



Improving Summer-Time Convective Wind Forecasting in the Southeastern United States



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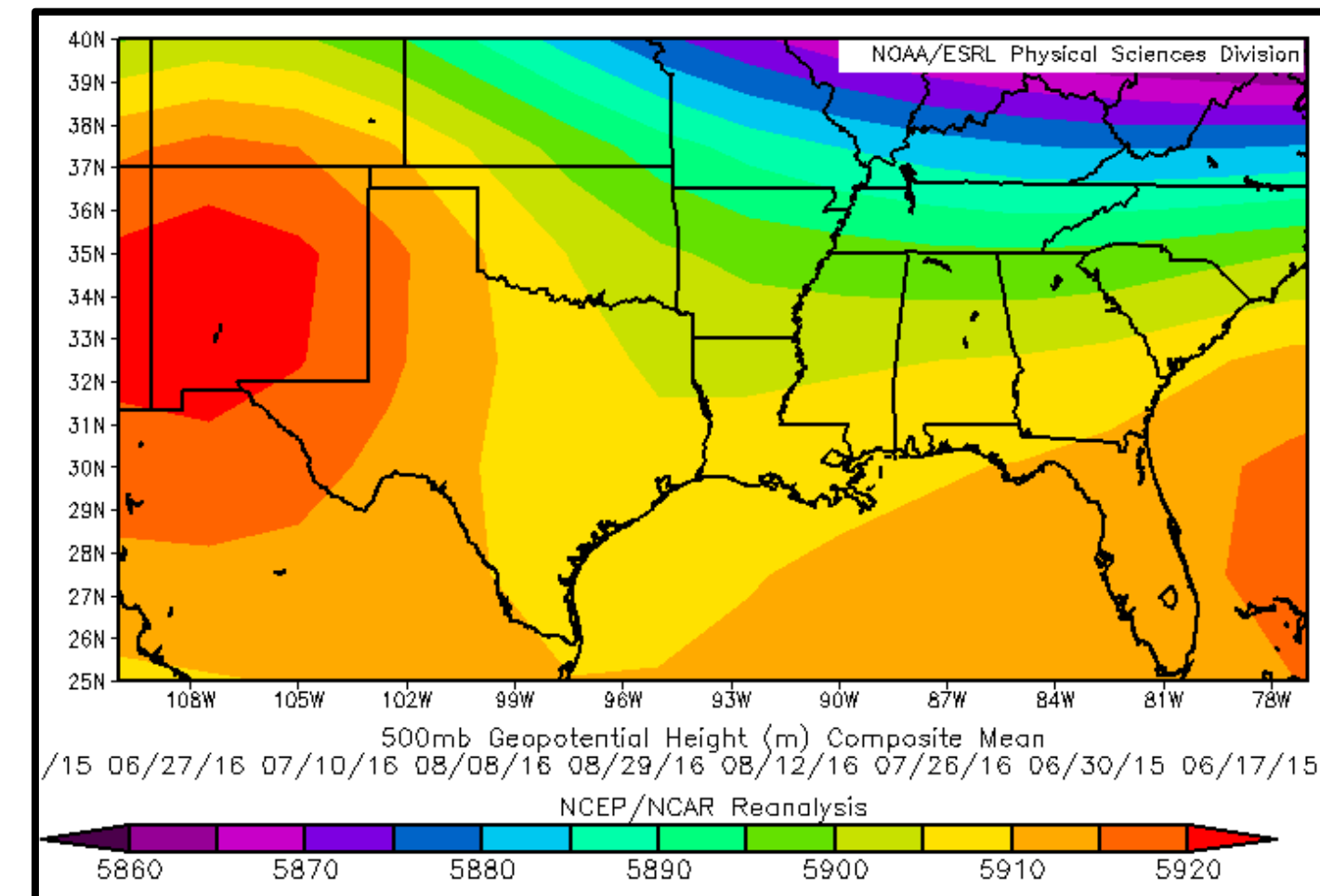
Introduction/Abstract

The United States Air Force's (USAF) 26th Operational Weather Squadron (26 OWS) has hazardous weather warning responsibility for approximately 150 sites and bases stretching across the southern United States. USAF weather forecasters face a daunting challenge in that most customers require a one hour lead time for warnings of "moderate thunderstorms". These products are issued when thunderstorms are expected to produce wind gusts from 35 to 49 knots and/or hail sizes of ¼ to ¾ inches. While not considered "severe" convection by National Weather Service definition, these storms still pose a threat to life and government property. Improving the detection and forecast accuracy of these storms, while maintaining sufficient lead time, will increase the confidence of military decision makers to take the necessary actions in order to save lives and protect millions of dollars in aircraft and other high value assets.

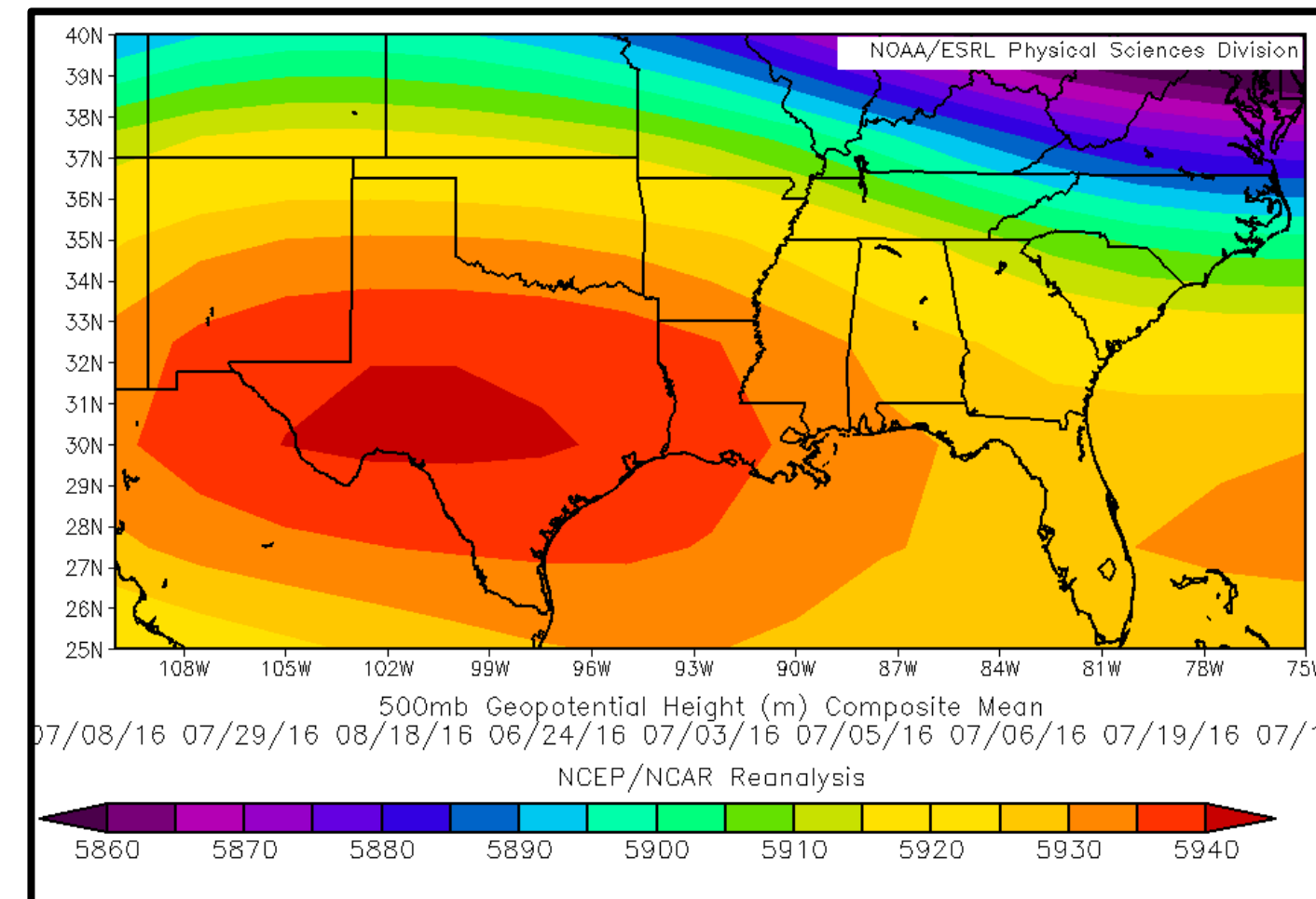
This poster will focus on improving warning detection of convective winds gusts of 35-49 knots that frequently occur across the 26 OWS' area of responsibility from June through August. Weak cold fronts, surface troughs, and/or an upper trough (500hPa/850hPa) were found to be good predictors of the potential for "moderate thunderstorms". Additionally; several instability, moisture and shear variables were found to be useful predictors. As a result of these findings, a checklist approach will be used leveraging the parameters found useful to help the forecaster assess the threat and then issue the required warnings.

500hPa Synoptic Pattern for Convective Wind Gusts 35-49 Knots

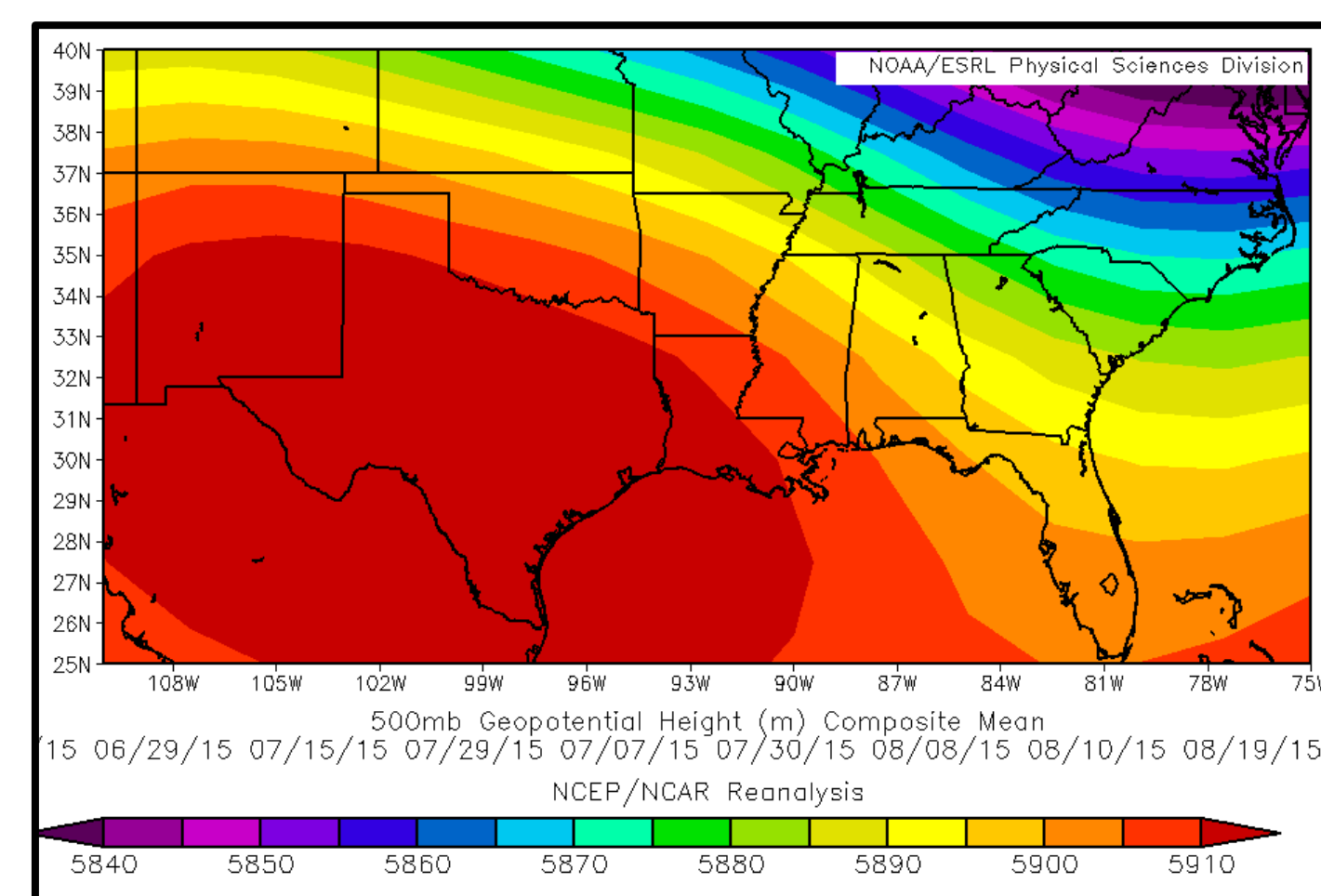
500hPa mean for Louisiana



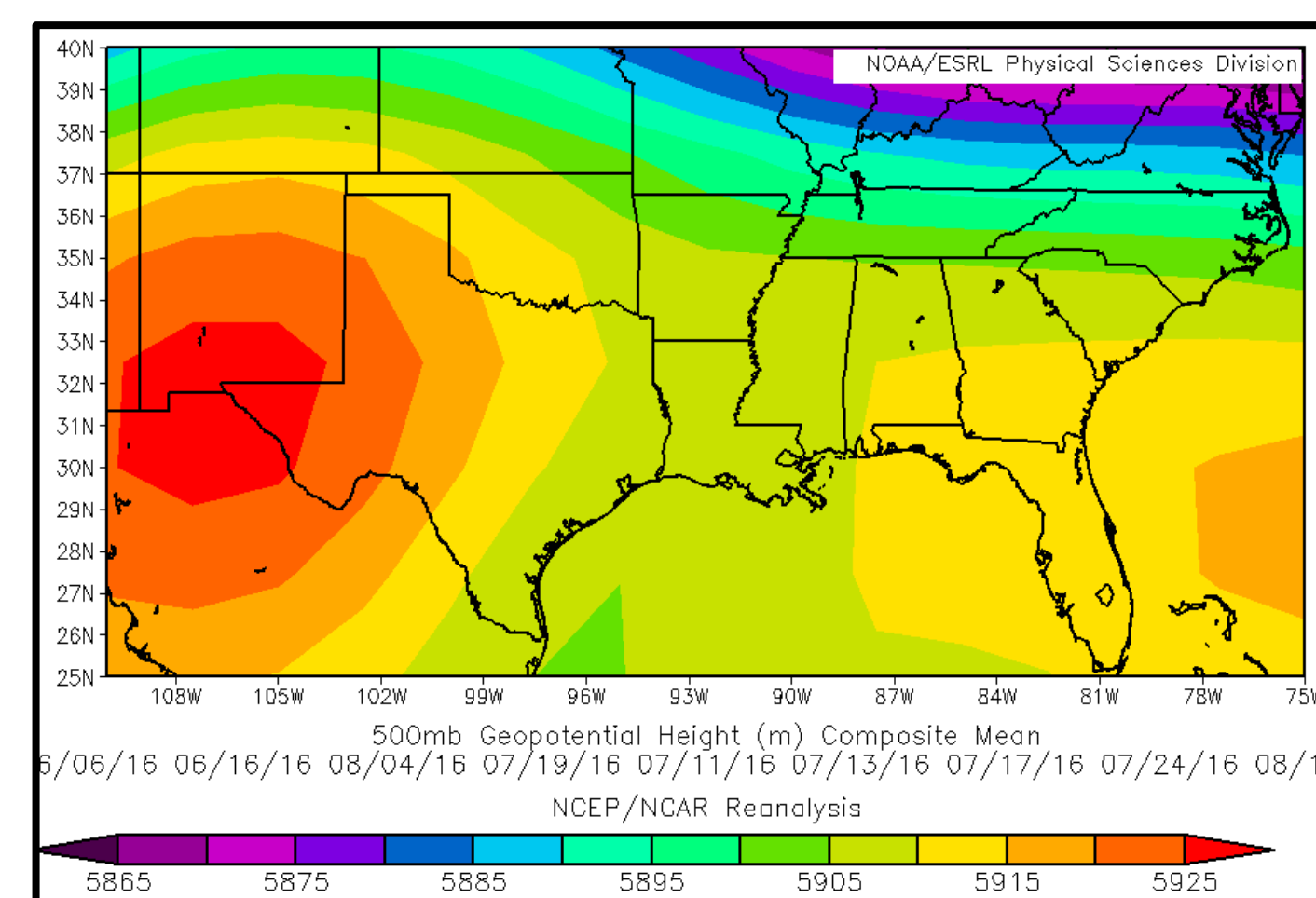
500hPa mean for South Carolina



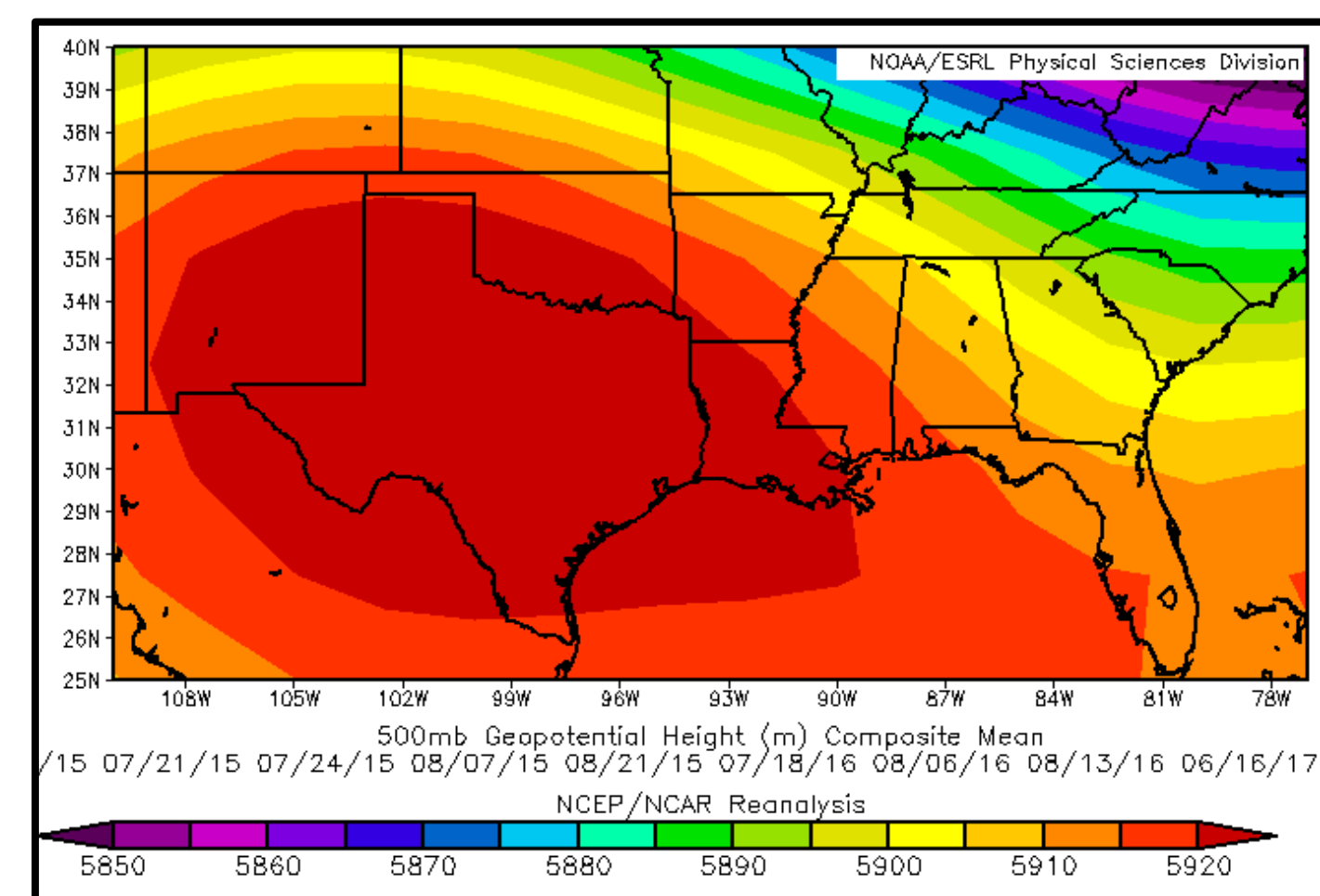
500hPa mean for Mississippi



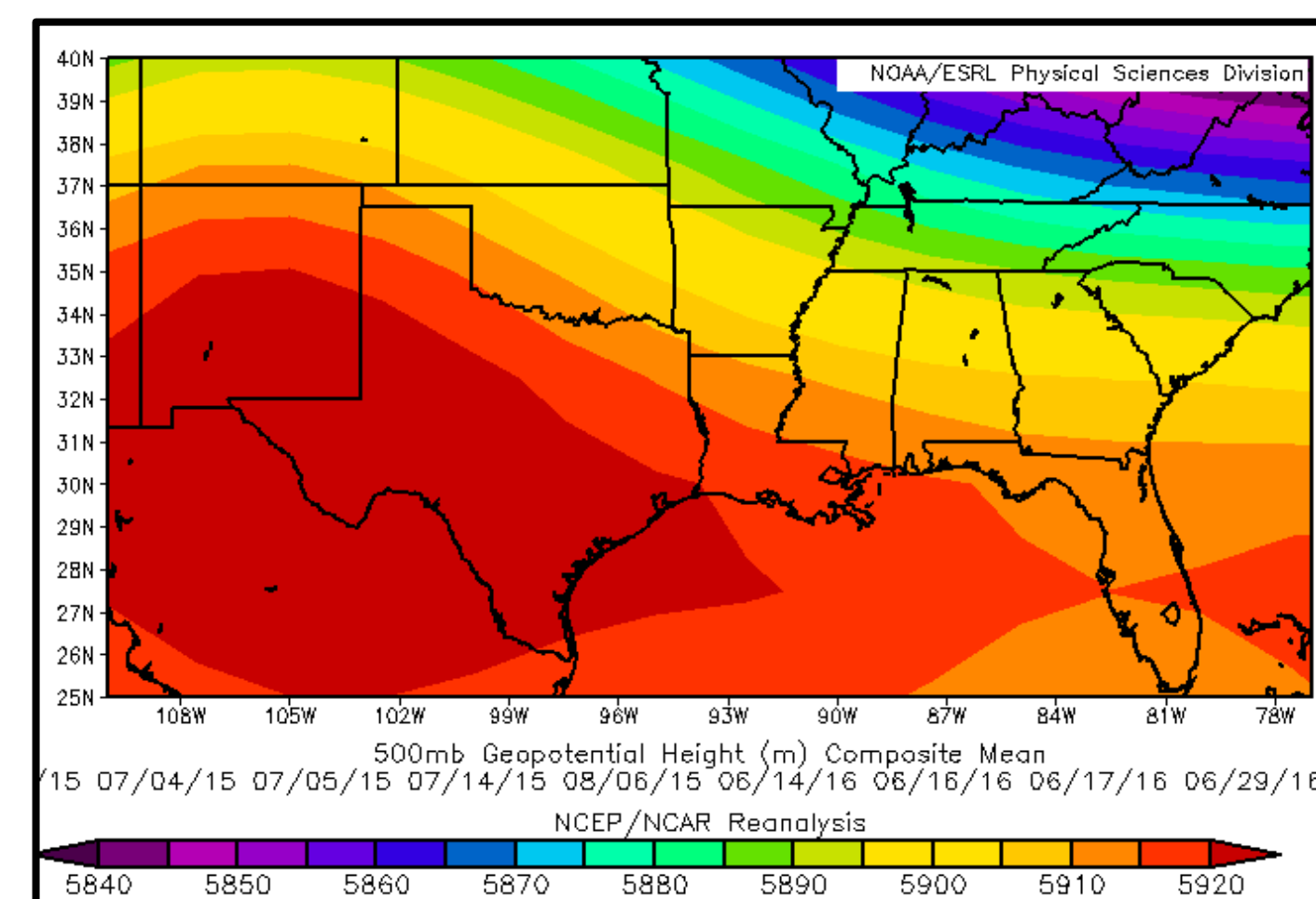
500hPa mean for Florida



500hPa mean for Alabama



500hPa mean for Georgia

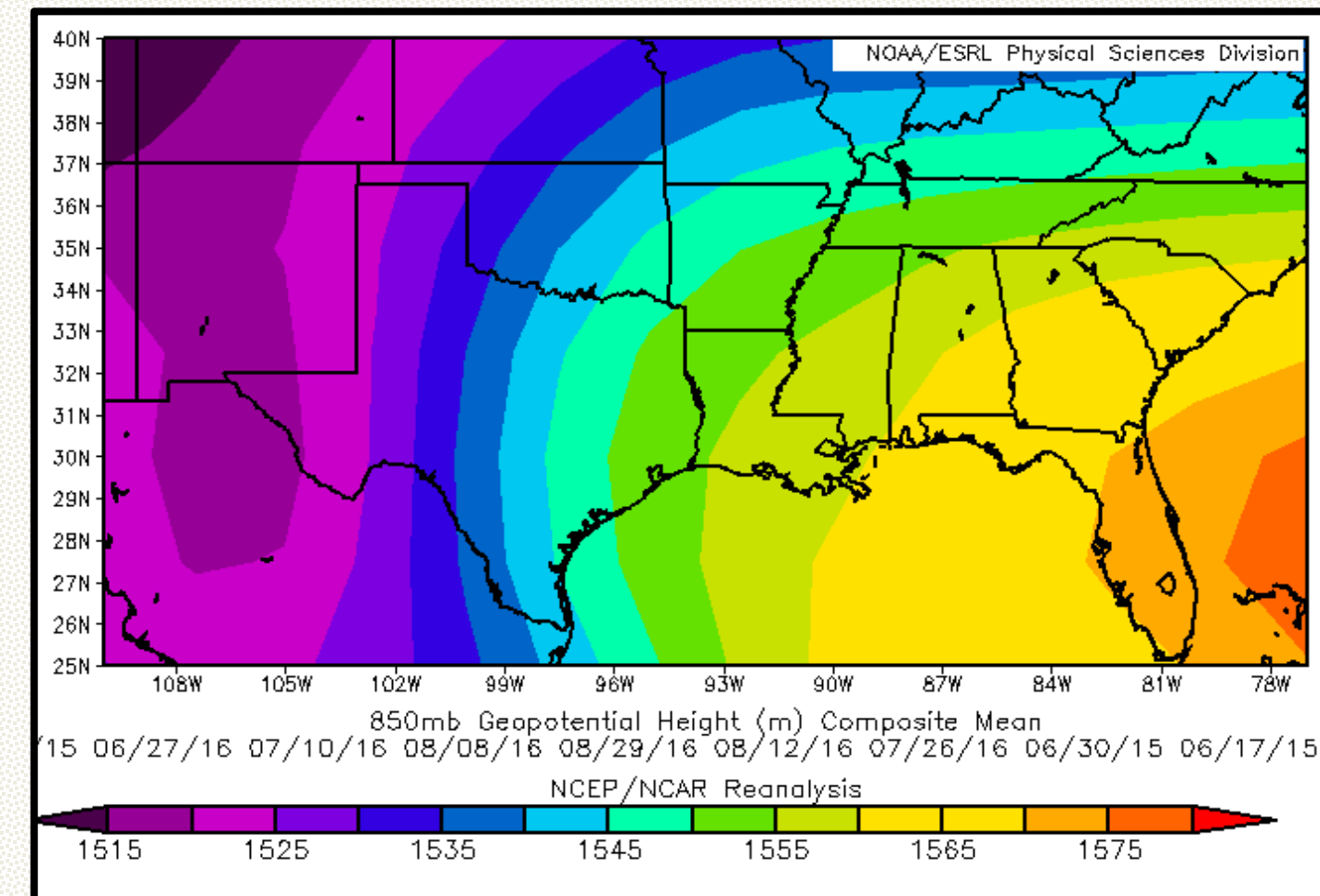


Key Features

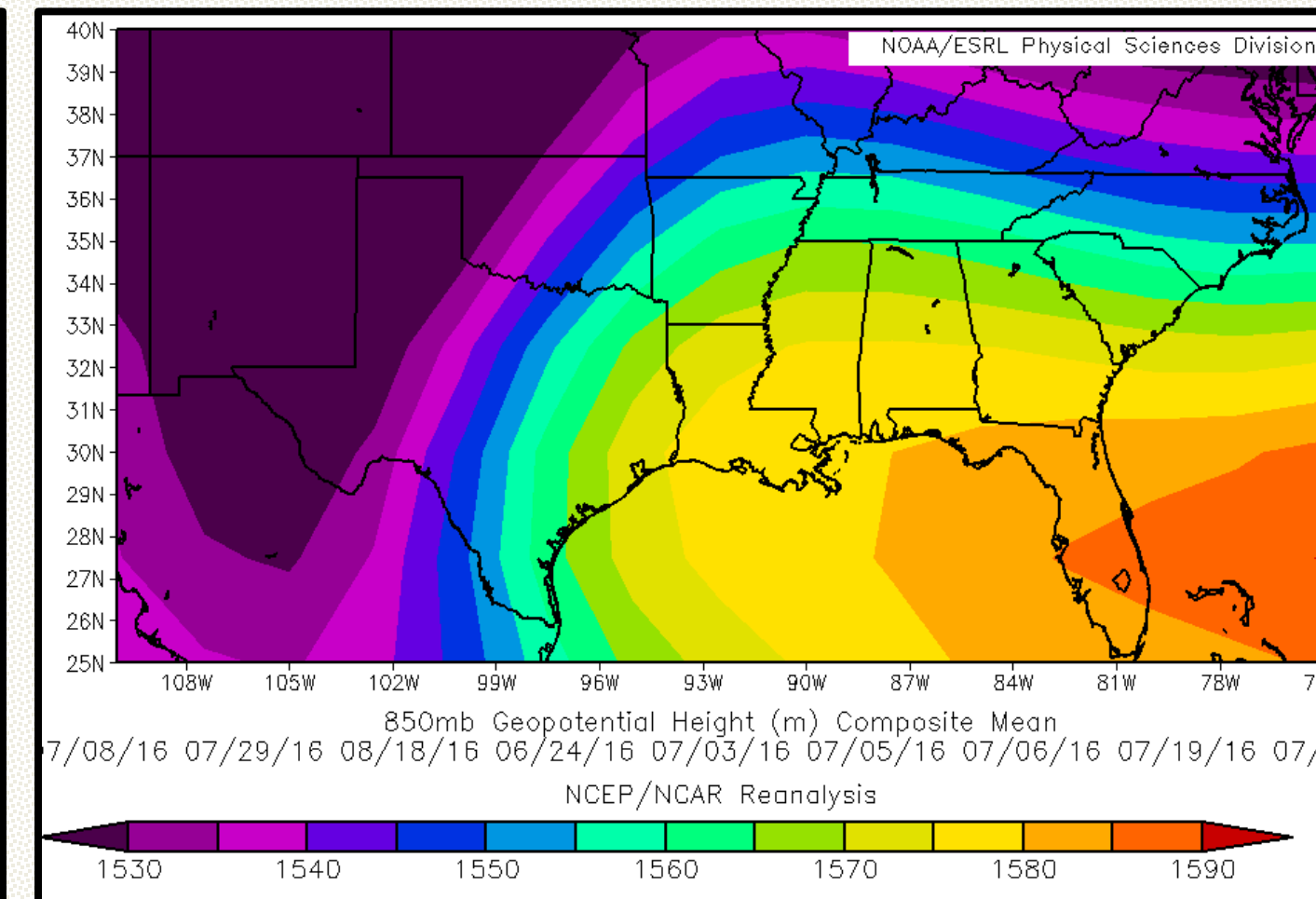
- Trough across southeast US with the subtropical ridge pushed slightly south from climatological position and high pressure centered near New Mexico and Texas.
- West to northwest wind is anomalously strong across southern US (not shown)
- Florida events - south to southeast 500hPa flow (slight positive anomaly)

850hPa Synoptic Pattern for Convective Wind Gusts 35-49 Knots

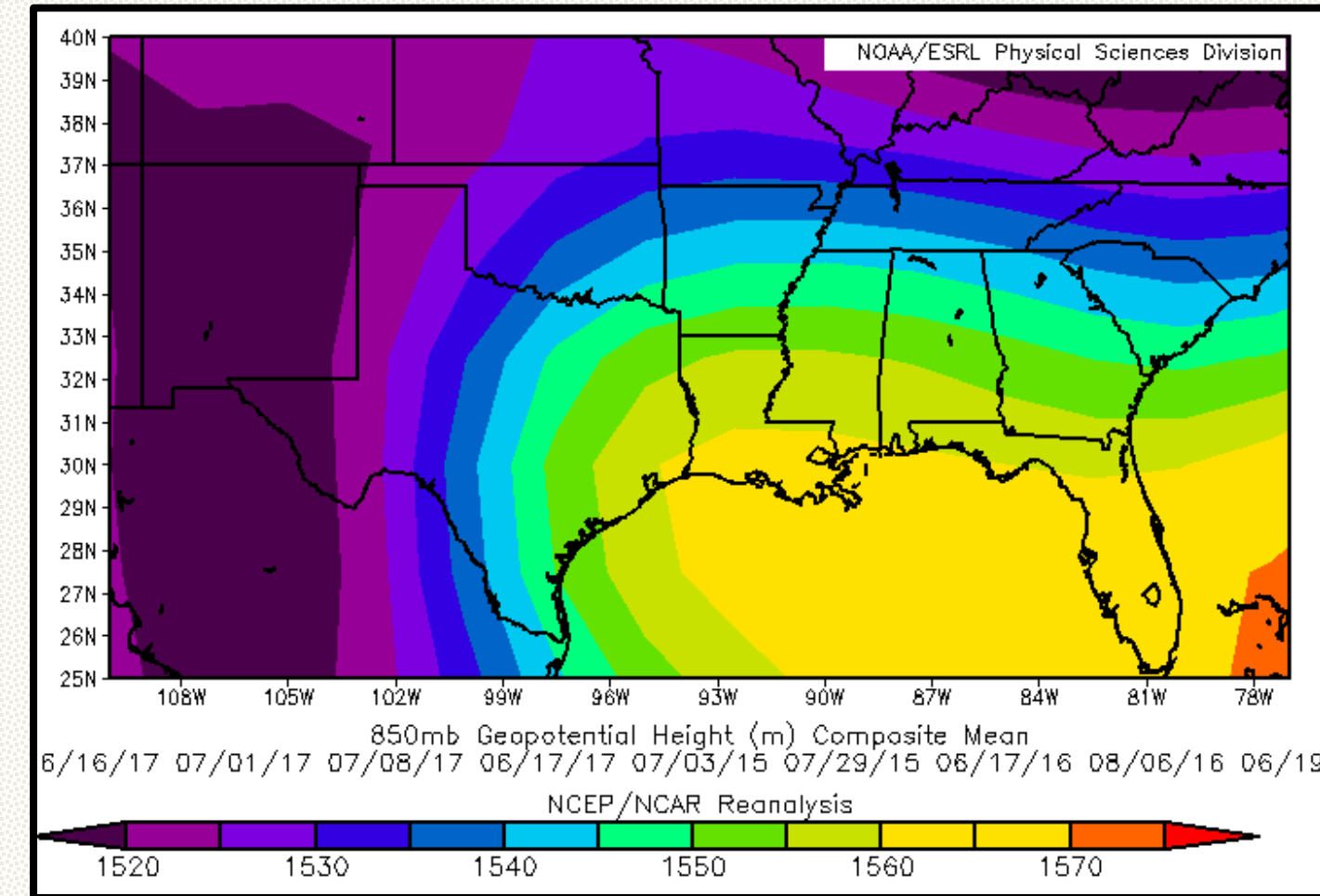
850hPa for Louisiana



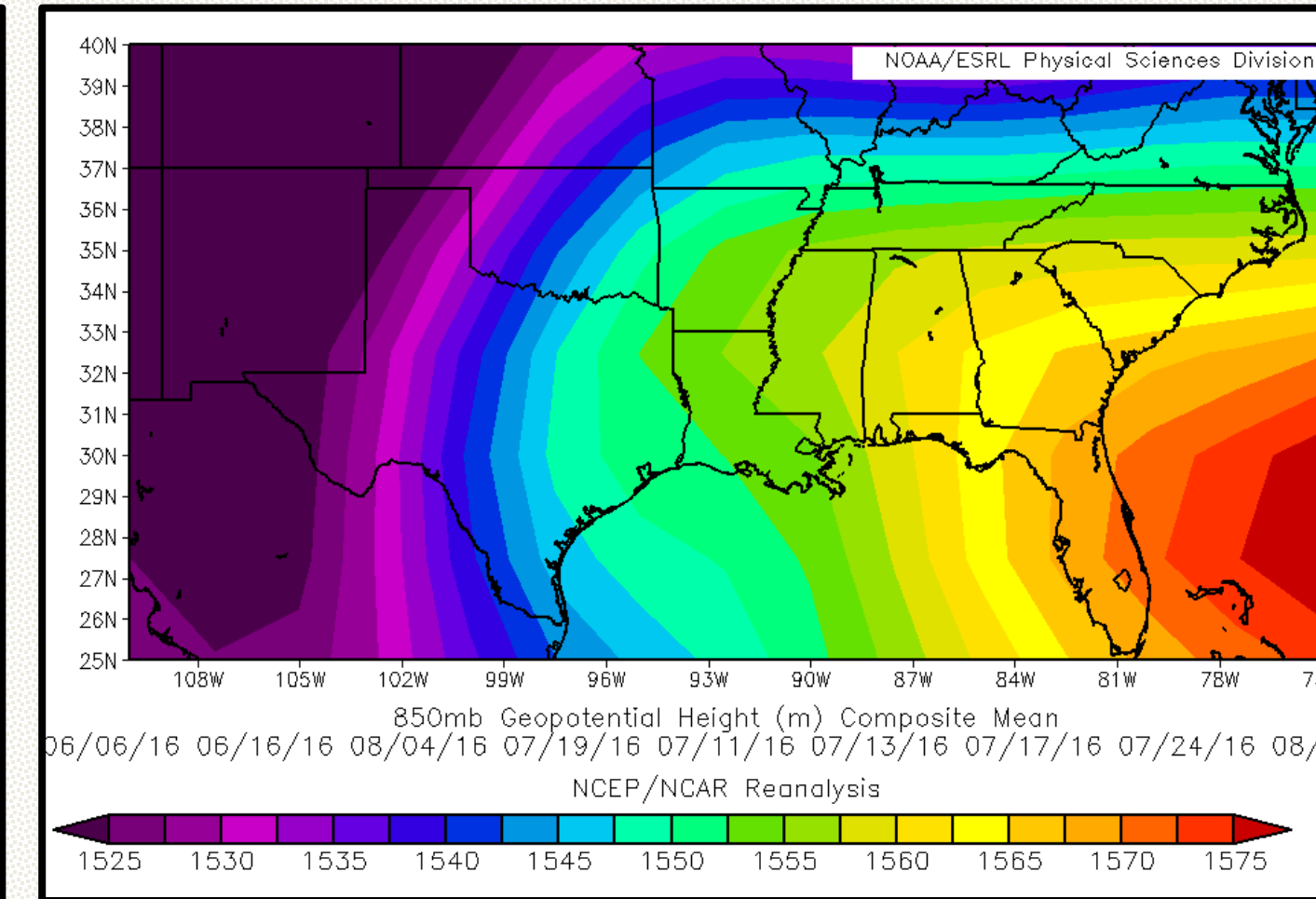
850hPa for South Carolina



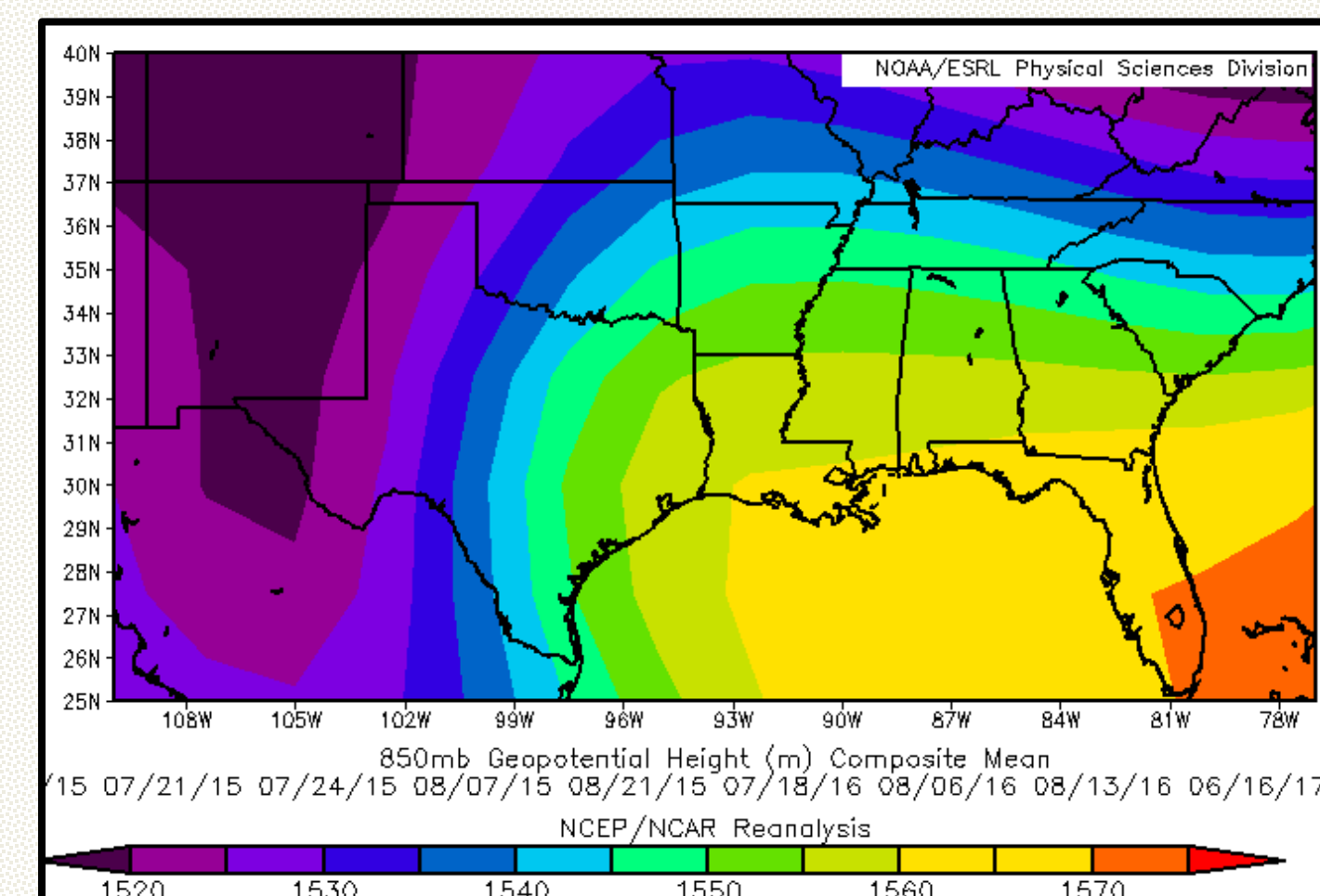
850hPa for Mississippi



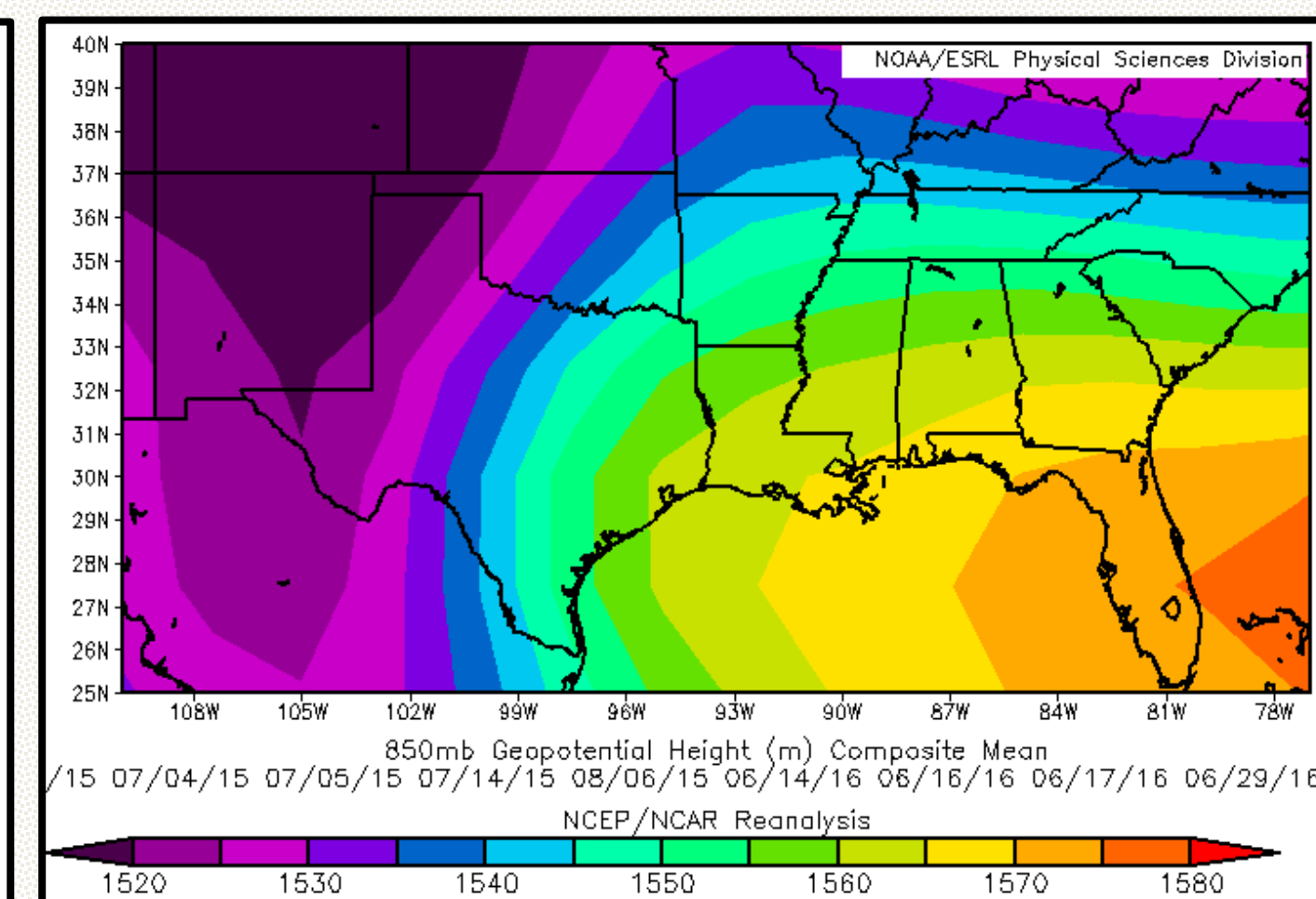
850hPa for Florida



850hPa for Alabama



850hPa for Georgia



Key Features

- Subtropical high suppressed southward from climatological position
- Trough evident from Georgia to Carolinas in many events
- Anomalously strong southerly or westerly winds across southern US (not shown)

Checklist for 35-49 Knot Convective Wind Gusts

- Checklist is designed for use in eastern Texas, Louisiana, Arkansas, Tennessee, Mississippi, Alabama, Georgia, South Carolina, North Carolina, and Florida from 1 June to 31 August
- Gathered data from 3 seasons, 1 June to 31 August (2015-2017), with over 200 events at sites in the southern US
- Tested in summer 2017 – Made adjustments to parameters based on results

Moderate Thunderstorm Checklist (35-49 Knot Convective Wind Gusts)			
Note: The test validated the following results and is intended for the summer season (June-Aug) in southeastern states (NC, SC, FL, AL, TN, GA, MS, LA, AR and east TX)			
Checklist Parameter	MDT / ISOLD SVR TS	MDT TS	Weak or no TS
1) Is Base Velocity (BV) or Storm Motion >25kts and storms or outflow boundaries moving towards site and within 45nm?	Yes, Issue MDT TS warning now!		No, continue checklist
2) Are thunderstorms occurring within 25nm of site with 50dbz or greater at > 15,000 ft or higher? Note: Use BR cross section on Radar (Good indication that storm may collapse and produce strong winds)	Yes, Issue MDT TS warning now!		No, continue checklist
3) Are organized cells with several outflow boundaries or intersecting outflow boundaries (regardless of BV or storm motion) within 40nm of site?	Yes, Issue MDT TS warning now!		No, continue checklist
4) 500mb or 700mb trof or Cyclonic curvature (look for thermal trof/areas of PVA/wind shifts) check both 500mb and 700mb levels	Strong trof (Winds at 700-500 >= 20)	Weak Trof (700-500 winds < 20kts)	No trof
5) 850mb front/trof or Cyclonic curvature within 100nm (look for thermal trof, thermal gradients or wind shifts)	Trof or front and winds >= 15kts	Weak Trof (winds < 15kts)	No trof
6) Sfc Front/trof within 100nm	Sfc front		None
7) SFC CAPE	>= 2500	2000-2499	< 2000
8) ML CAPE	>= 1500	1000-1499	< 1000
9) LI	<= -5	-4	> -4
10) Vertical Totals	> 25	24-25	< 24
11) 0-6 km Shear	> 9 kts	6-9 kts	< 6 kts
12) Snyder Index	30-45		< 30
13) SFC Td	> 21 C	20-21 C	< 20 C
14) 850 Td	> 14 C	14 C	< 14 C
15) Precipitable Water	> 1.7	1.6 to 1.7	< 1.6
Now assign points to each parameter: each Red = 1 pt, each Orange = 1 pt, and each			
44 or more points	Forecast MDT TS Possible SVR (Strongly consider MDT warning and issue MDT or SVR watch)		
43-38 points		Strongly Consider MDT TS (Issue MDT watch and consider issuance of MDT warning)	
38-30 points		MDT TS possible (consider issuance of MDT watch)	
29 or less points			MDT not likely, but still keep close METWATCH if TS possible or already occurring

Operational improvement in forecast skill

- 12.6% reduction in missed and late warnings
- 1-3% improvement in desired and partial lead times

Contact Information

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