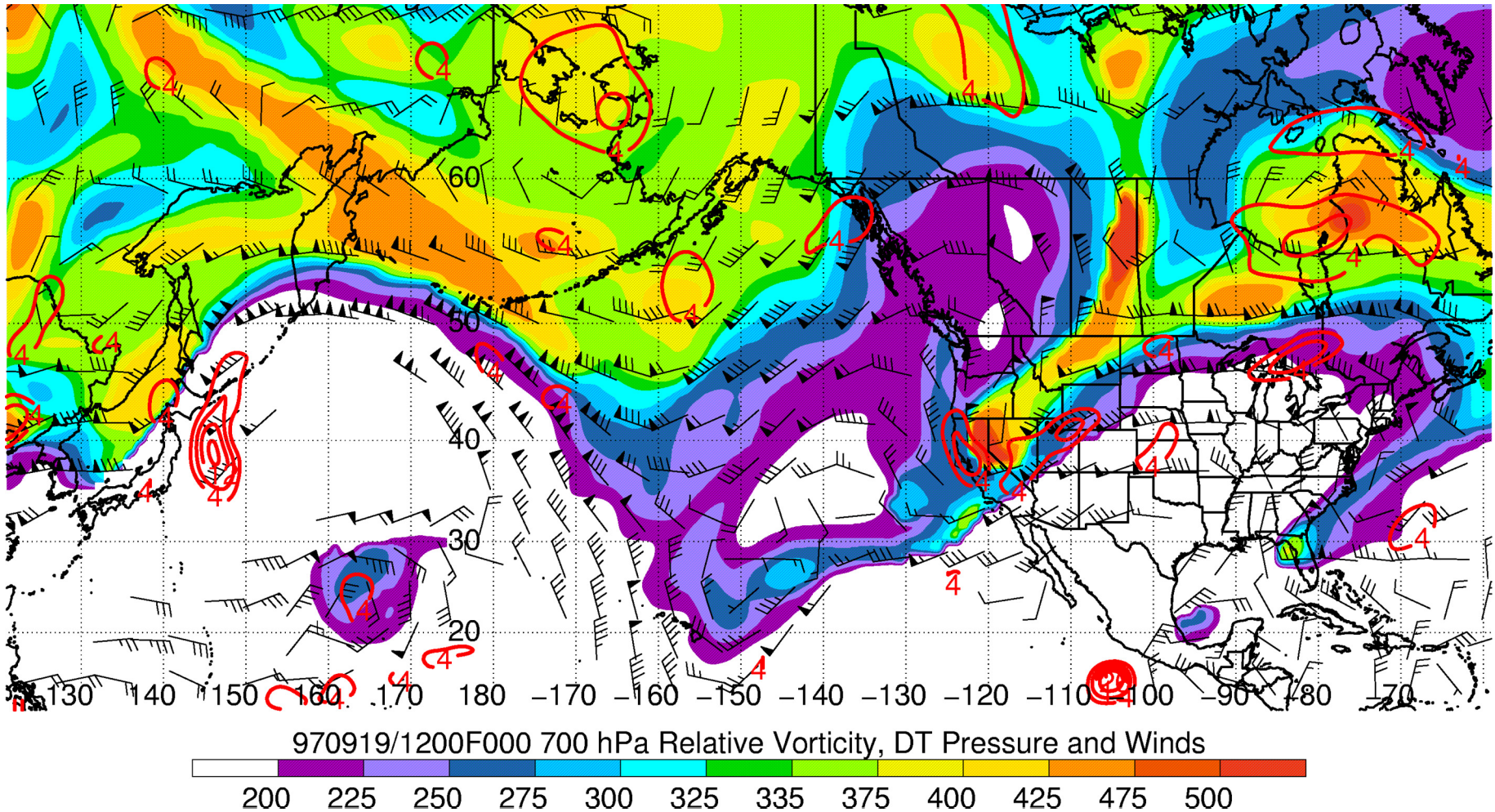
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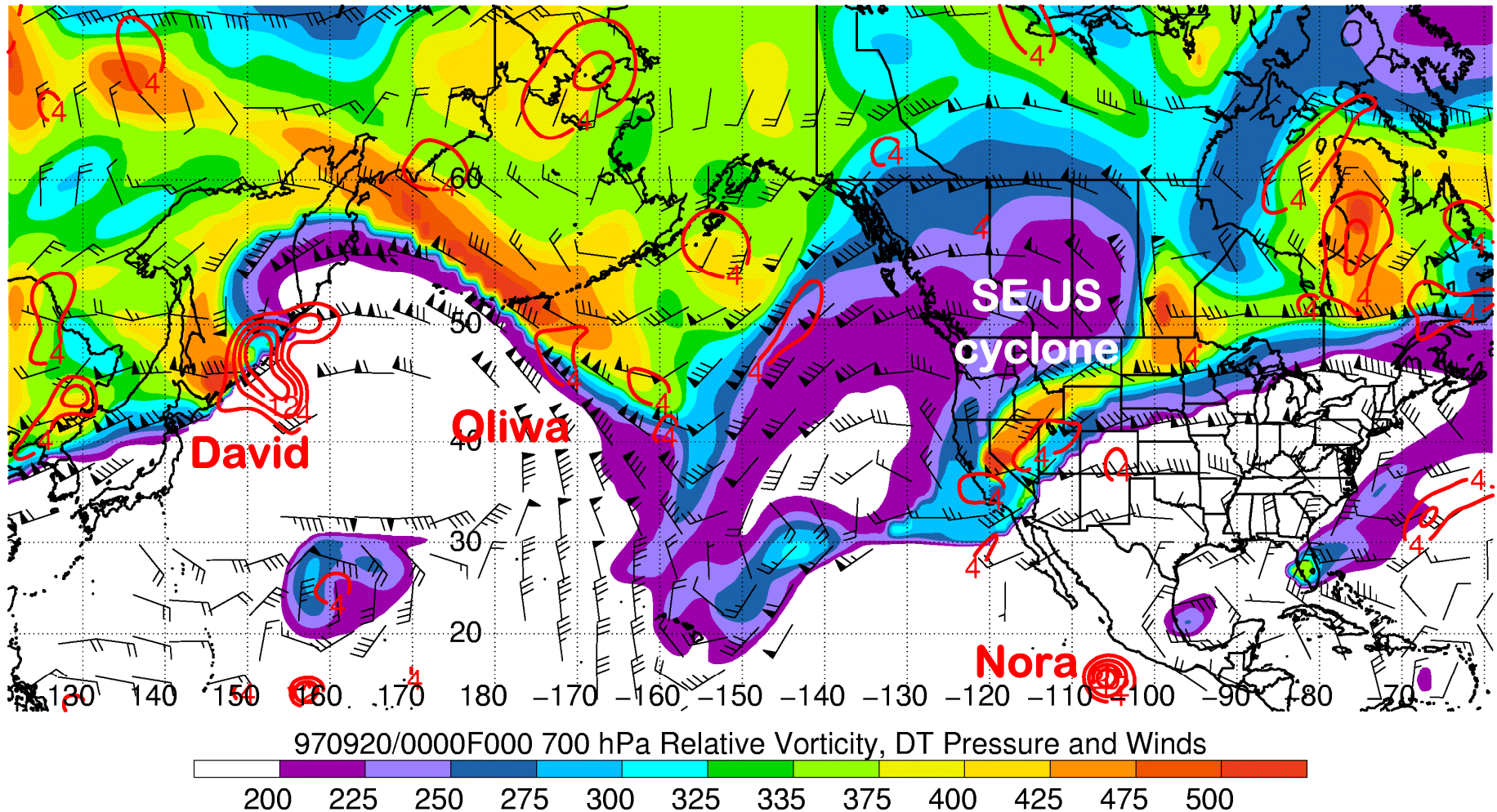


ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity

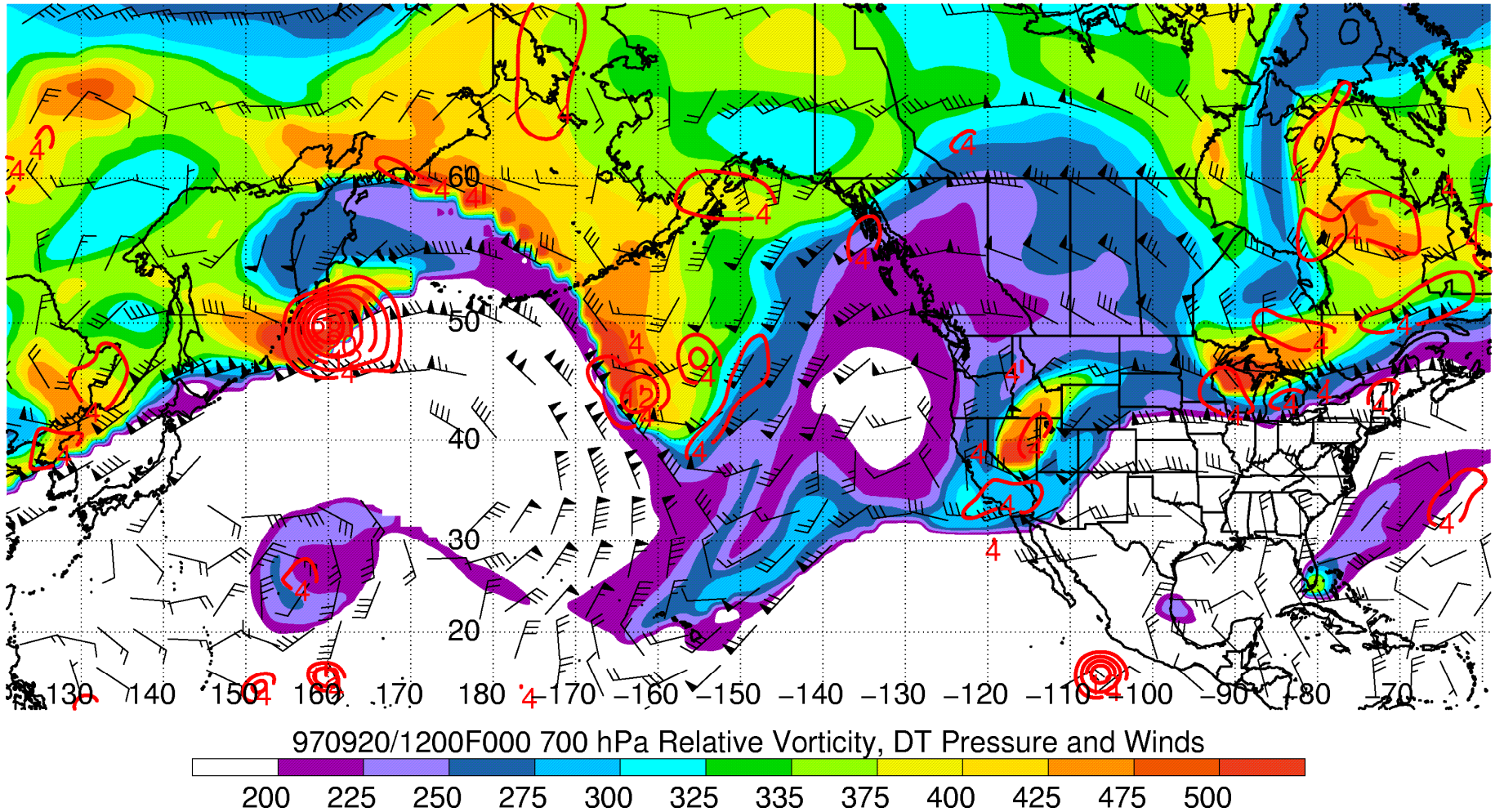


ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



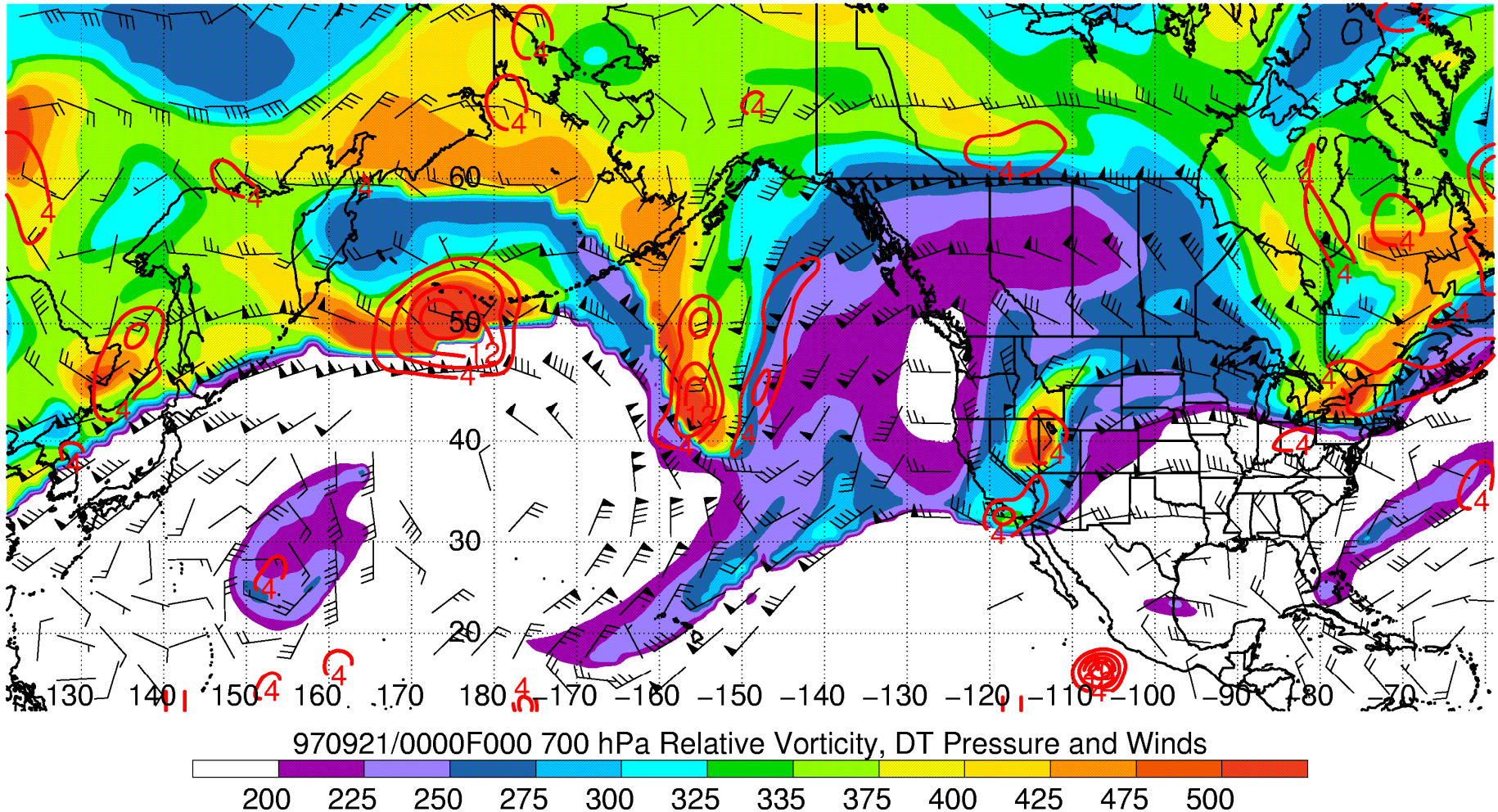
ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity



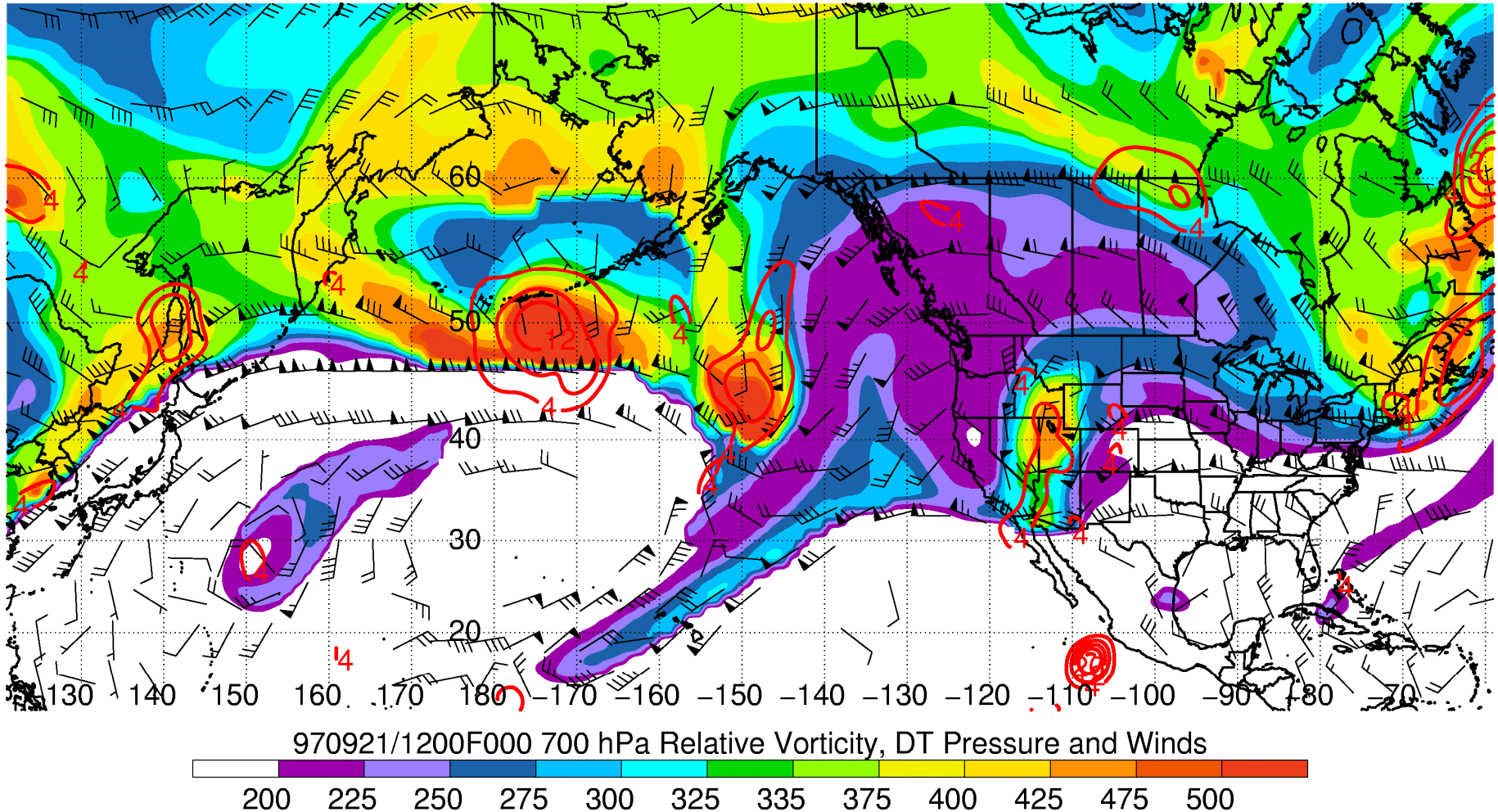
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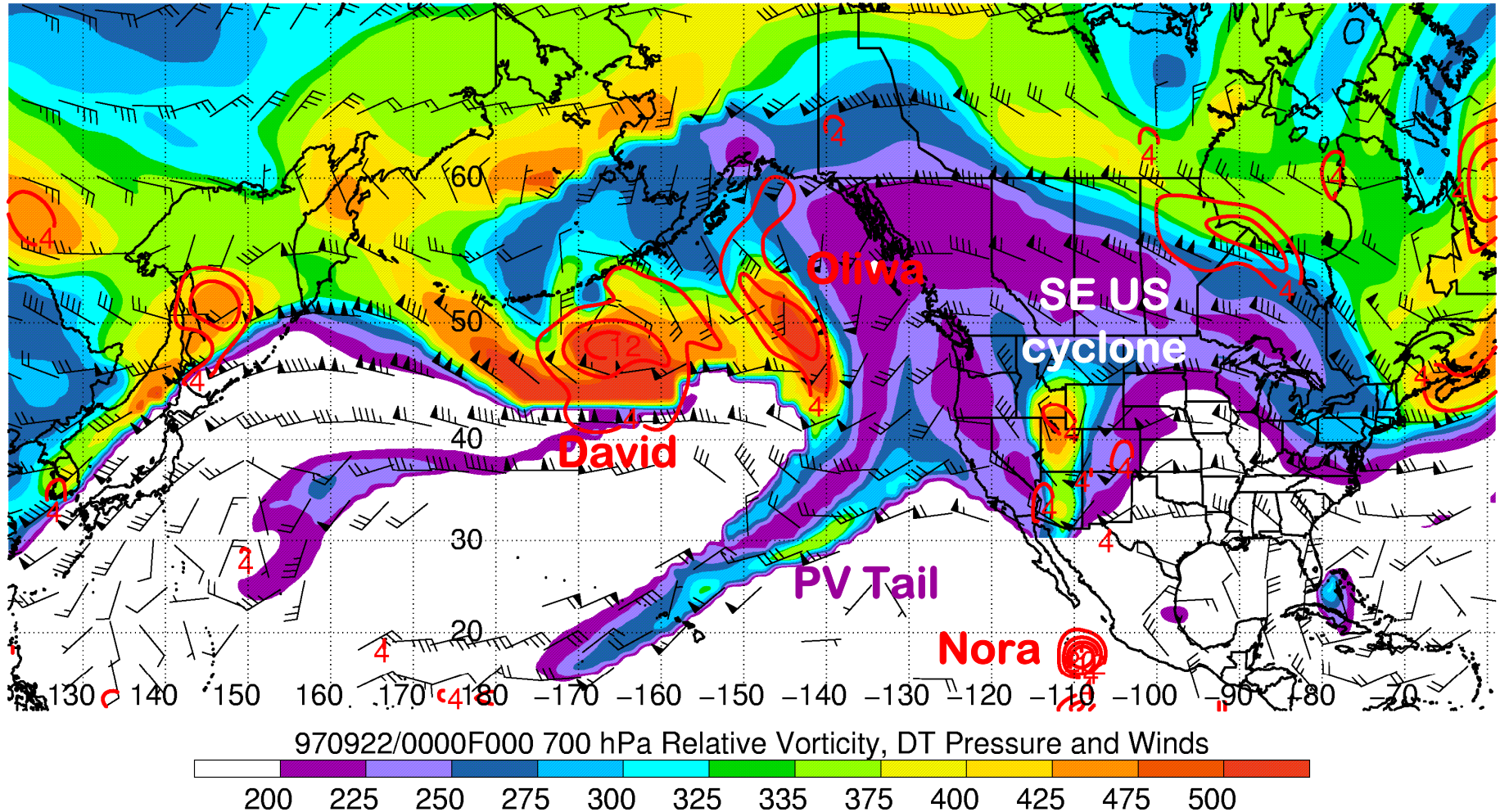


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DT pressure, DT winds, and 700 hPa relative vorticity

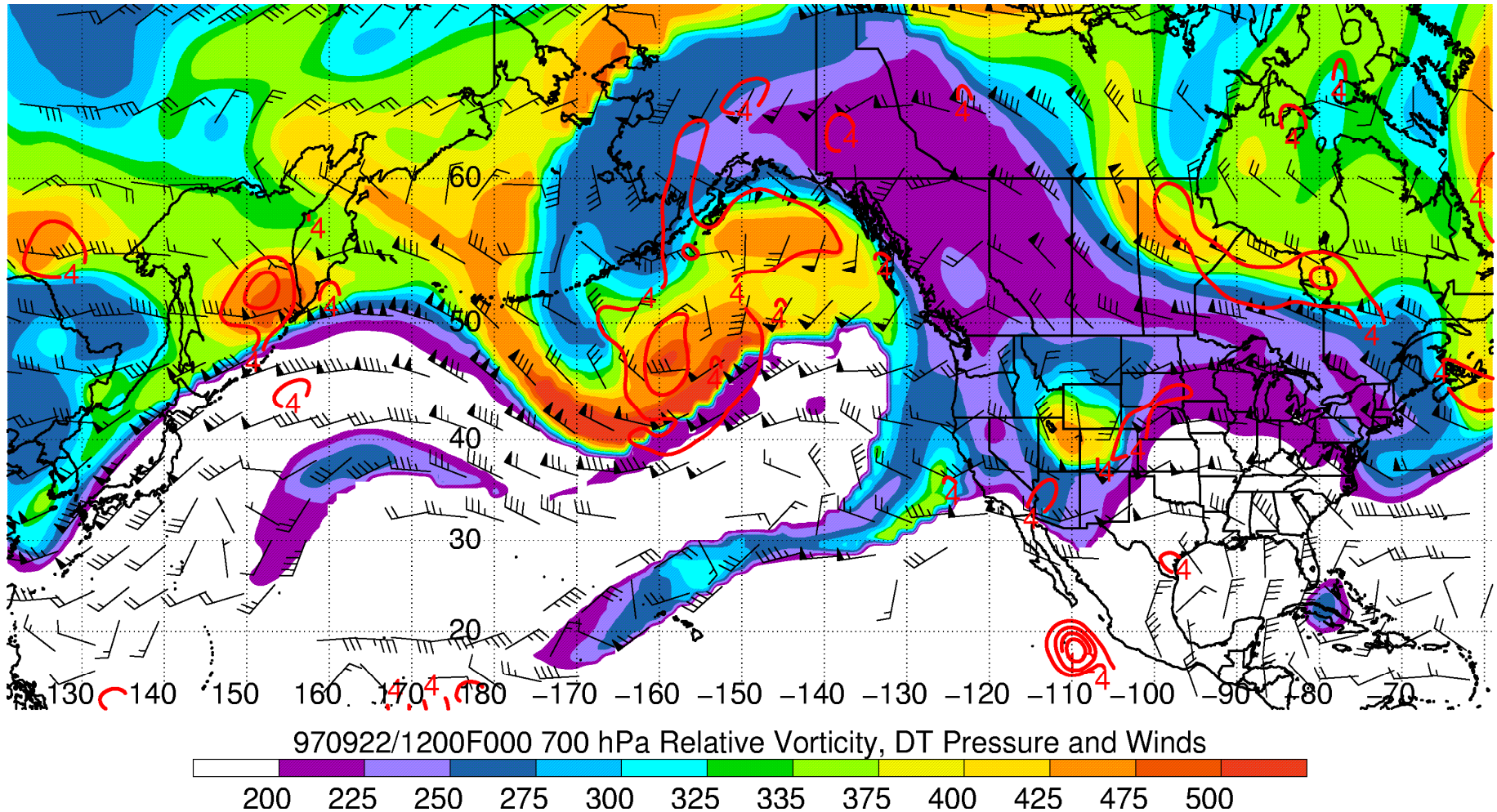


ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity

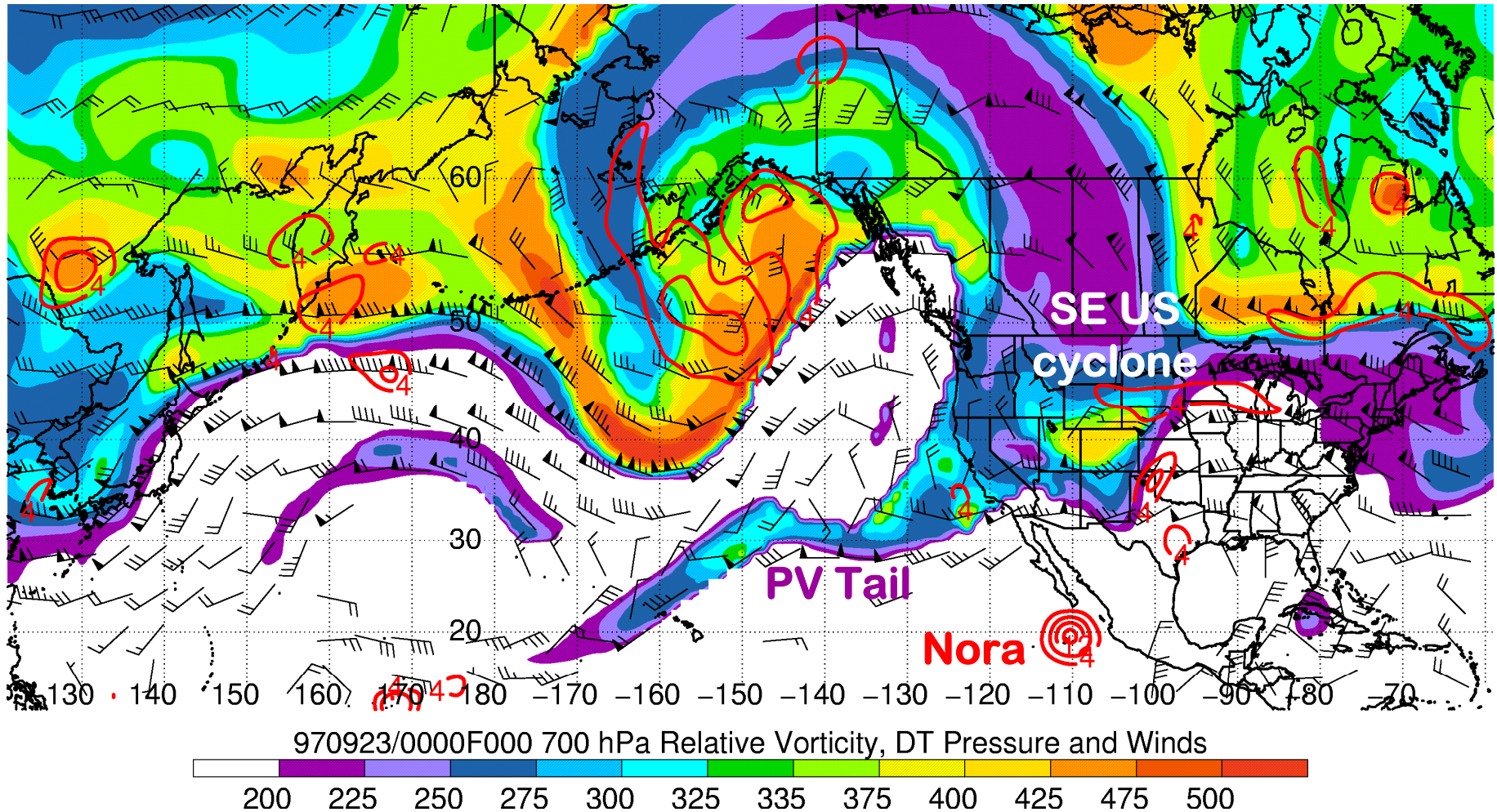


ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity

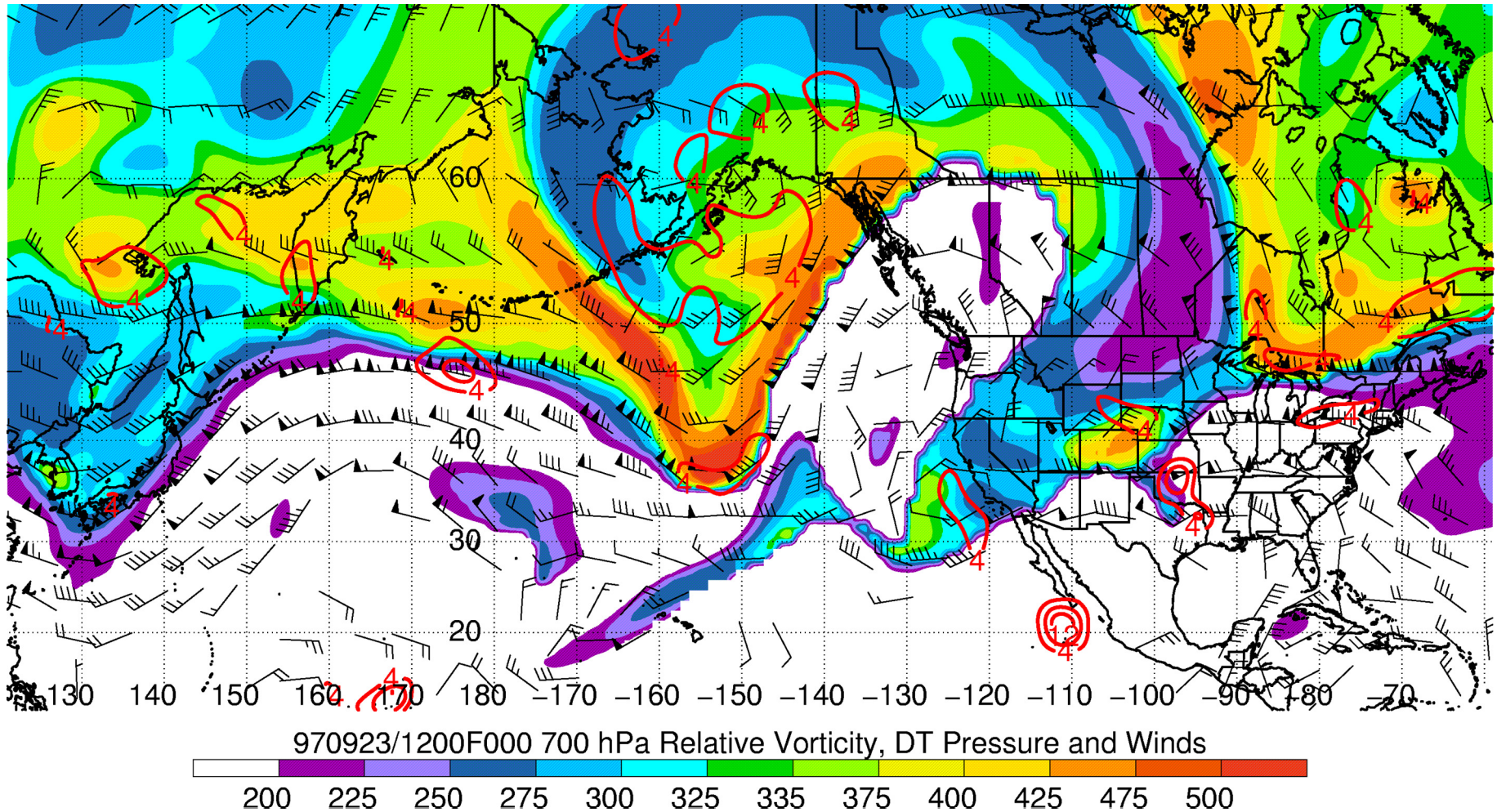


ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



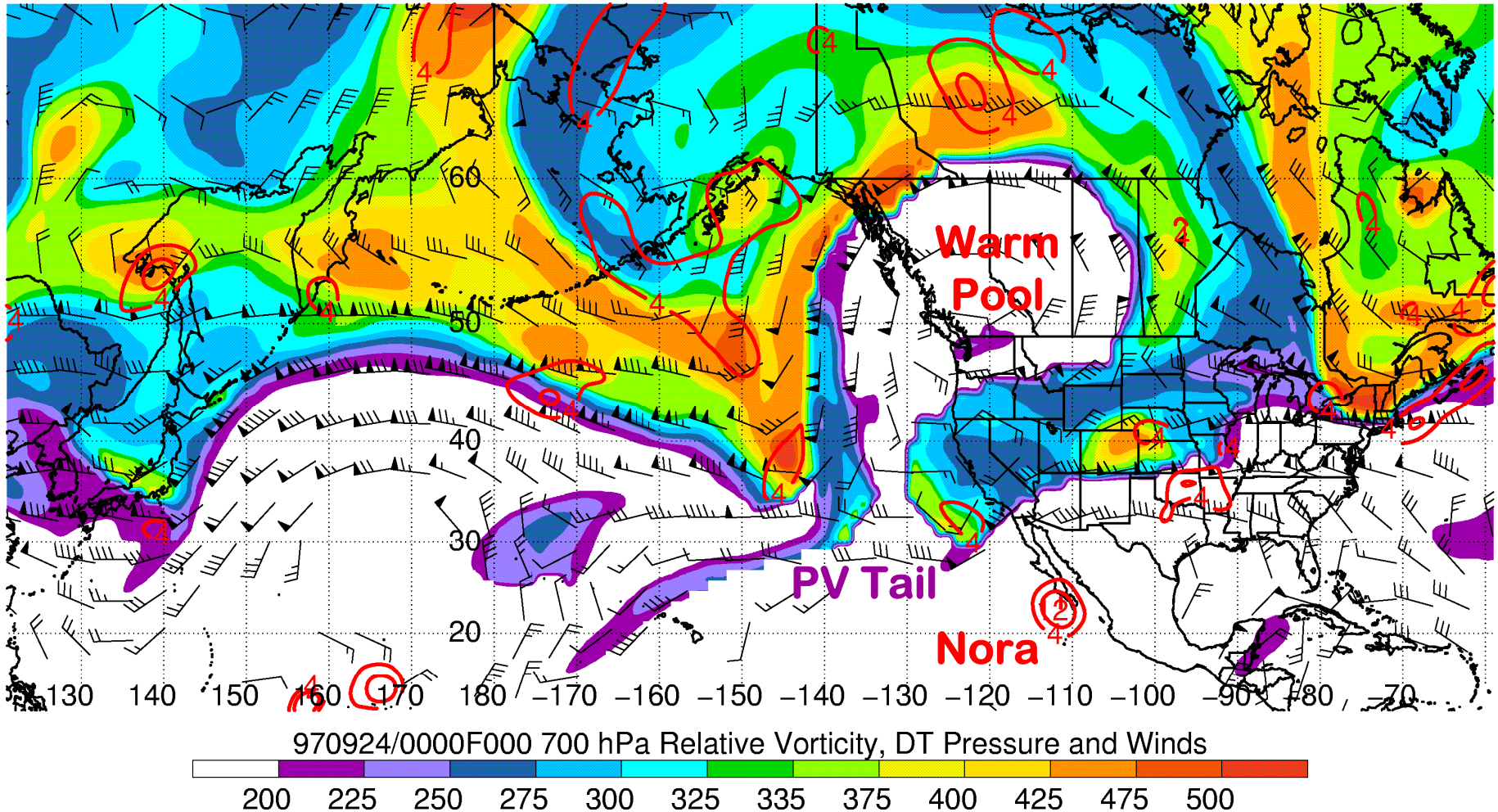
ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity



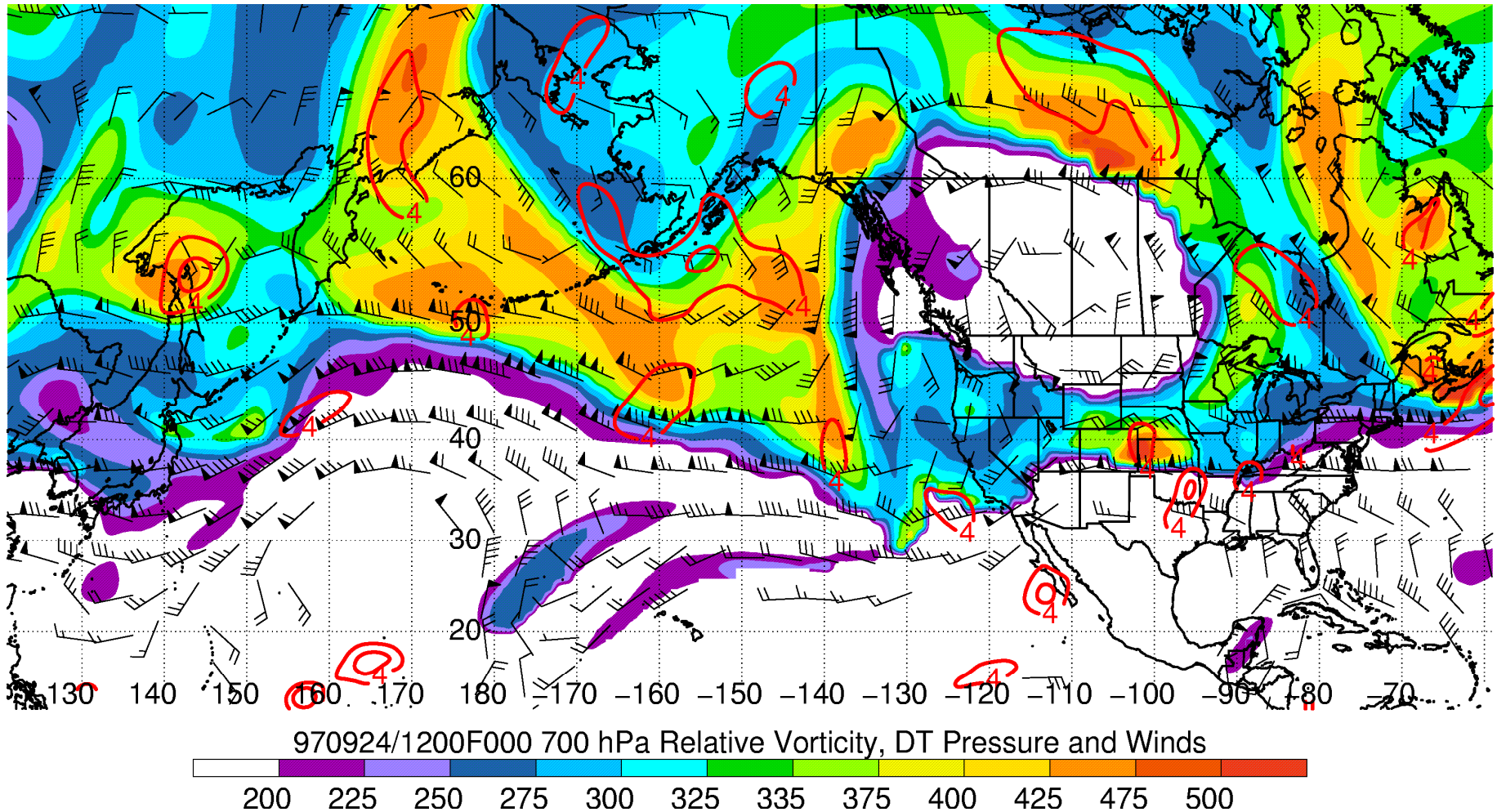
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DT pressure, DT winds, and 700 hPa relative vorticity



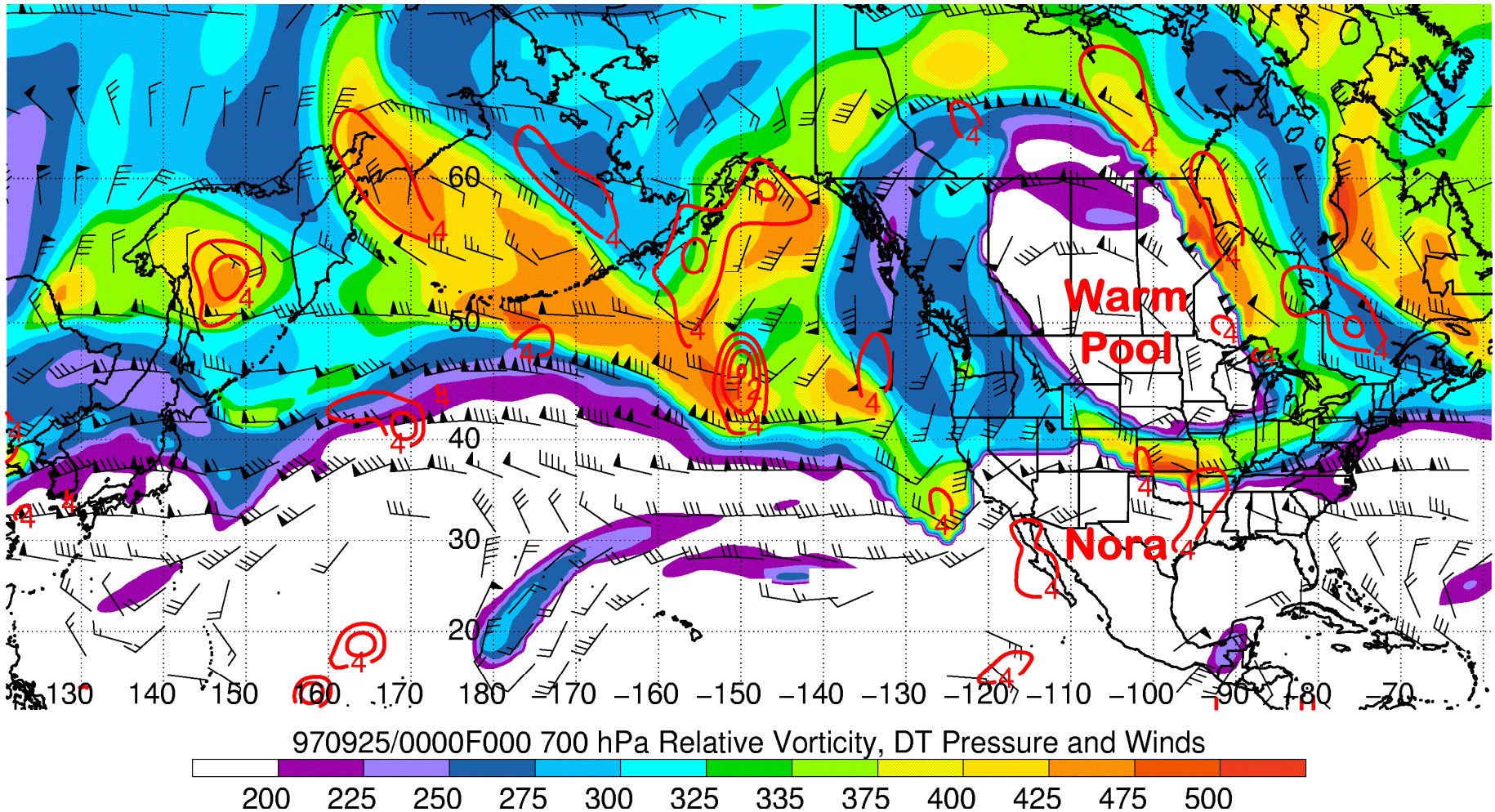
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DT pressure, DT winds, and 700 hPa relative vorticity



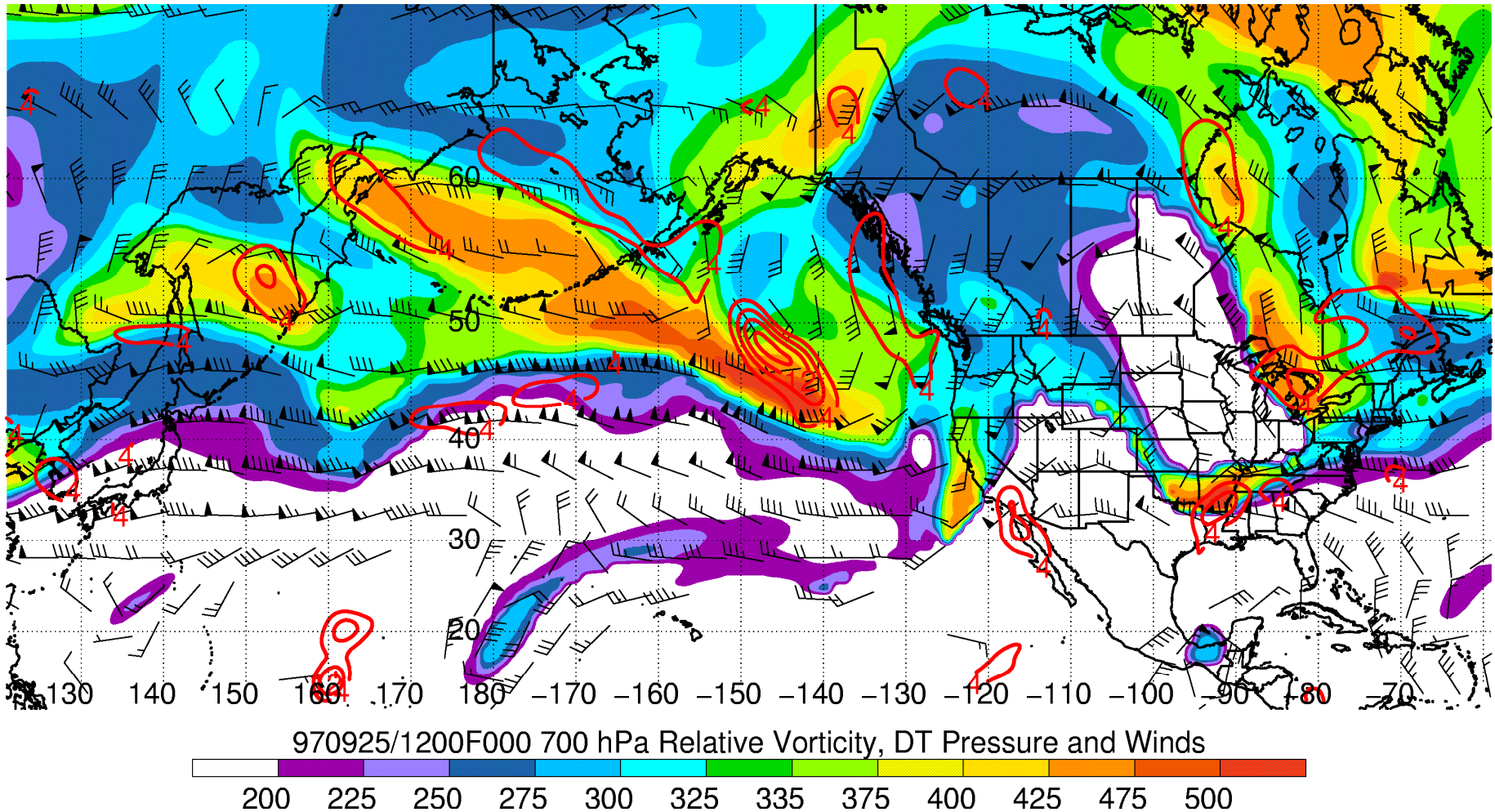
ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity



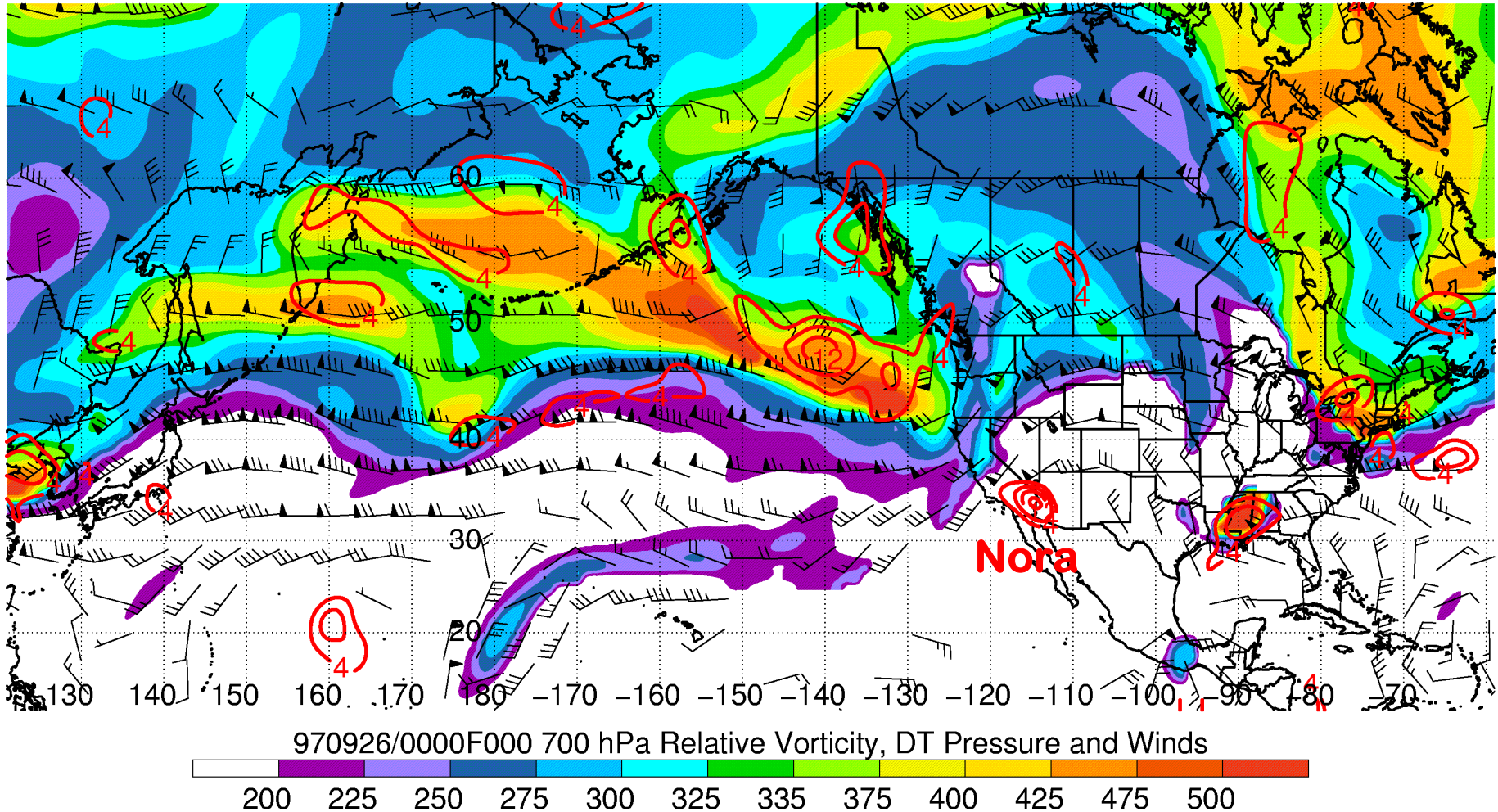
ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity



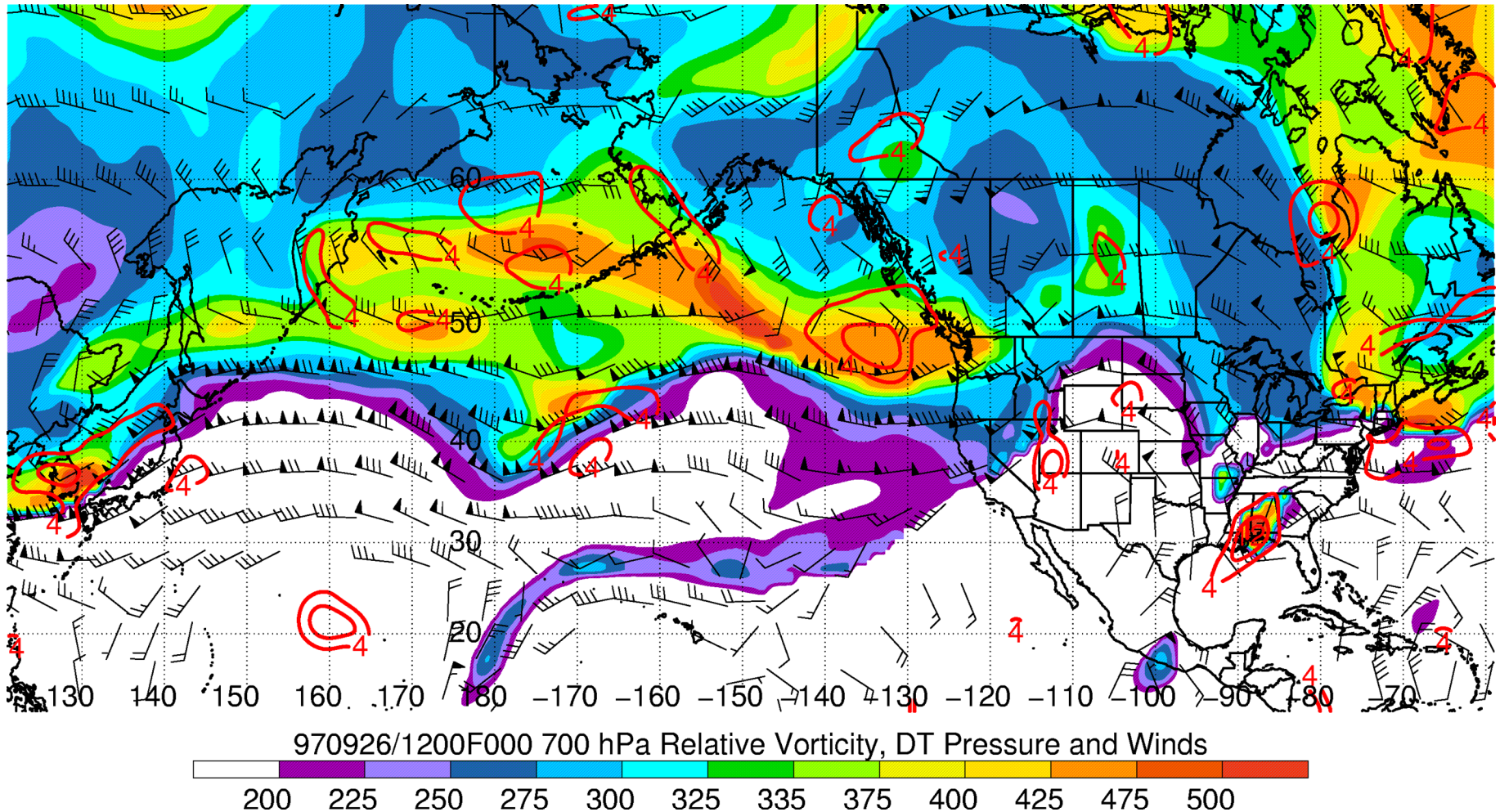
ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity

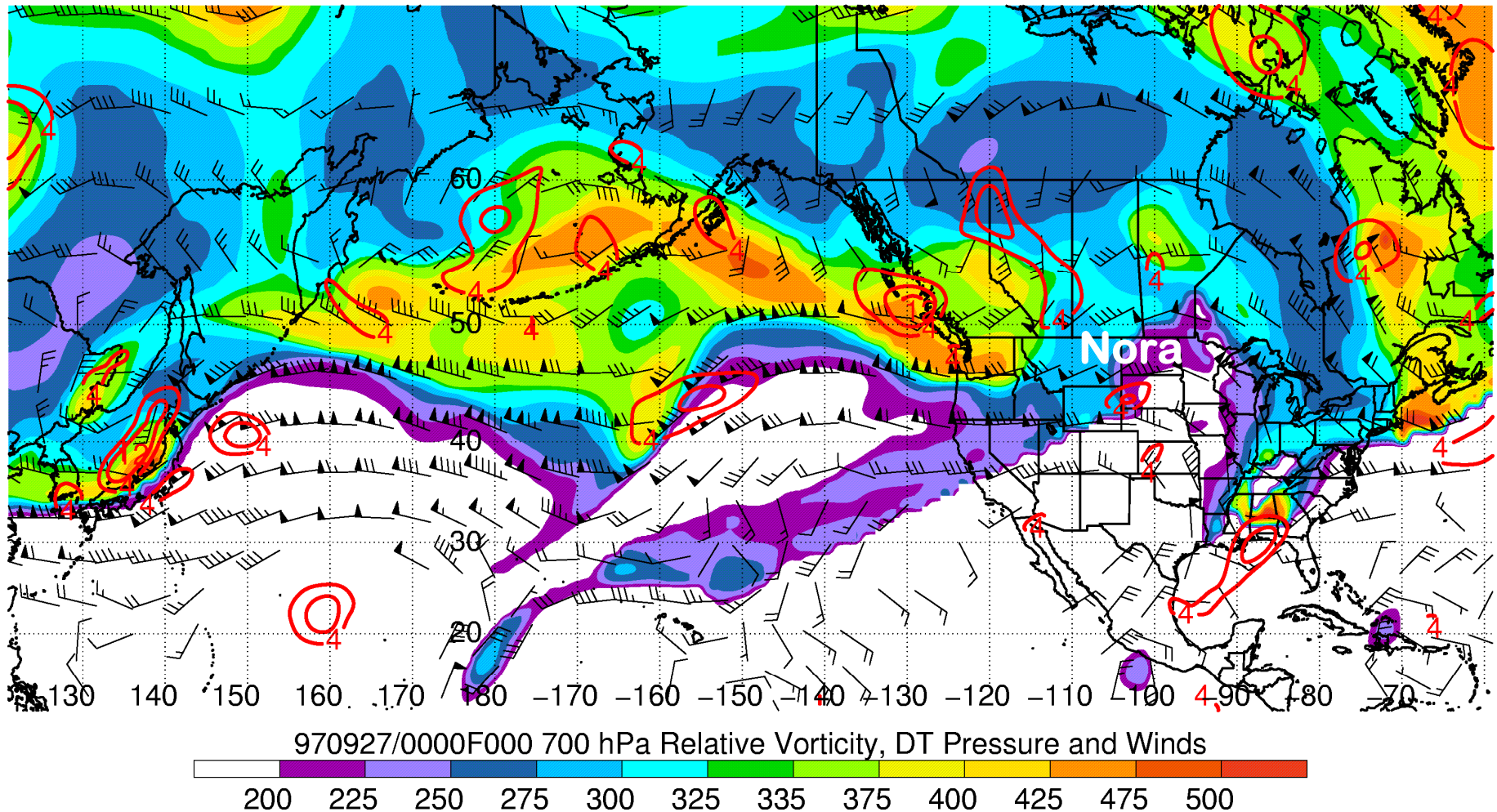


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DT pressure, DT winds, and 700 hPa relative vorticity

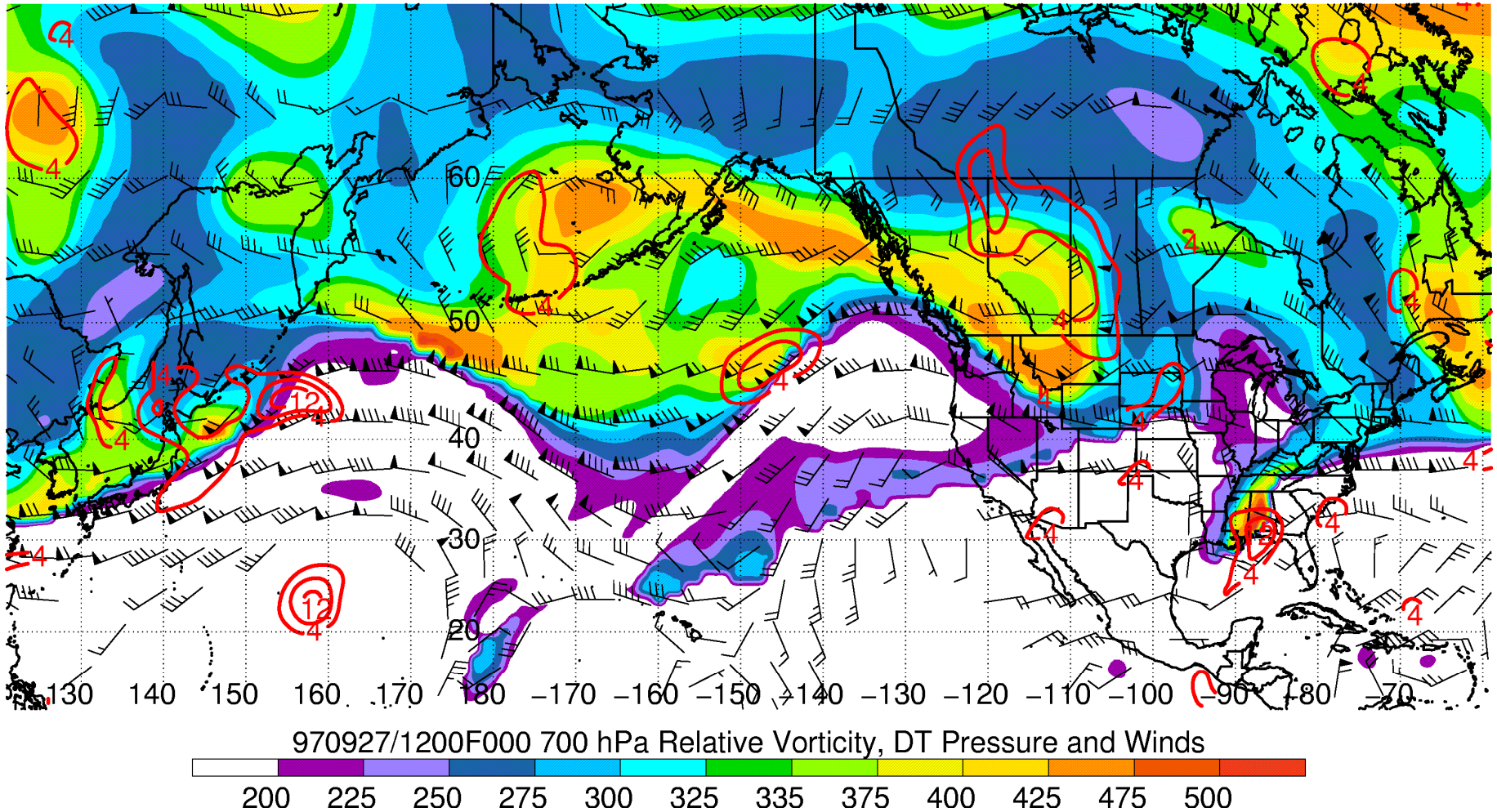


ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



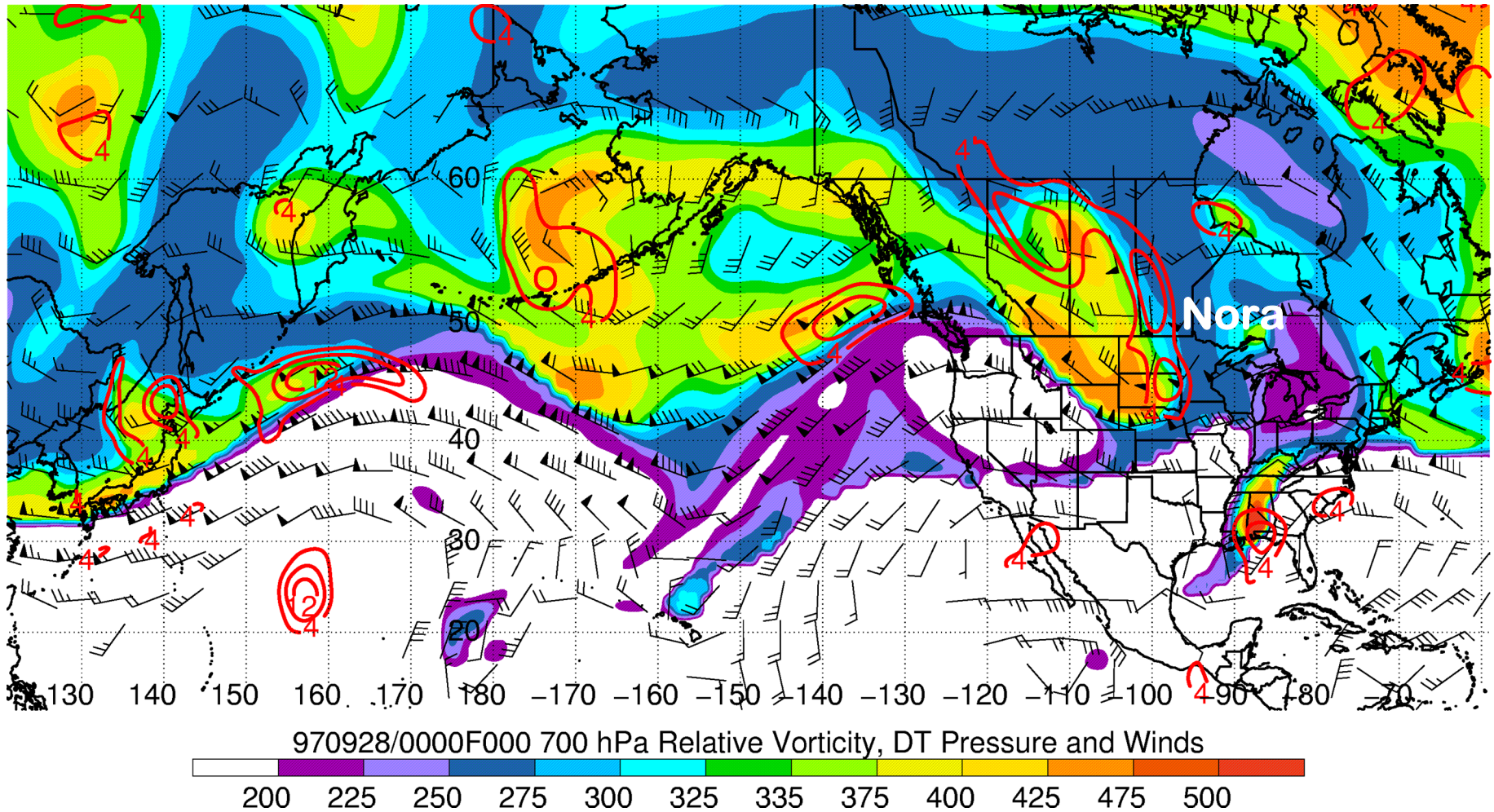
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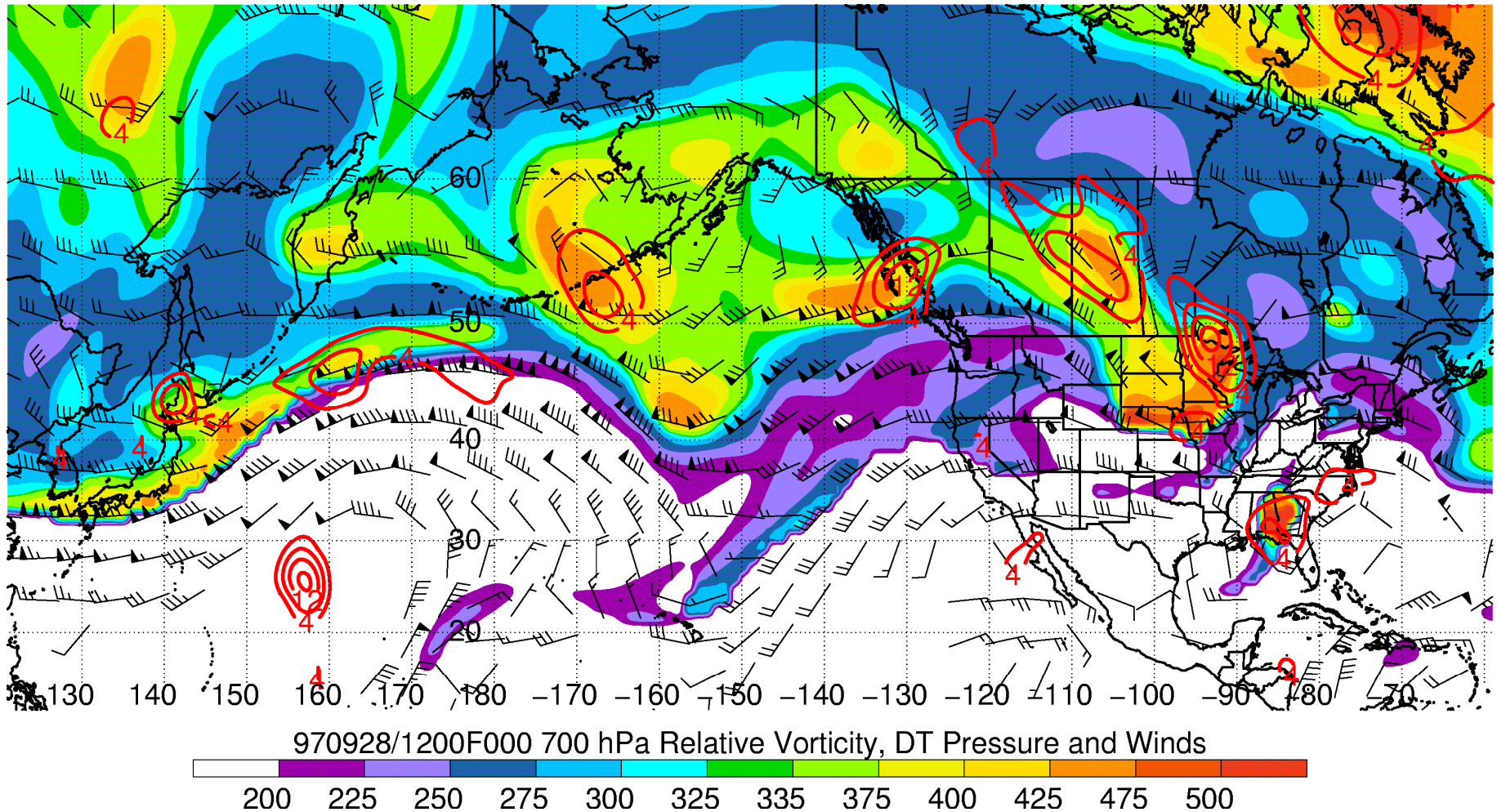


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DT pressure, DT winds, and 700 hPa relative vorticity

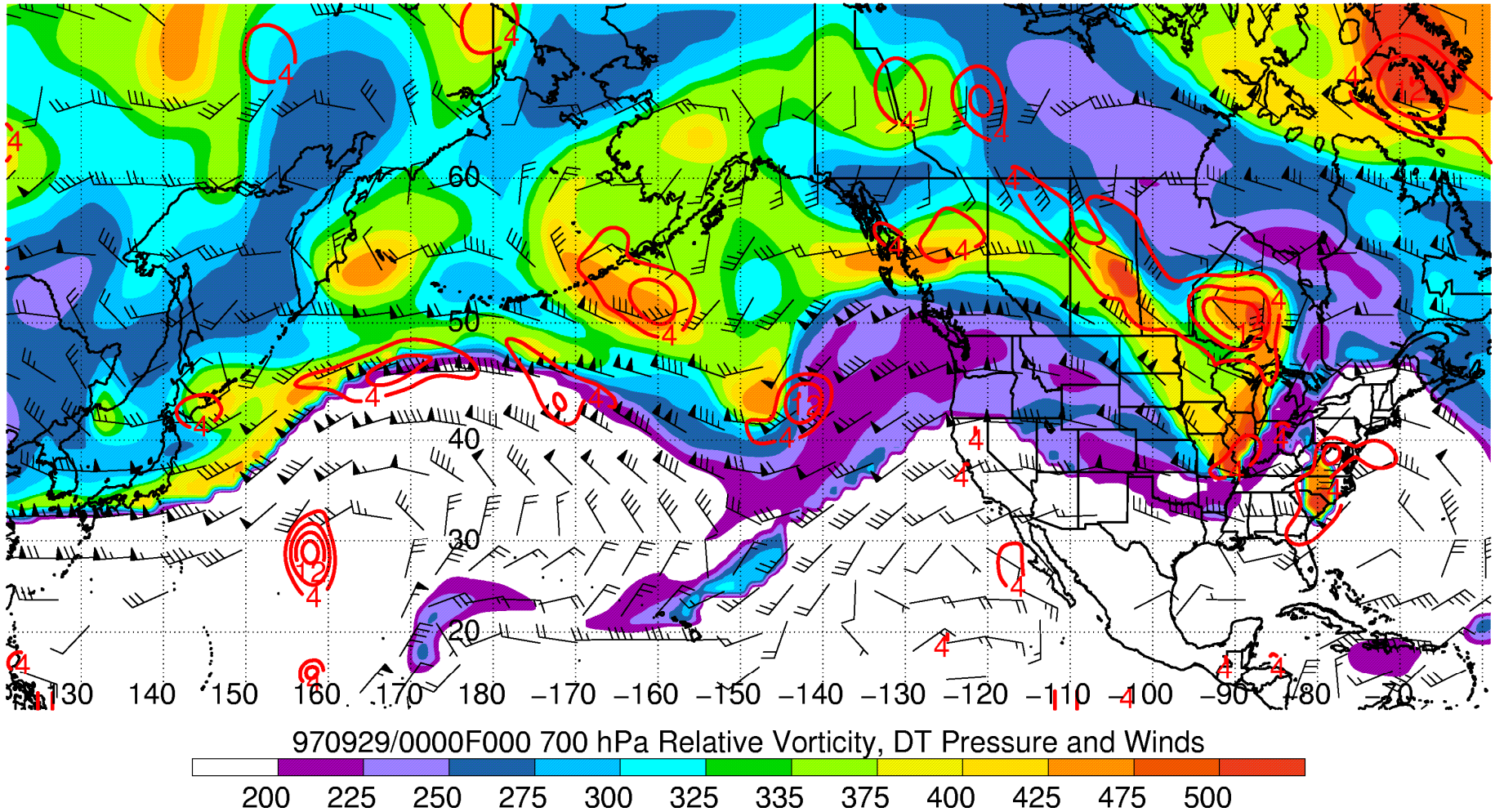


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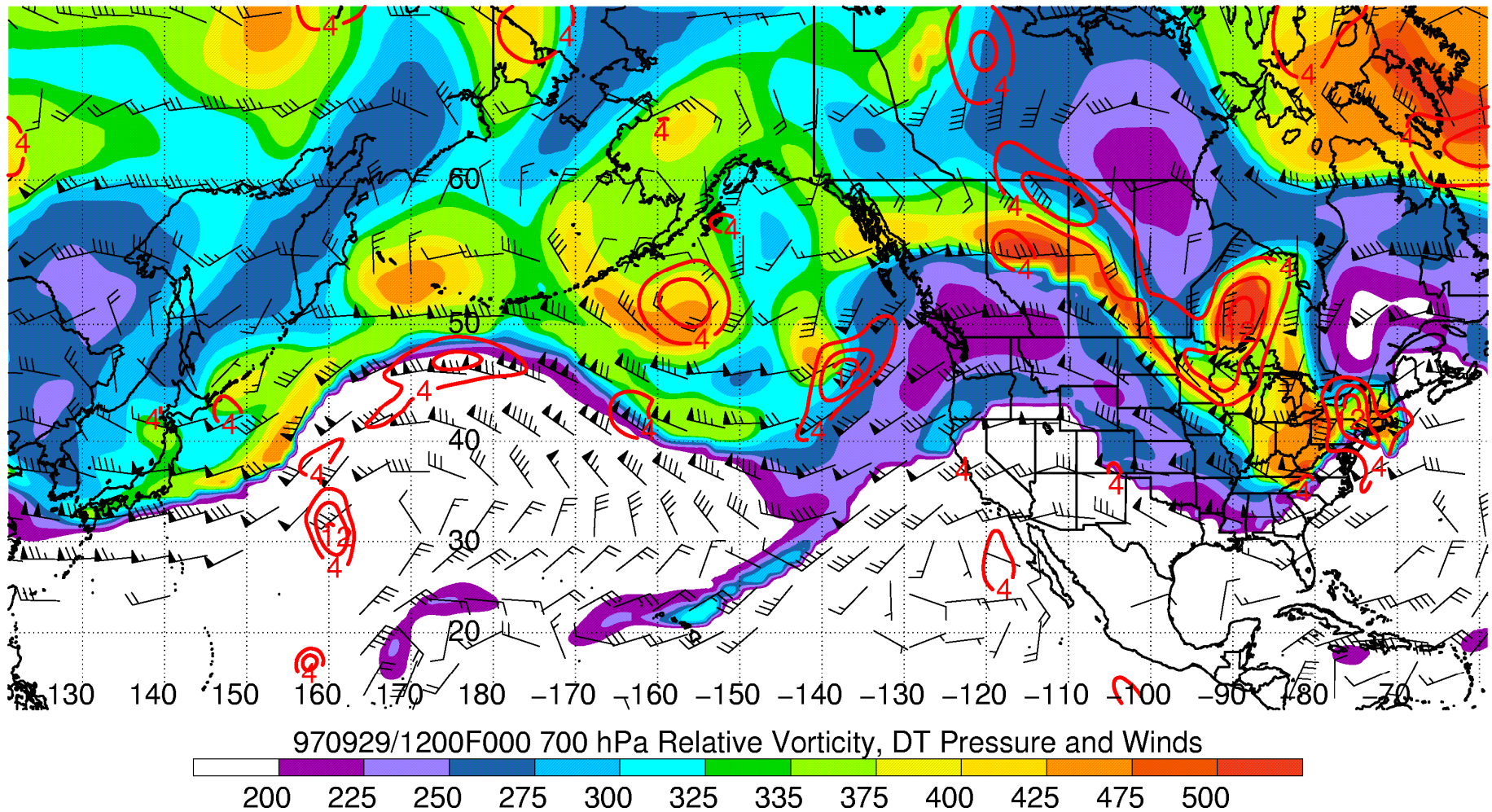


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DT pressure, DT winds, and 700 hPa relative vorticity

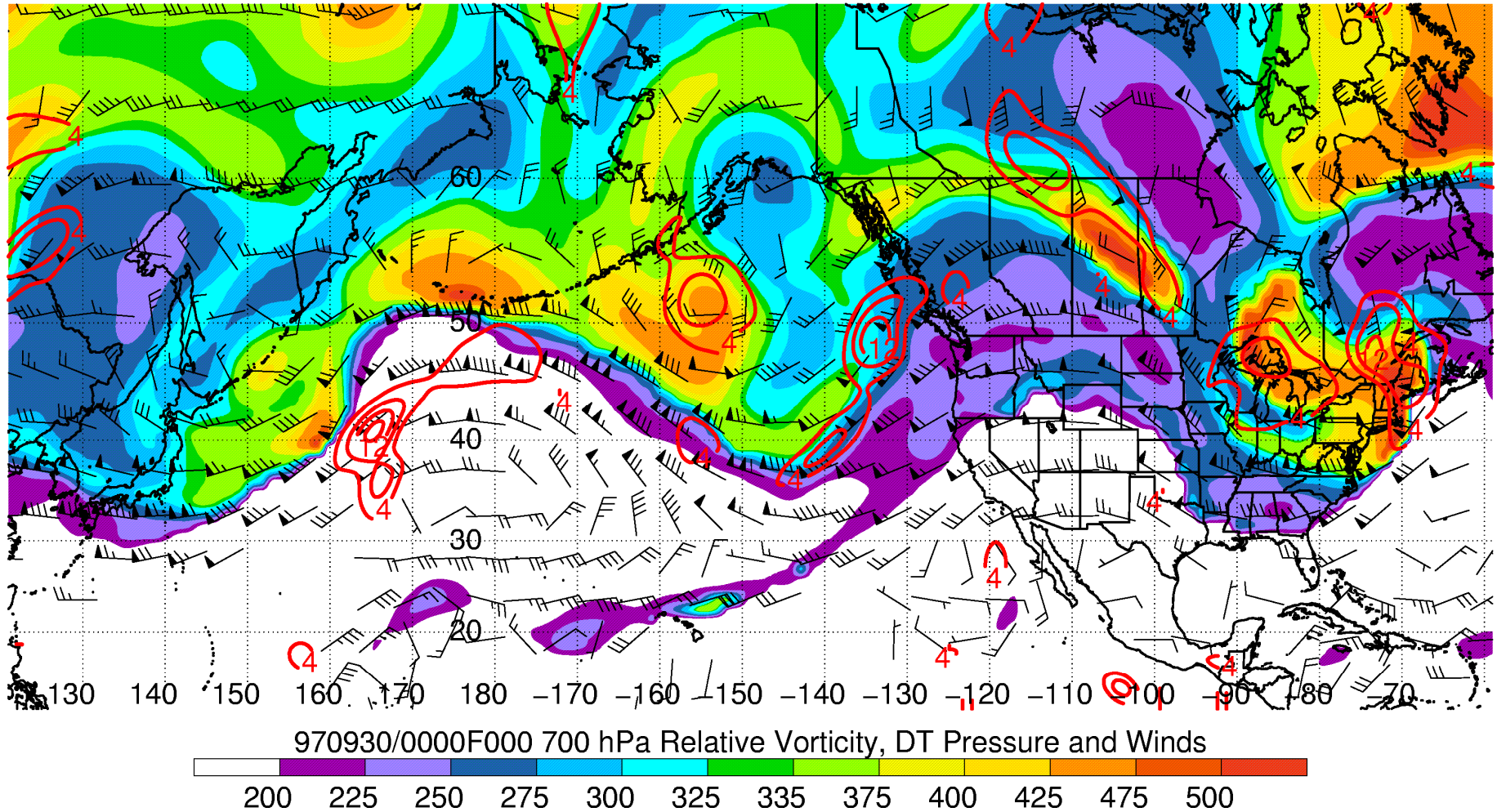


ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



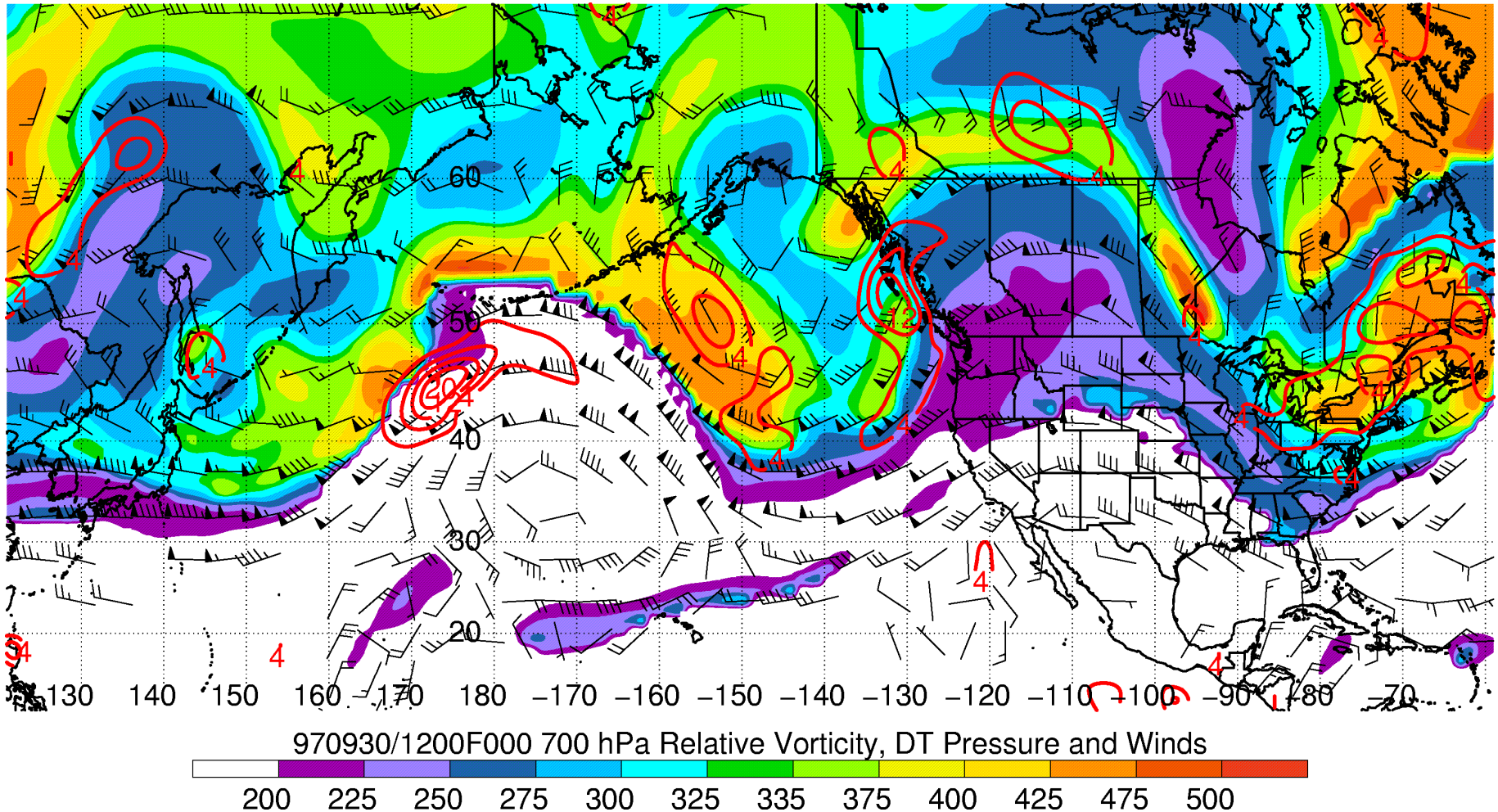
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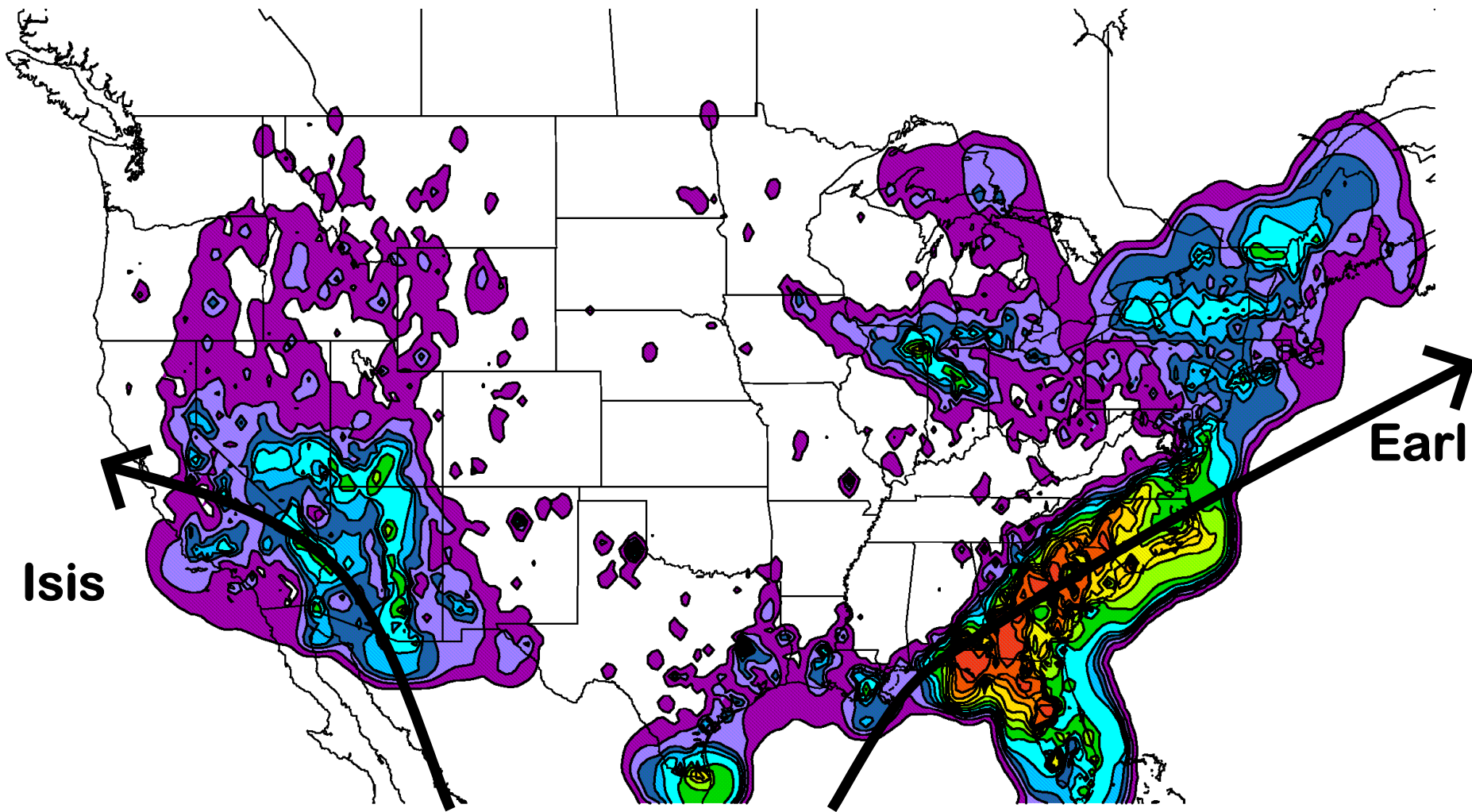
DT pressure, DT winds, and 700 hPa relative vorticity



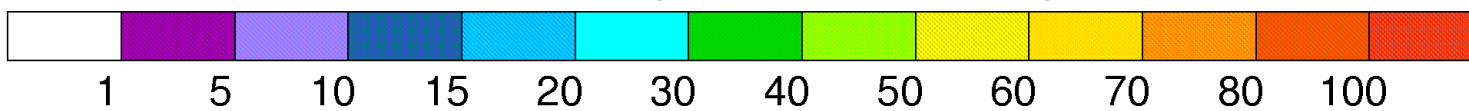
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DT pressure, DT winds, and 700 hPa relative vorticity

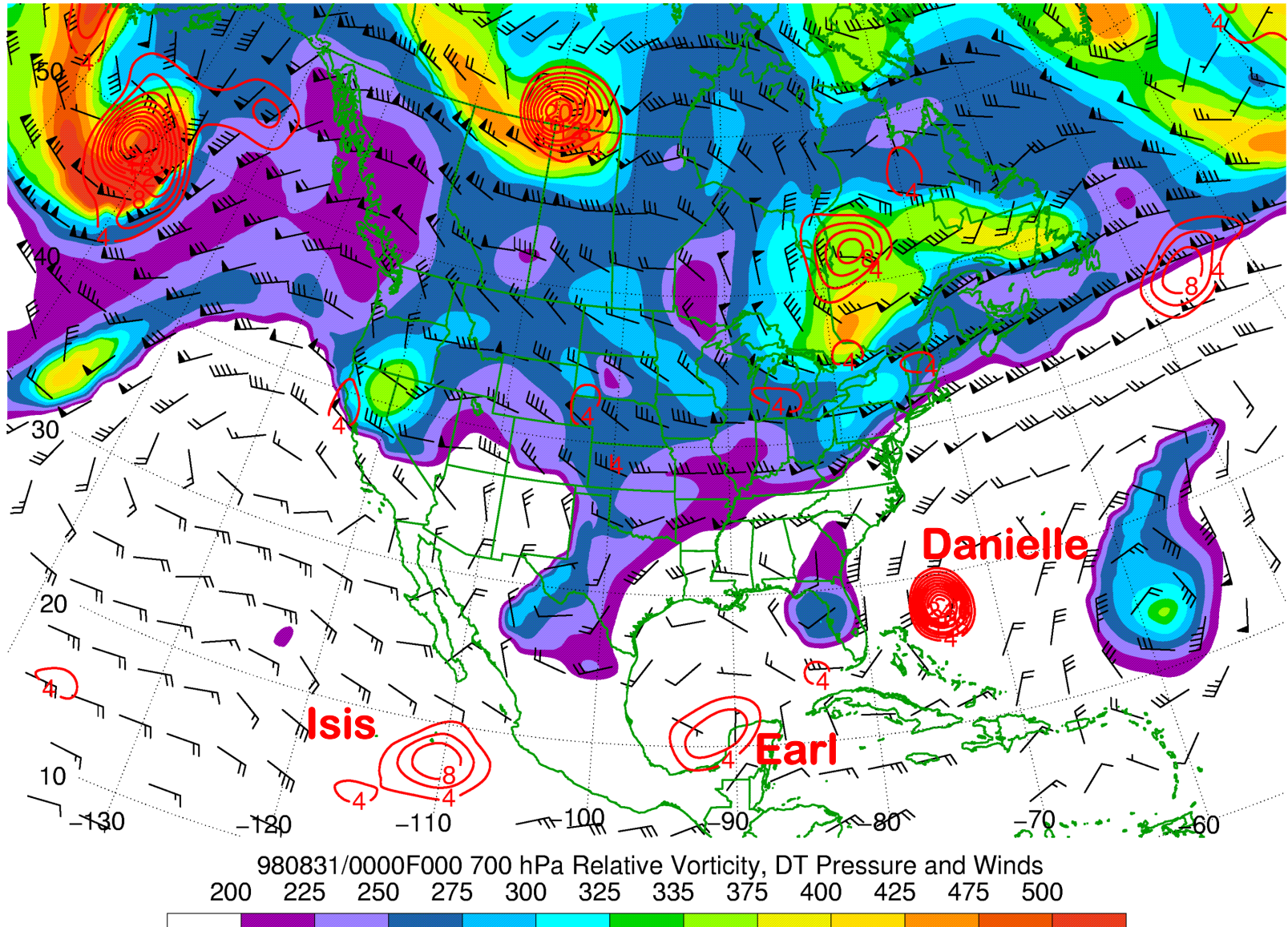




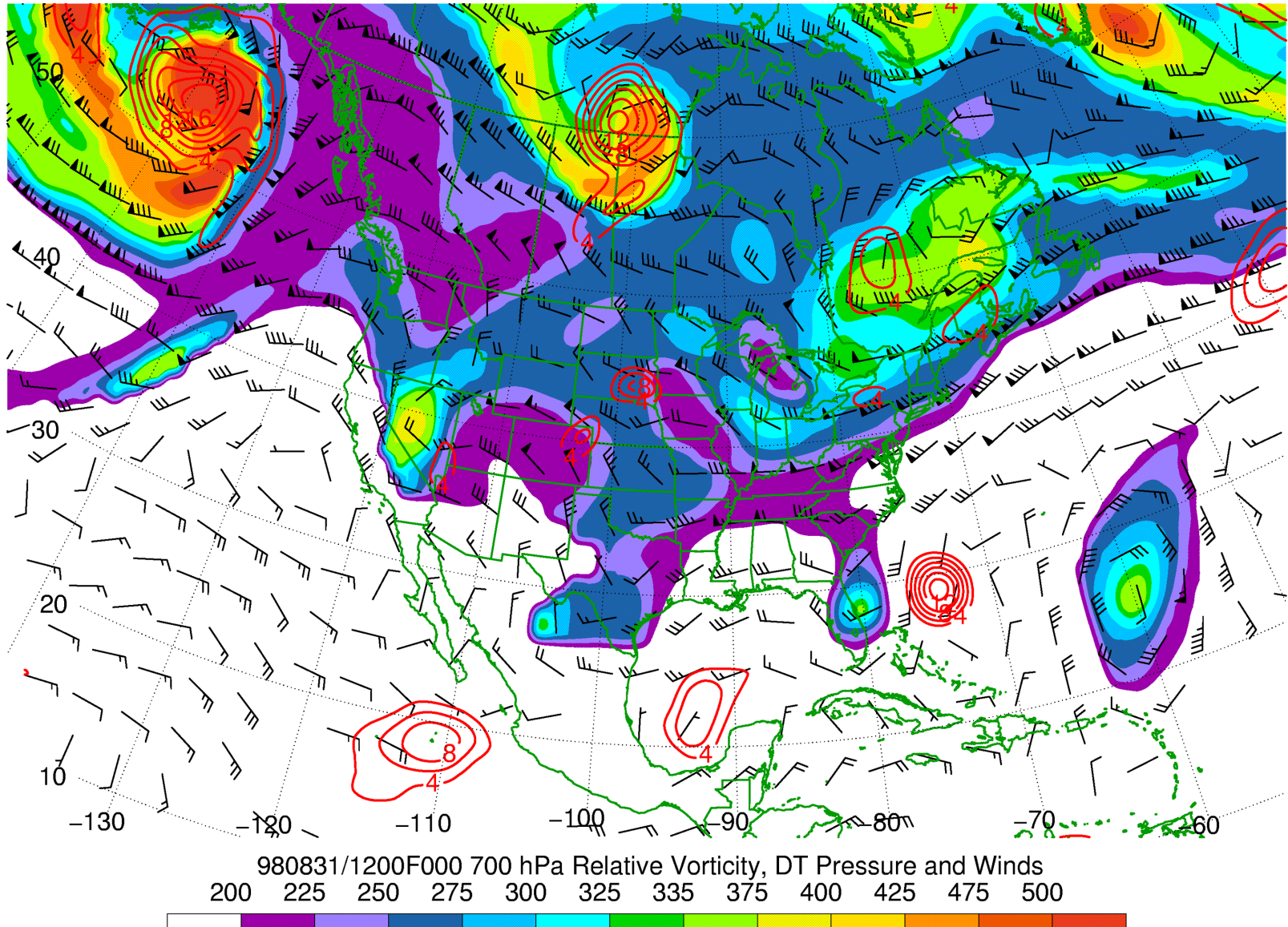
Hurricane Isis Total Precipitation (mm) 3-7 September 1998



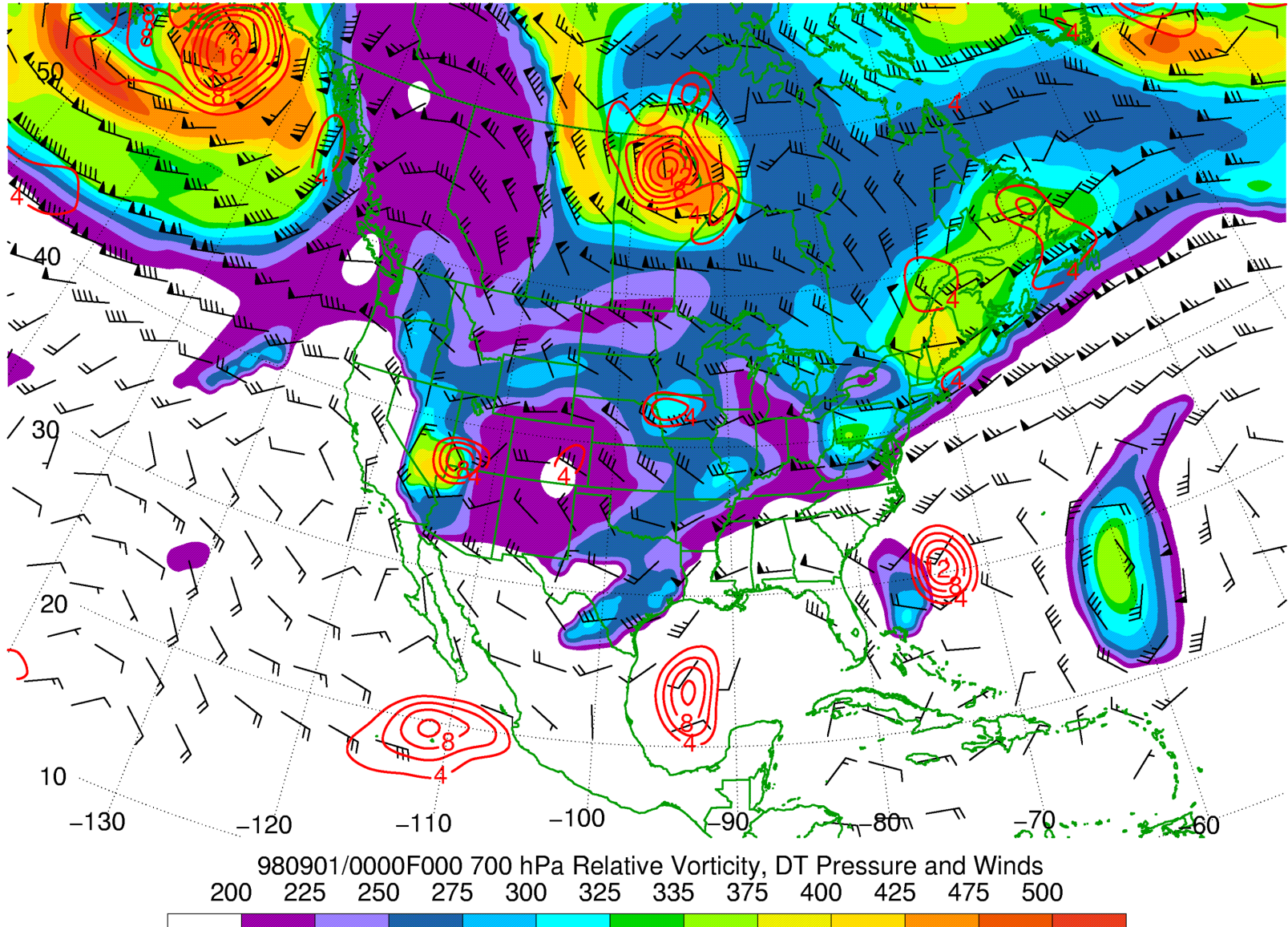
ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



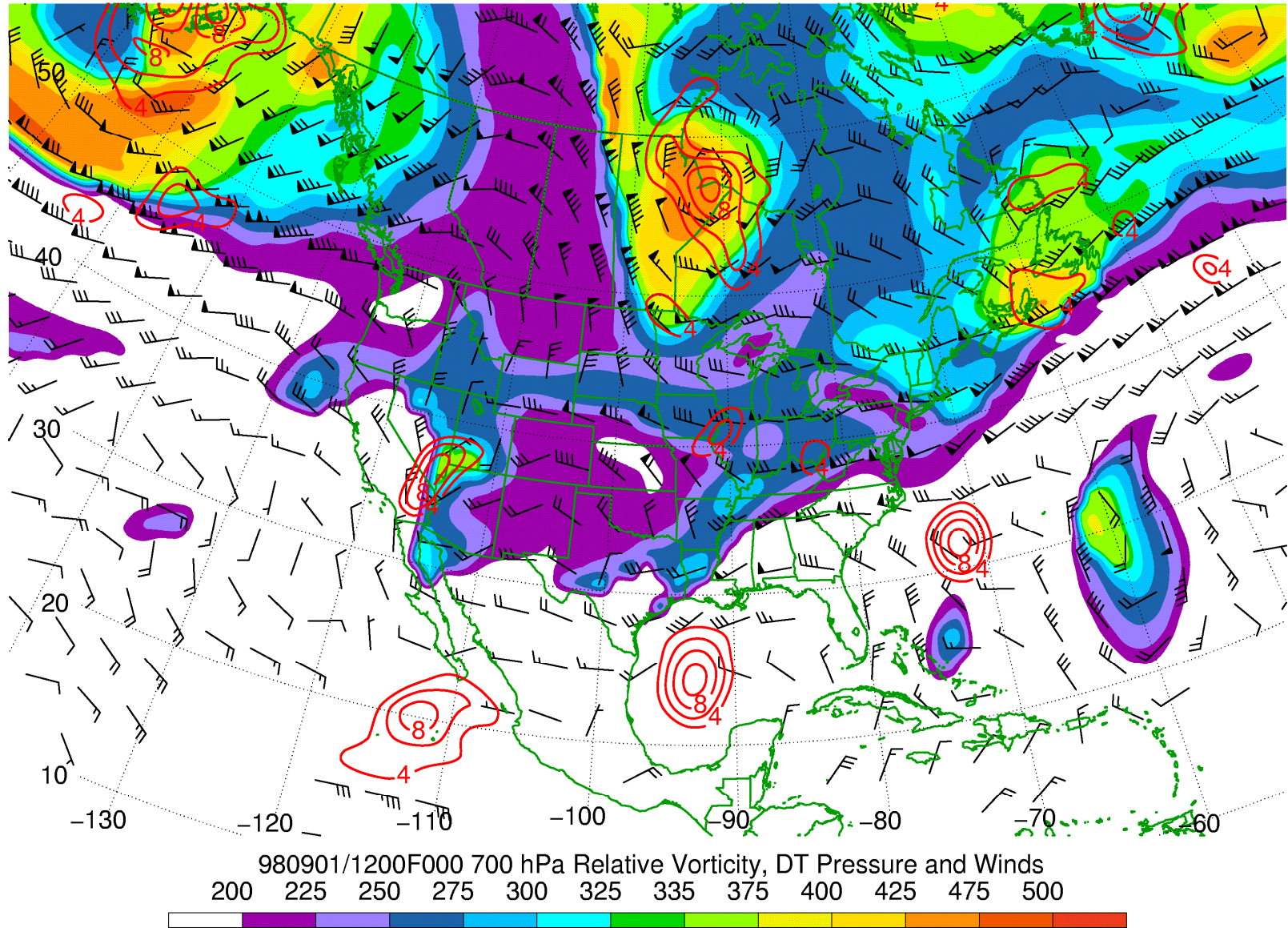
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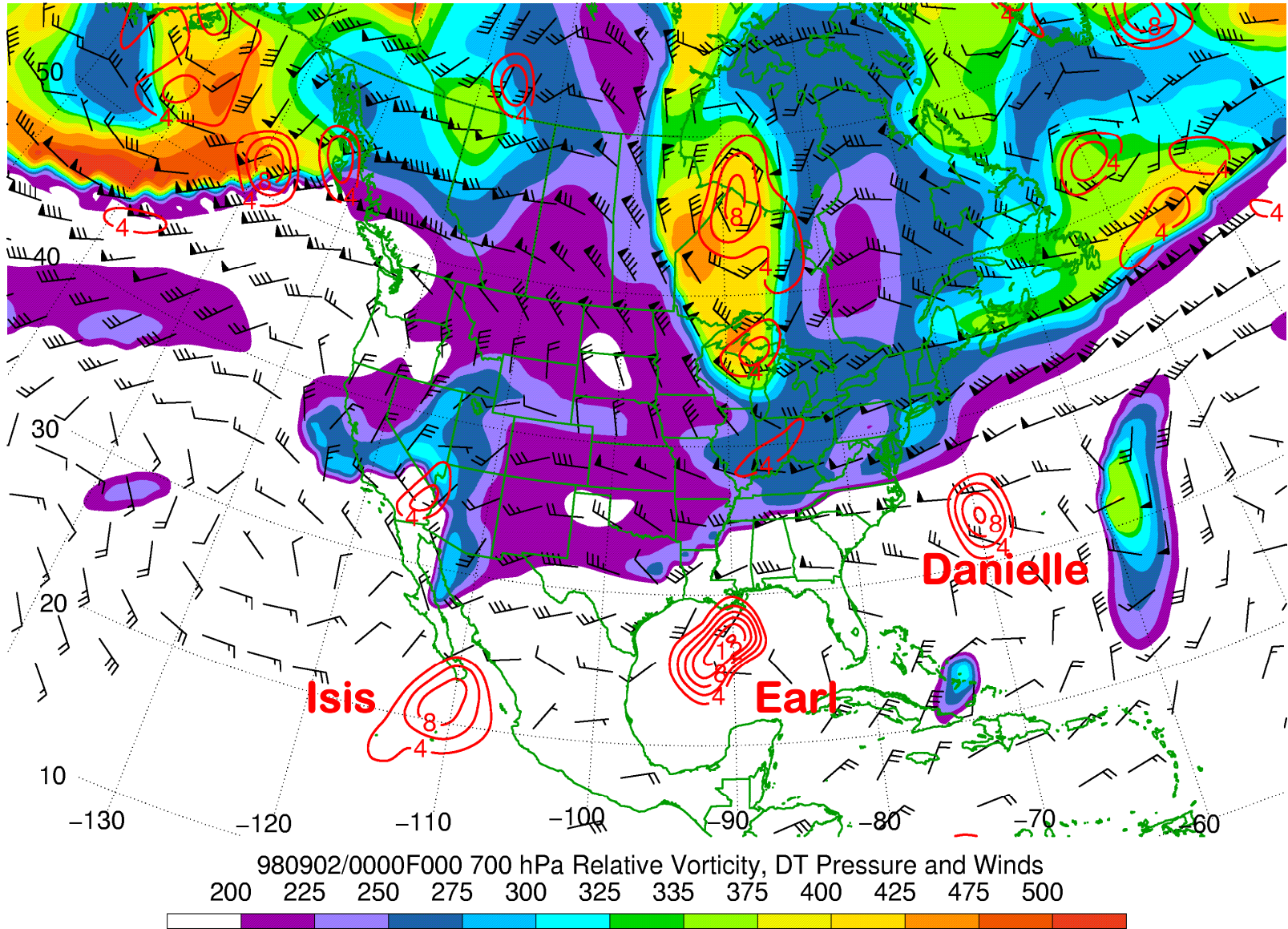
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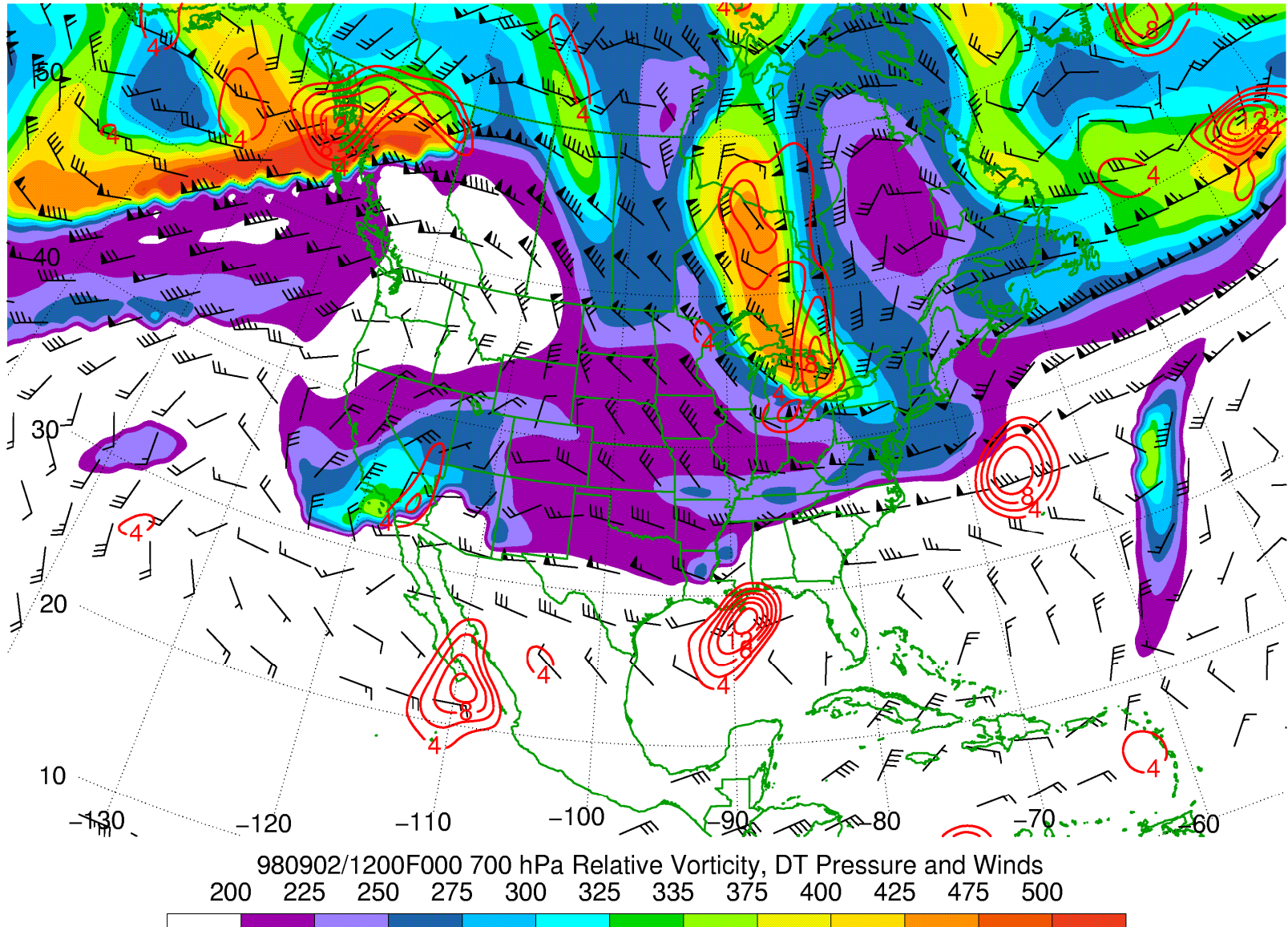
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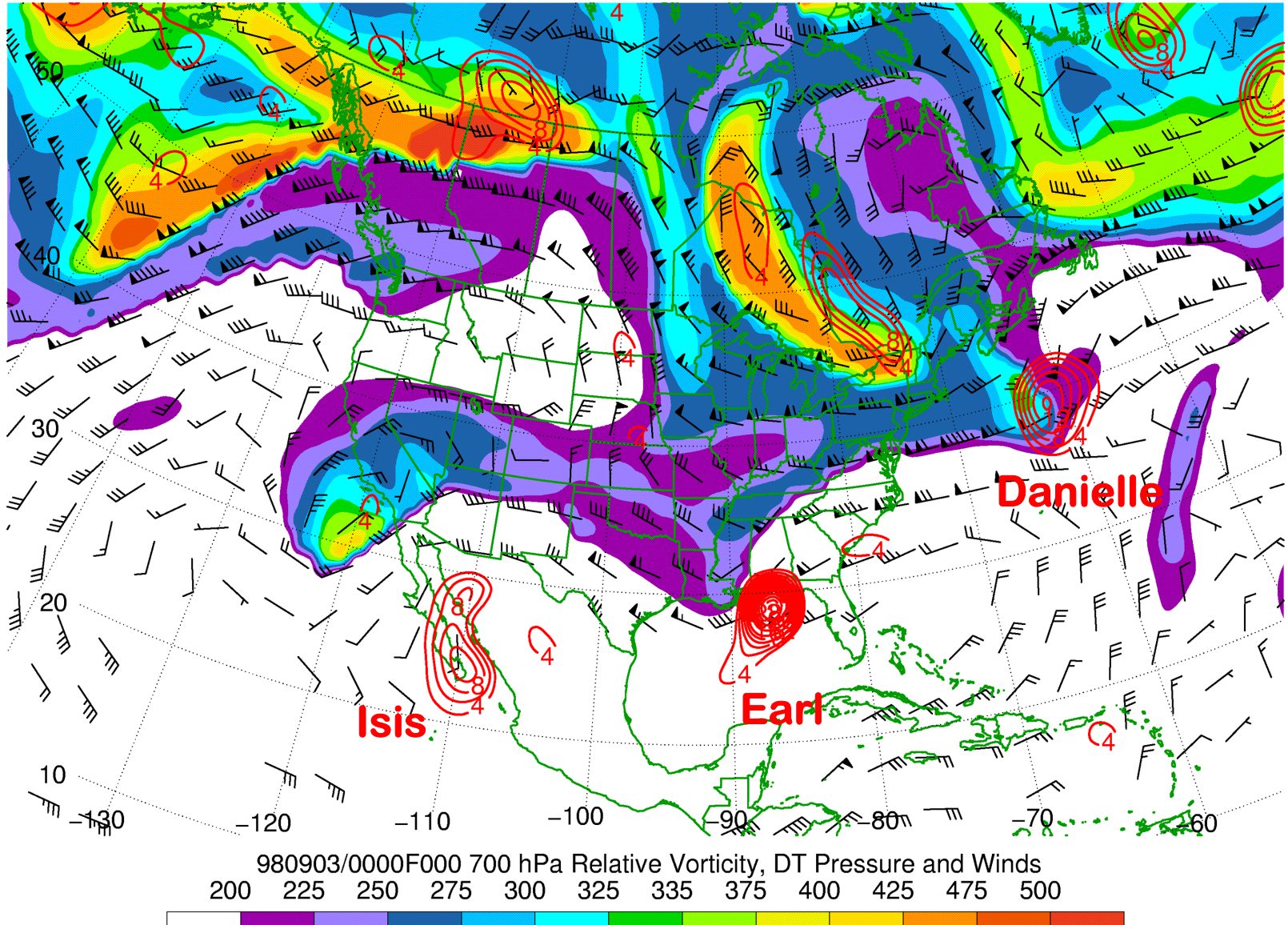
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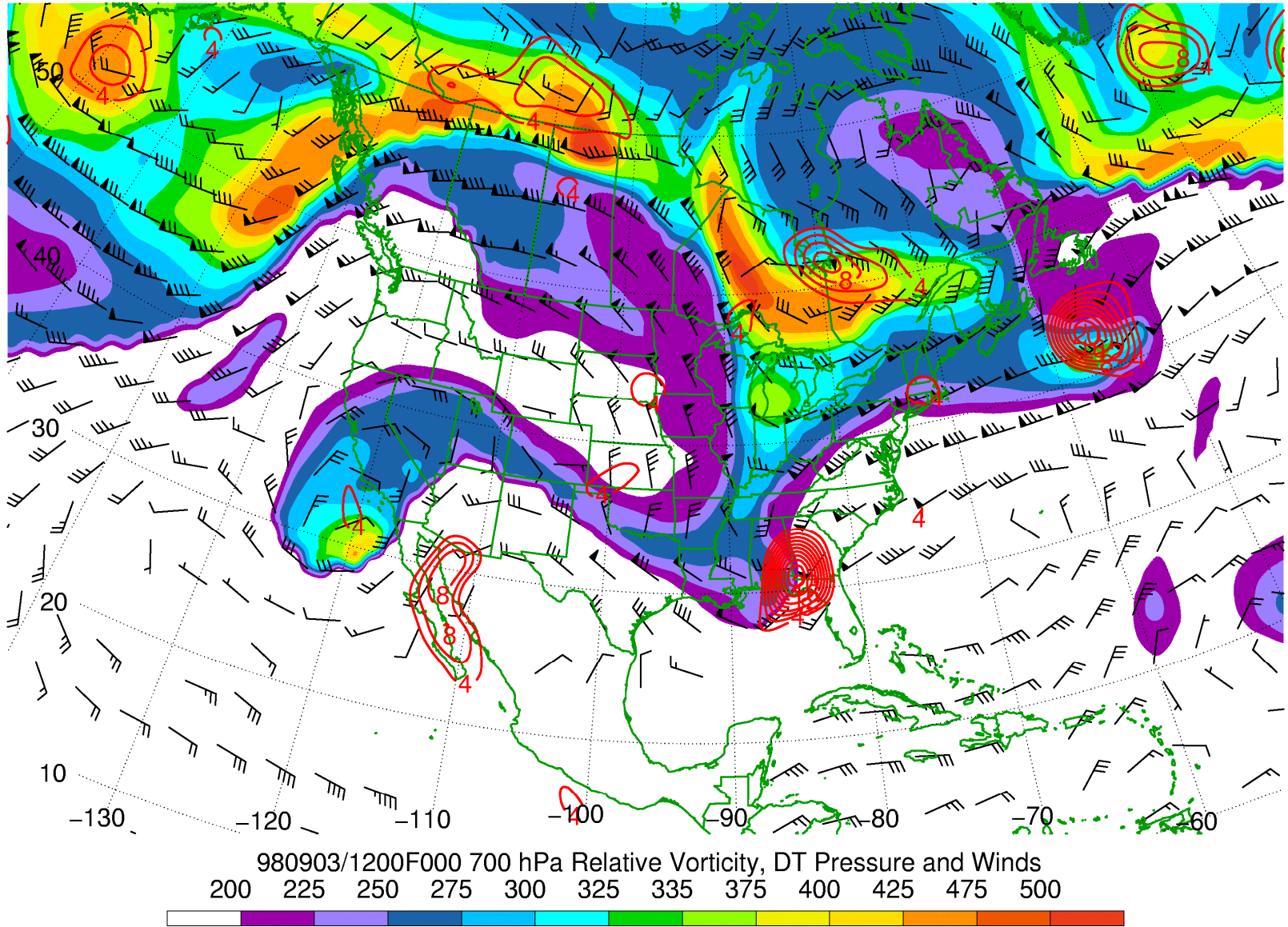
ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



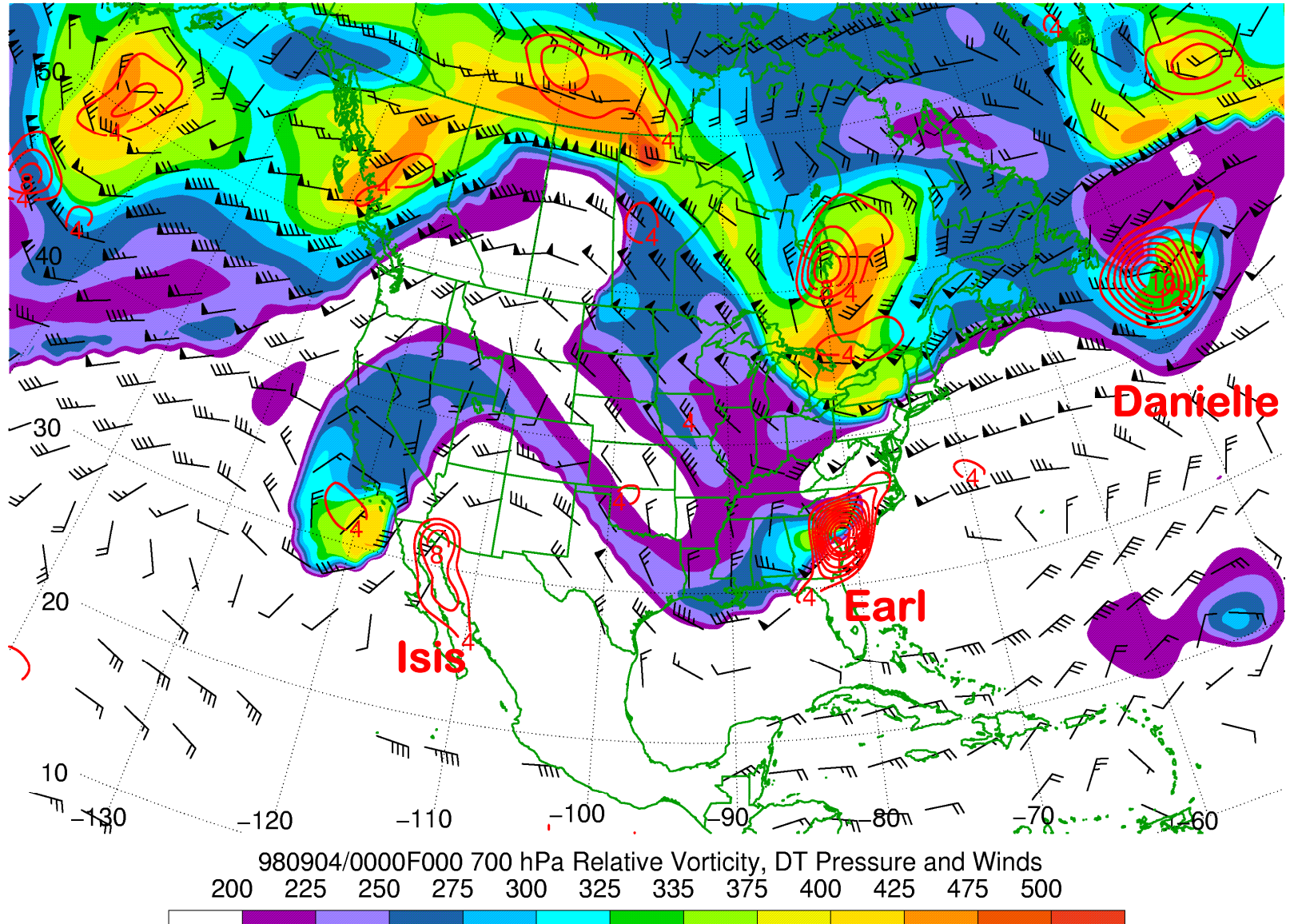
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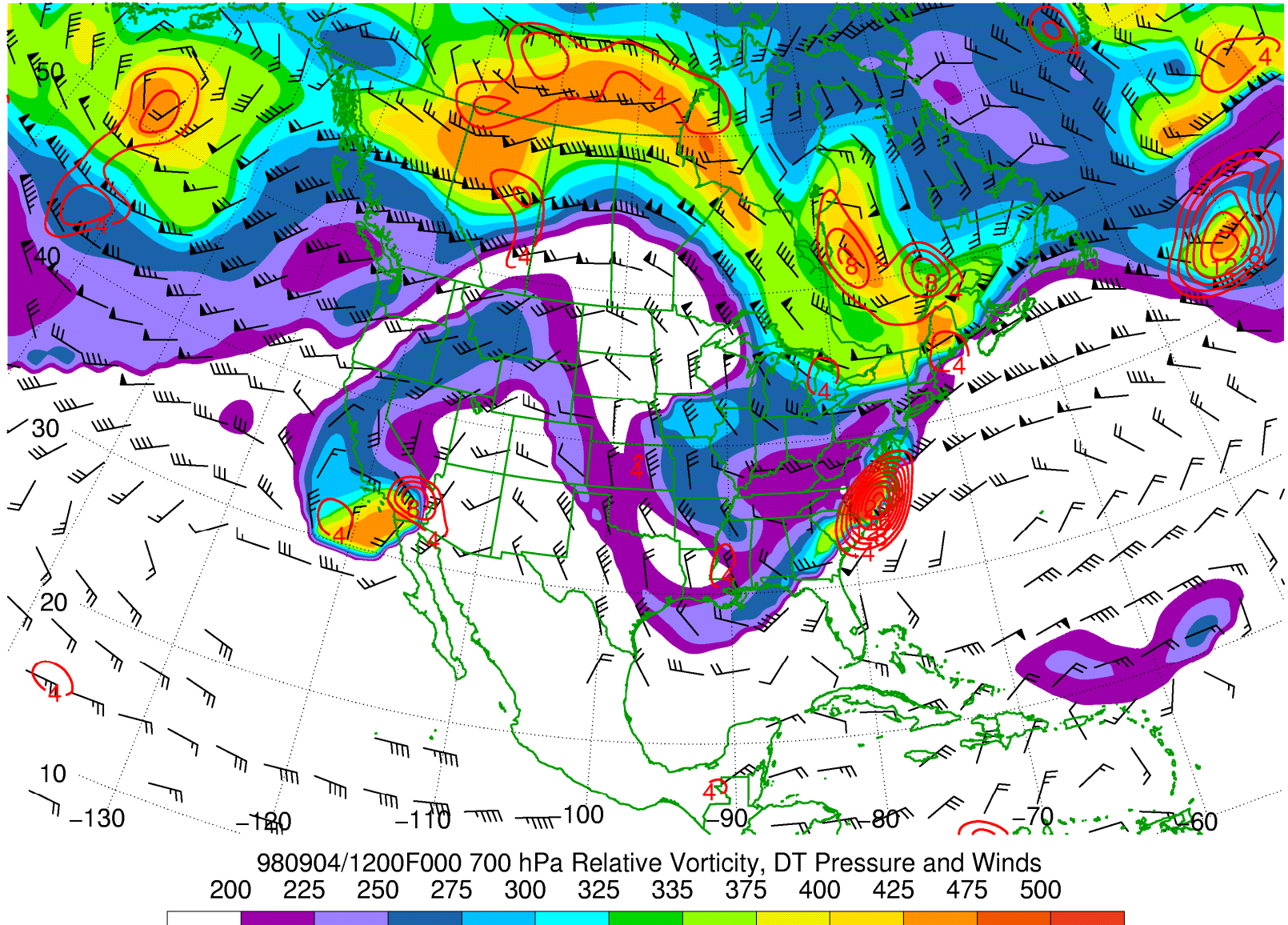
ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity

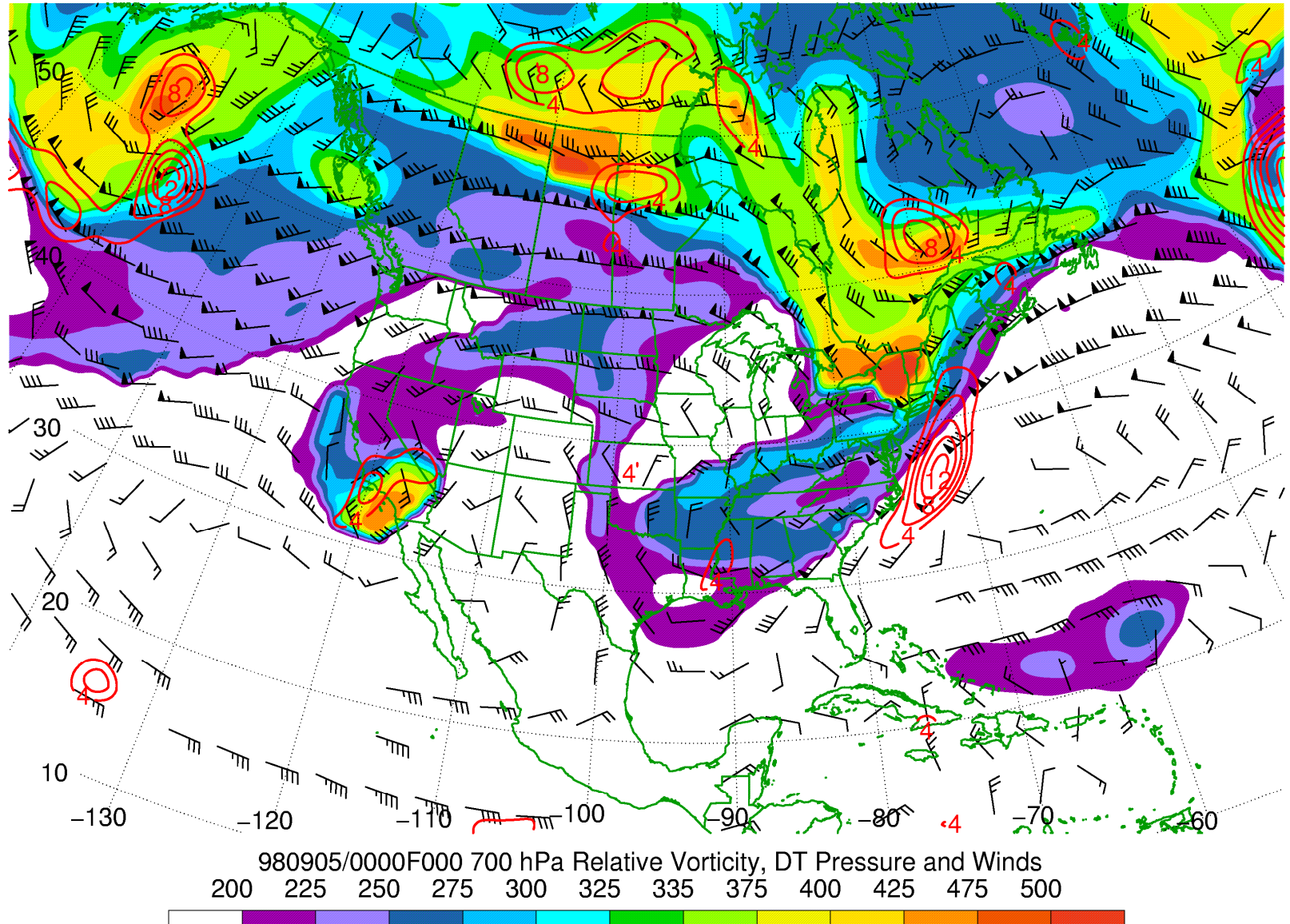


ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity

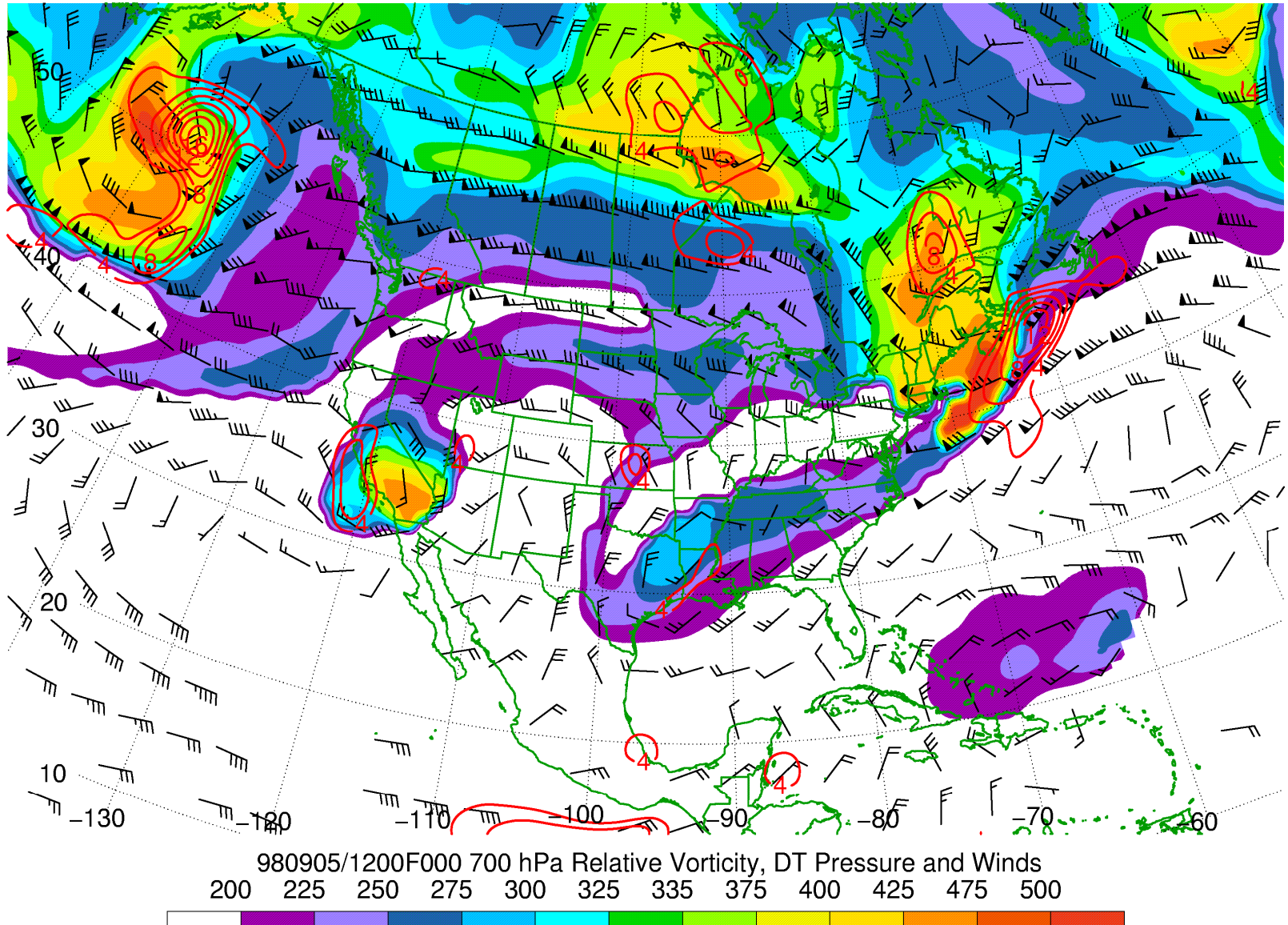


ERA40 Reanalysis

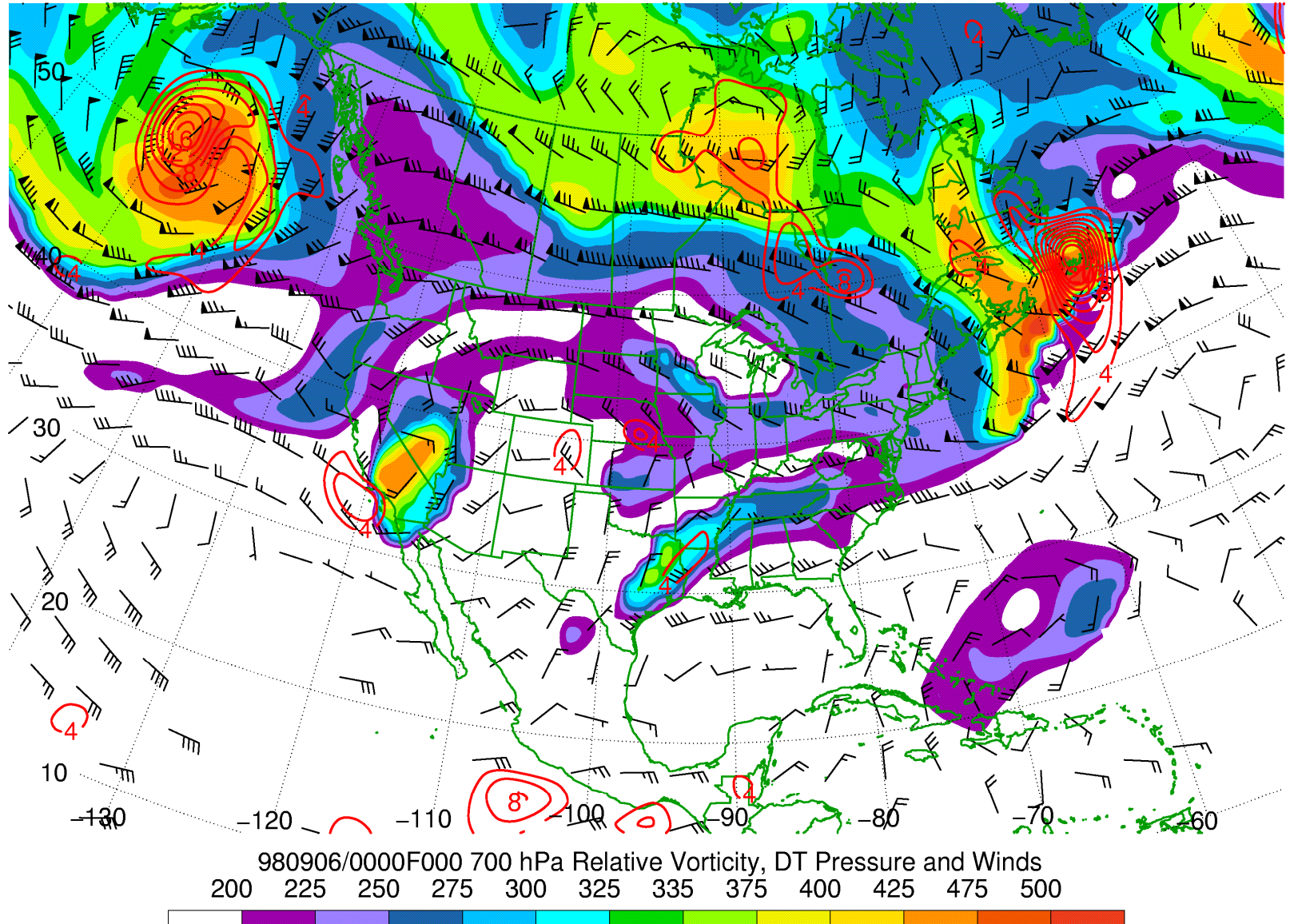
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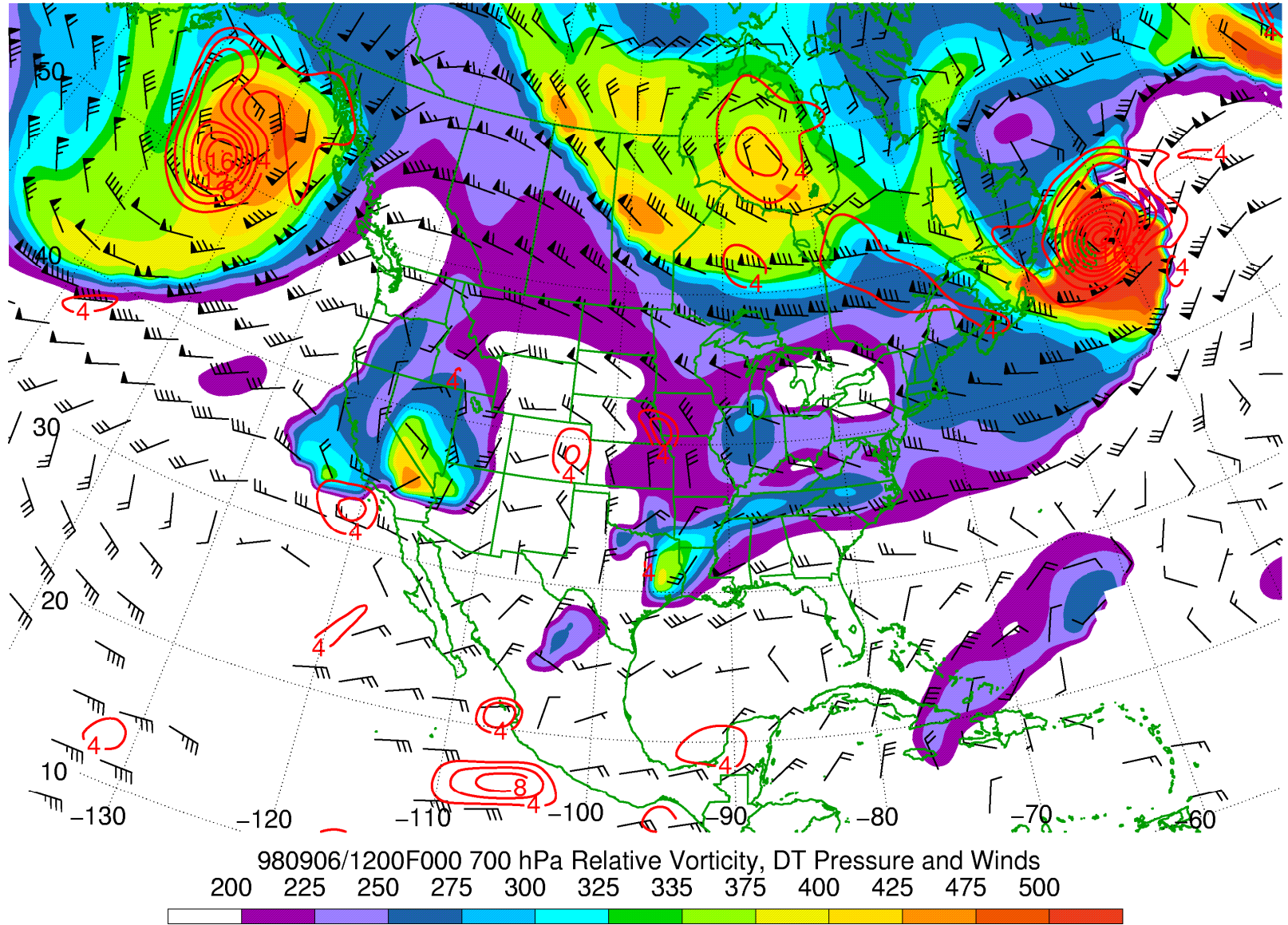
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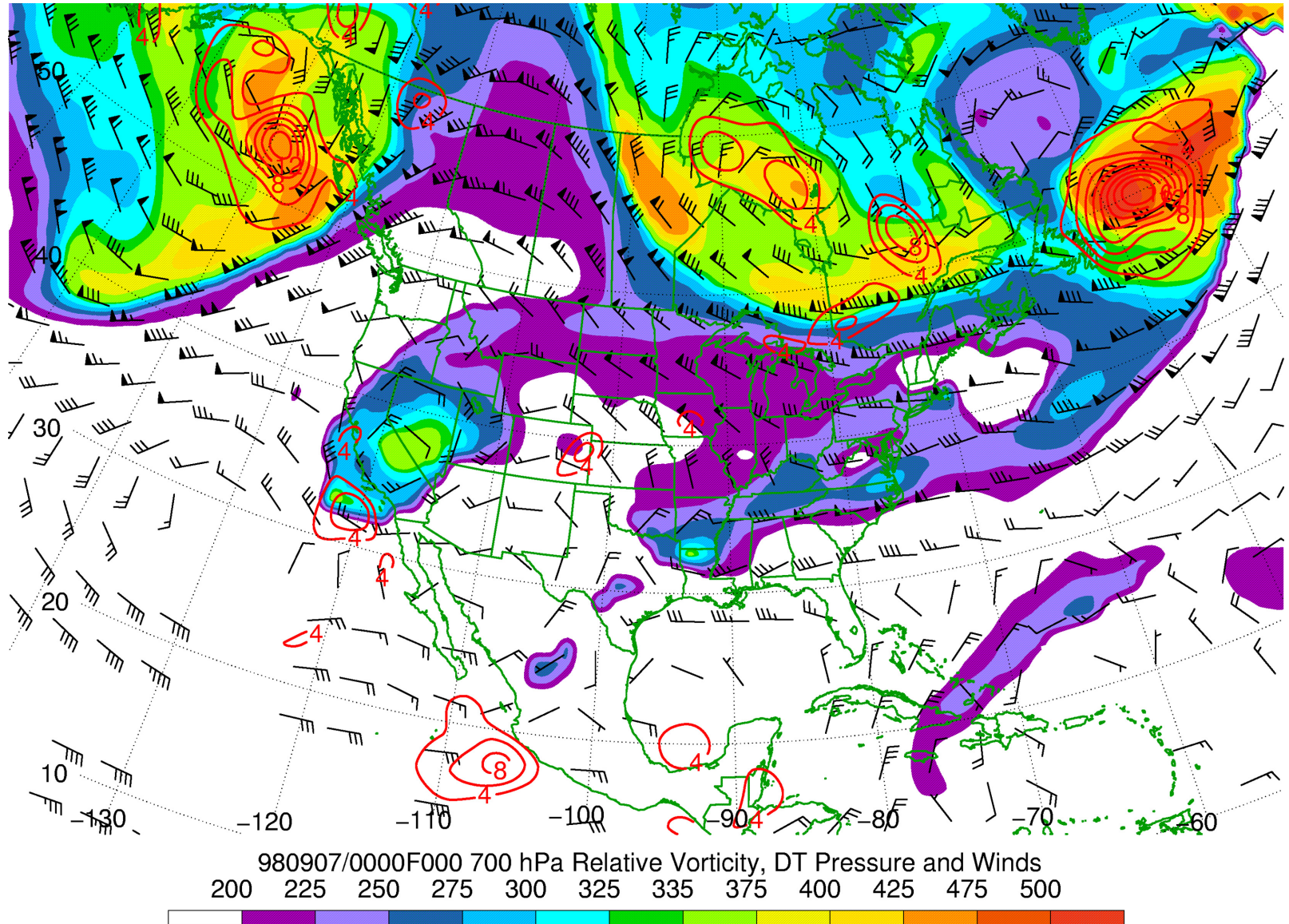
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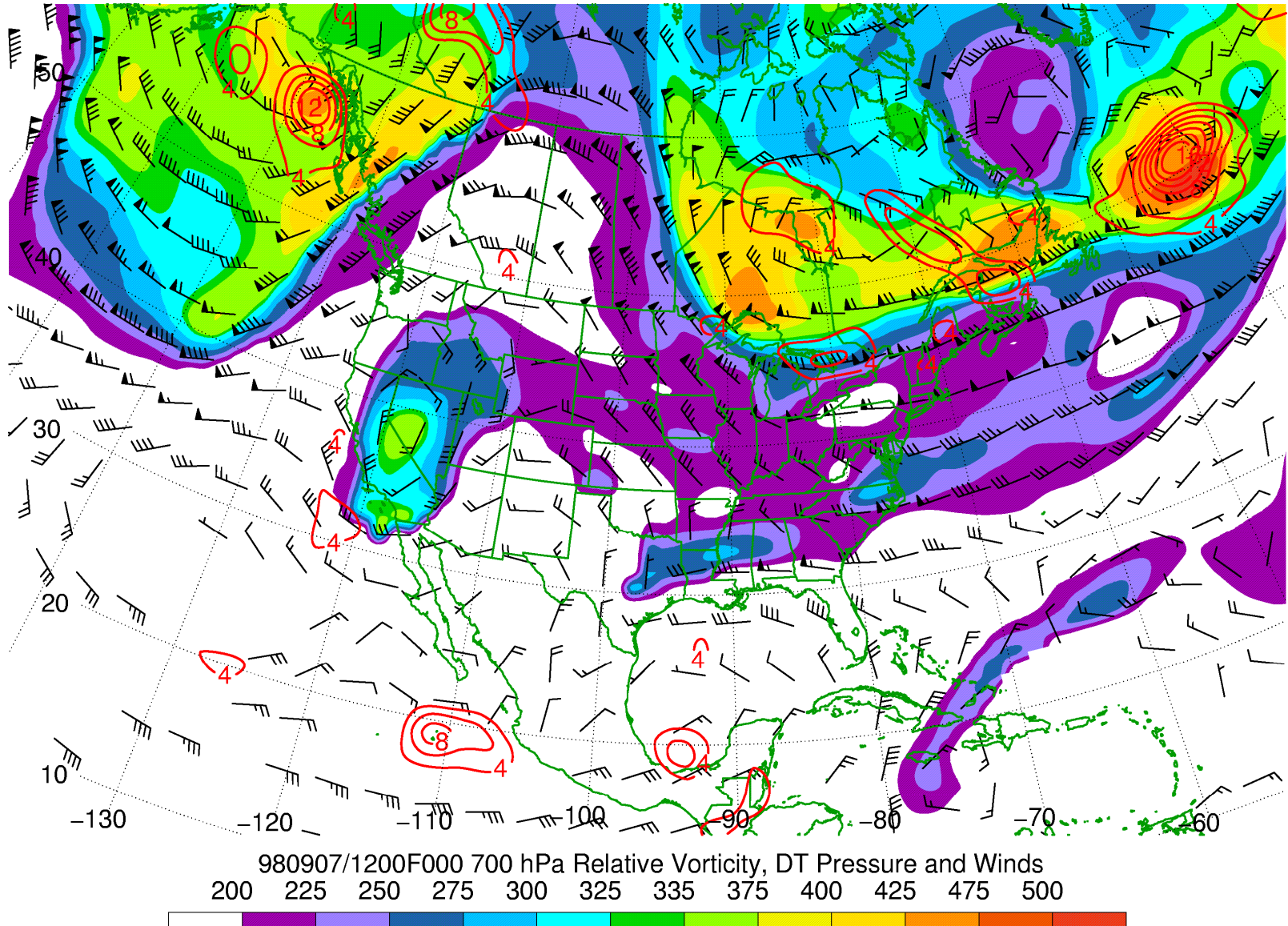
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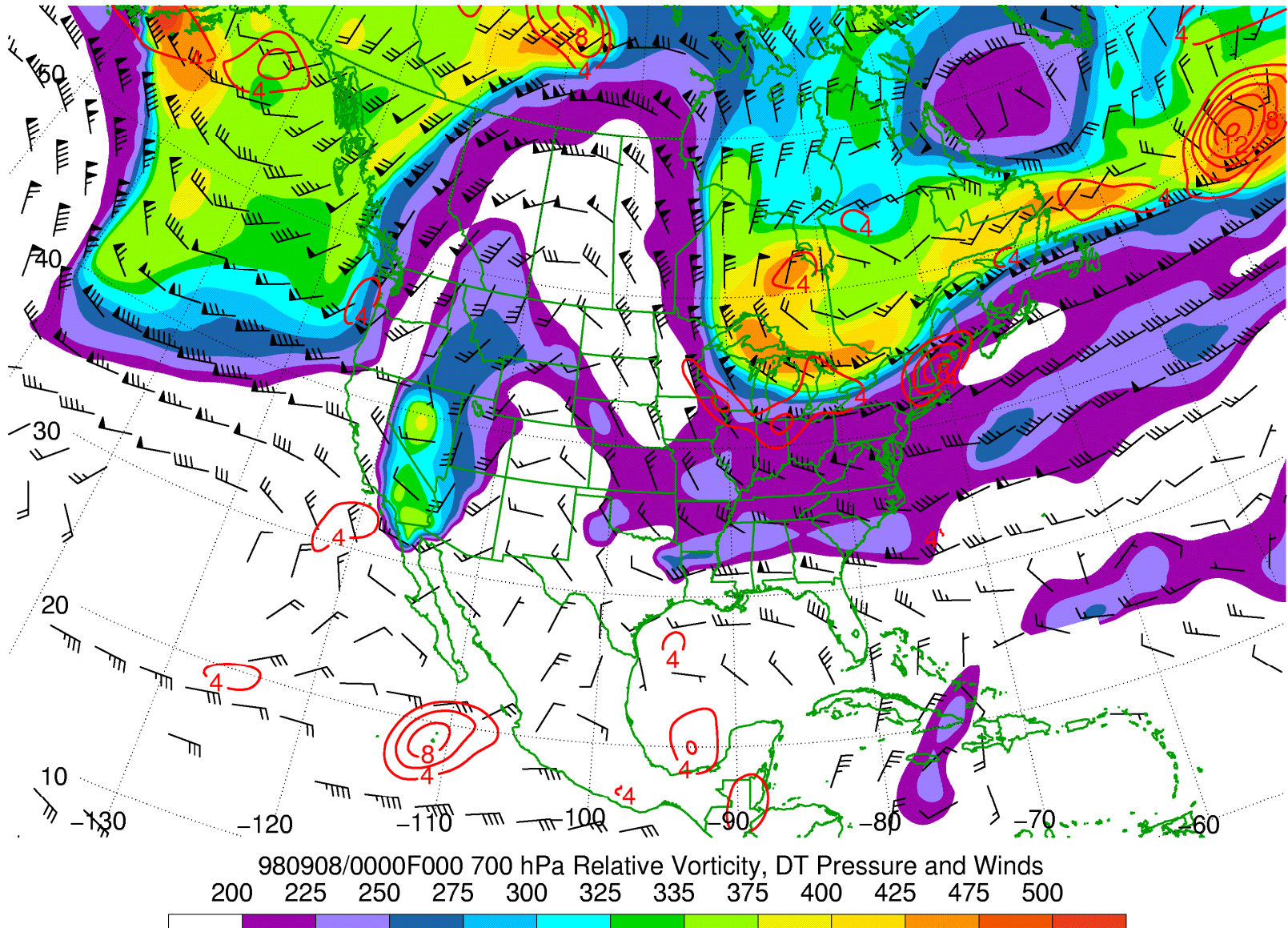
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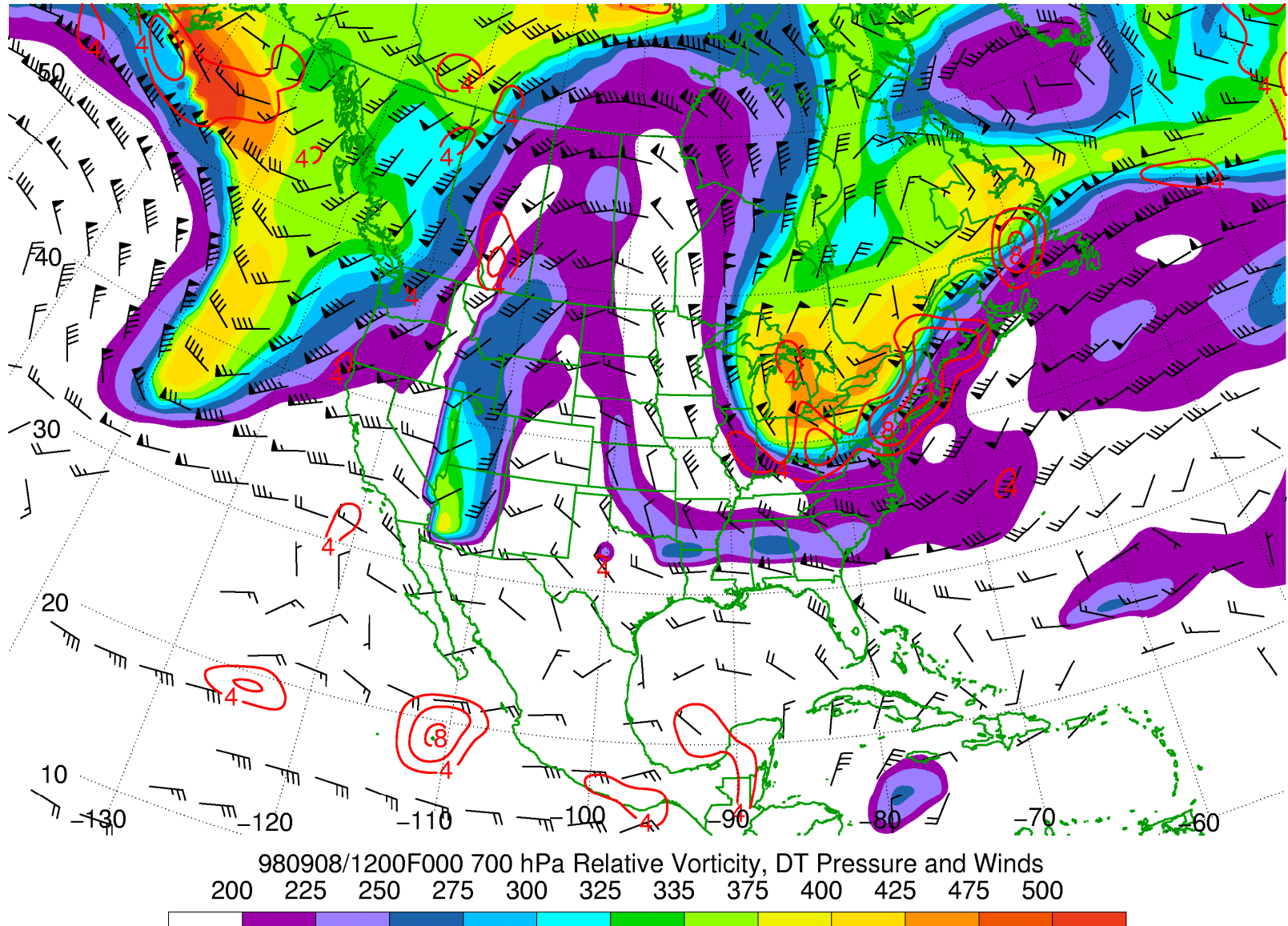


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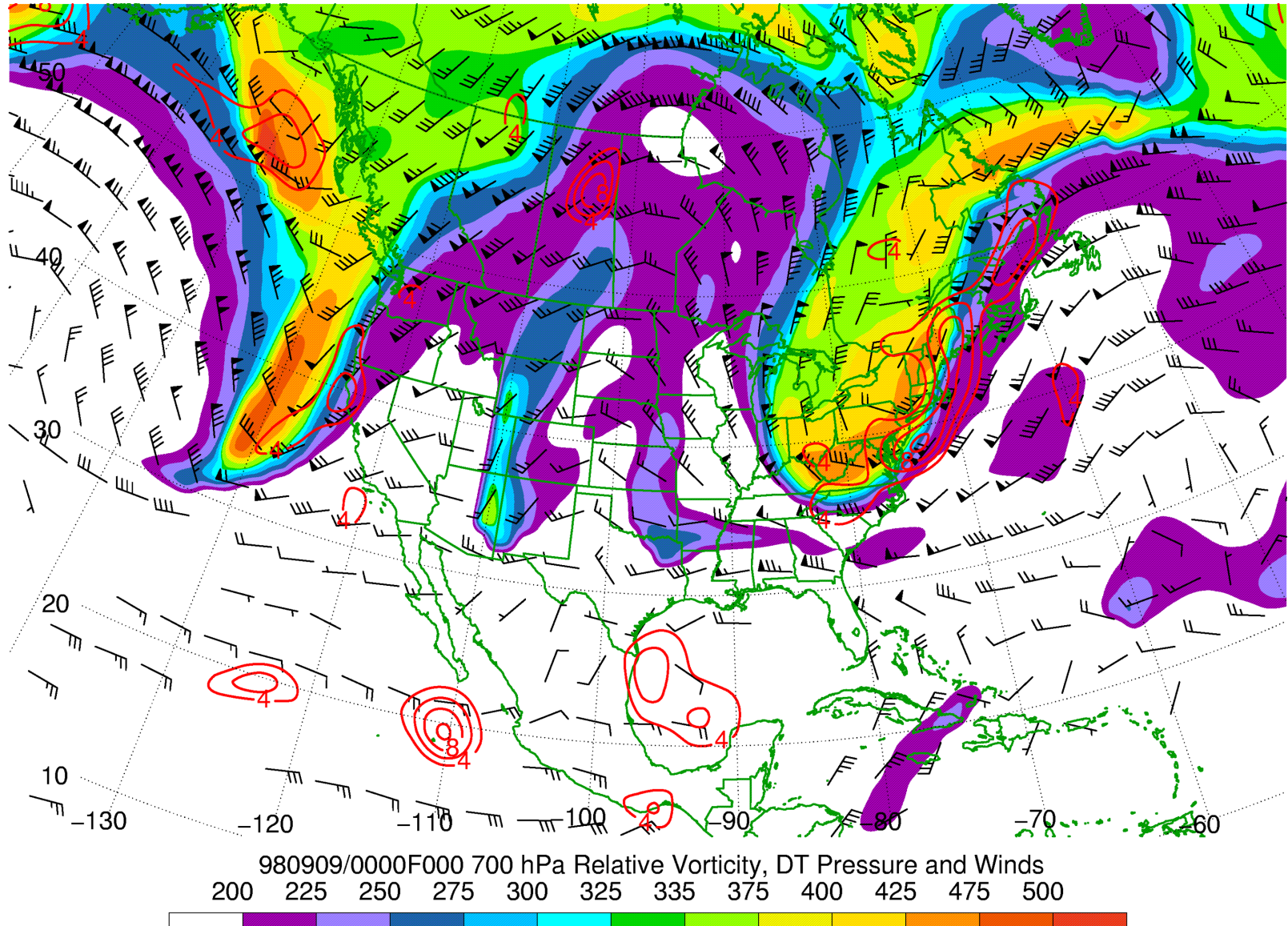


ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity

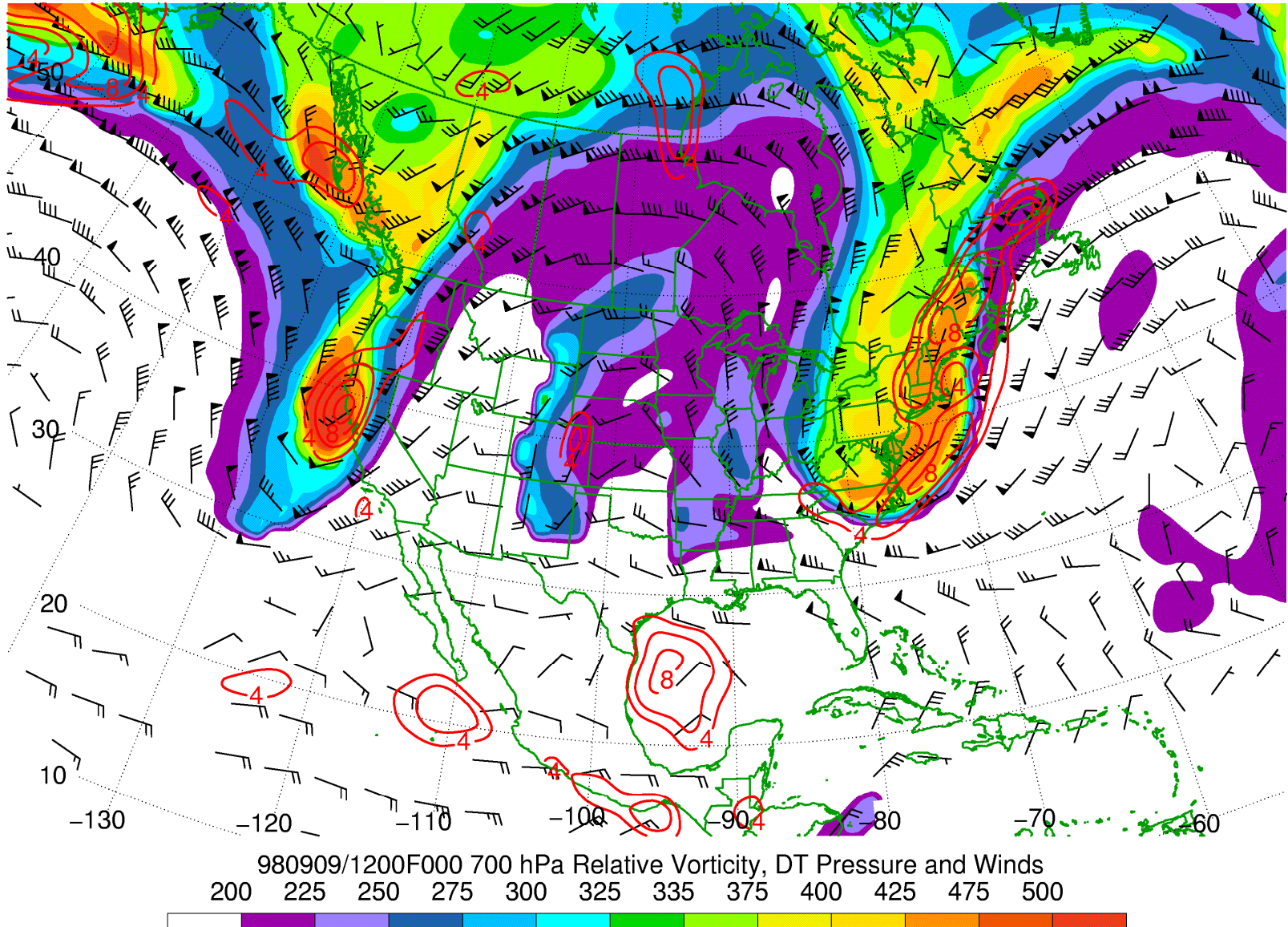


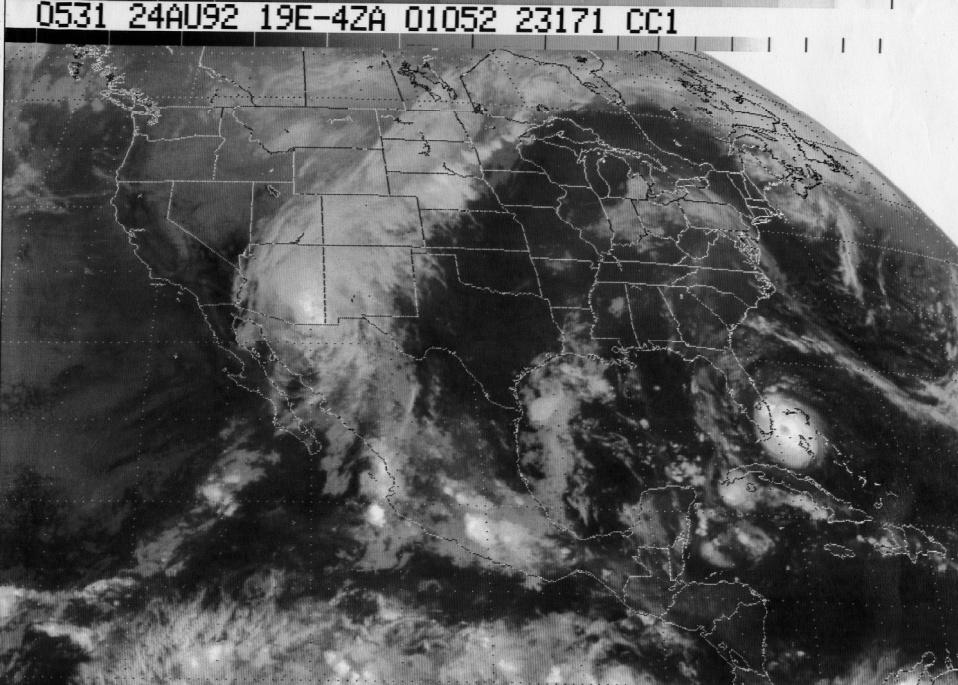
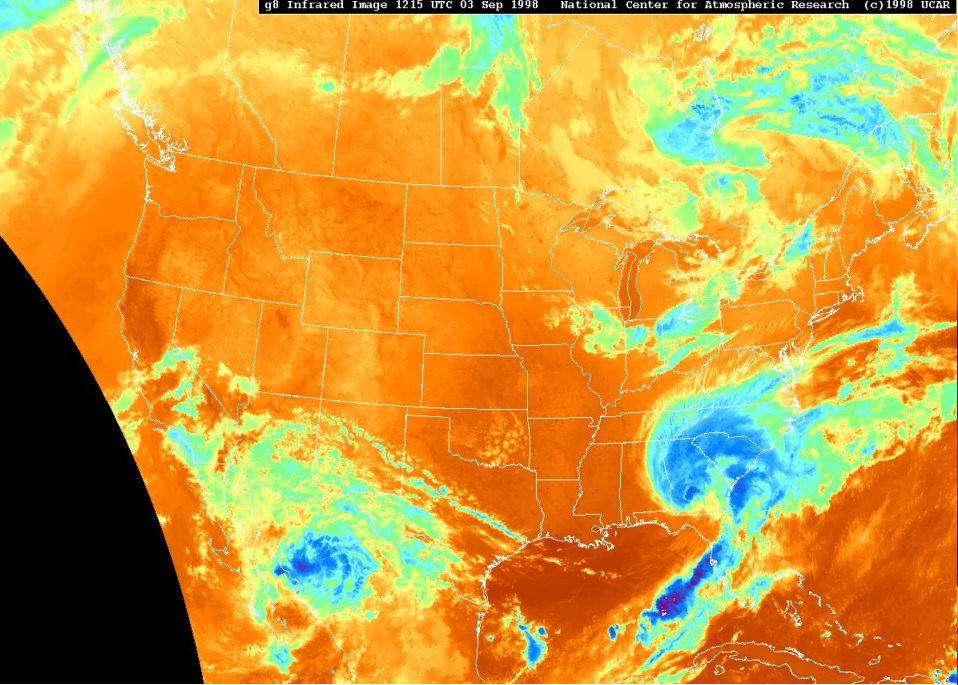
ERA40 Reanalysis DT pressure, DT winds, and 700 hPa relative vorticity



ERA40 Reanalysis

DT pressure, DT winds, and 700 hPa relative vorticity





Summary:

- Every 3 out of 4 years, TC remnants from the eastern North Pacific impact the southwest United States
- As the remnant TC vorticity and diabatic heating encroach on the mid-latitudes, a rich spectrum of interactions occur
- Extra-tropical transition, the development of cutoffs, lee cyclogenesis and downstream development

Future Work:

- Examine flow evolution on the DT for all long-lived TC remnants
- Look for upstream “enemy action” from the west Pacific
- Investigate the forecasts of recurving east Pacific TCs and explore the predictability of these events

