Biscay Storm and wind event of 24 January 2008.

1. INTRODUCTION

A strong wind storm pounded southern France and Spain closing roads and railroads. Millions of people were left without power by the violent storm which downed trees, power lines, and flipped tractor trailer trucks. At least 21 fatalities were associated with the wind event, most of which were observed in Spain, where a sports center roof collapsed and killed several people I Barcelona.

Winds over 110 miles per hour (180 kph) where recorded during this event. The storm battered Spain and France on the 24th and Italy on the 25th of January 2009.

This note will serve to document the event of 24 January 2009. It is a good example of how anomalies can be used to define and identify strong weather systems and potentially significant weather events.

2. OVERVIEW OF THE CYLONE

Figures 1-5 show the evolution of this event from the National Centers for Environmental Predictions (NCEP) Global Forecast System (GFS). The Biscay storm, off the coast of France at 0000 UTC 24 January is clearly evident in Figure 1.

South of the storm, impinging on Spain

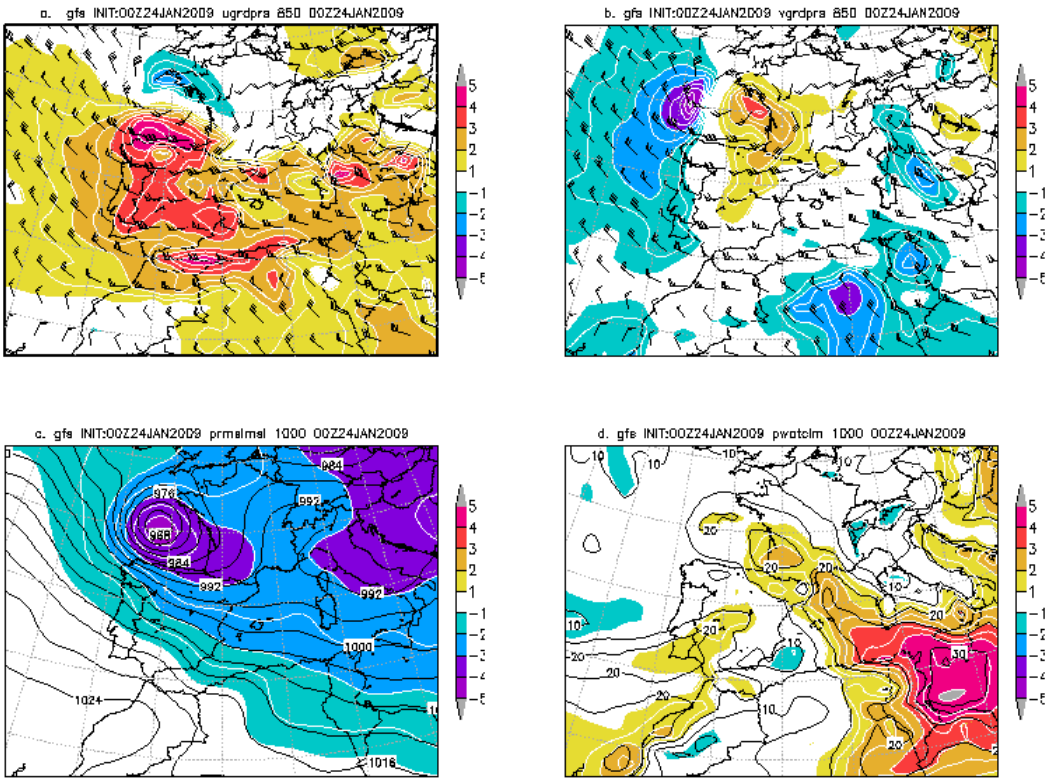

Figure 1. NCEP GFS 00-hour forecasts showing valid at 0000 UTC 24 January 2009 showing a) 850 hPa winds (kts) and the u-wind anomalies, b) the 850 hPa winds and v-wind anomalies, c) the mean sea level pressure (hPa) and the pressure anomalies and d) the precipitable water and precipitable water anomalies.

and southern France, strong 850 hPa winds were evident (Fig. 1a). The cyclone central pressure was about -5 standard deviations (SD) below normal, indicating an extraordinarily deep cyclone. The 850 hPa westerlies were +4 to +5 SDs above ormal. The storm pulled in a plume of above normal moisture which extended from North Africa into southern France (Fig. 1d).

By 0600 UTC 24 January the cyclone was over Spain (Fig.2). The strong winds and deep cyclone were still quite evident. The westerly winds over Spain were over +5SDs above normal peaking over northern Spain at this time (Fig. 2a).

By 1200 UTC 24 January (Fig. 3) the storm had a central pressure was under 964 hPa in western France (Fig. 3c). Strong northerly winds (Fig. 3b) were present over France, on the west side of the storm. Strong westerlies were present over the eastern Mediterranean Sea near Sardinia and eastern Italy. The storm was over Italy by 1800 UTC on the 24th and strong westerly winds (Fig. 4a) were present from near Sicily to the West Coast of the Italian Peninsula. Strong northerly winds were focused over Spain and northern Italy suggesting still concentrated areas of high winds behind the storm.

The storm moved over the Adriatic by 0000 UTC 25 January (Fig. 5). Strong

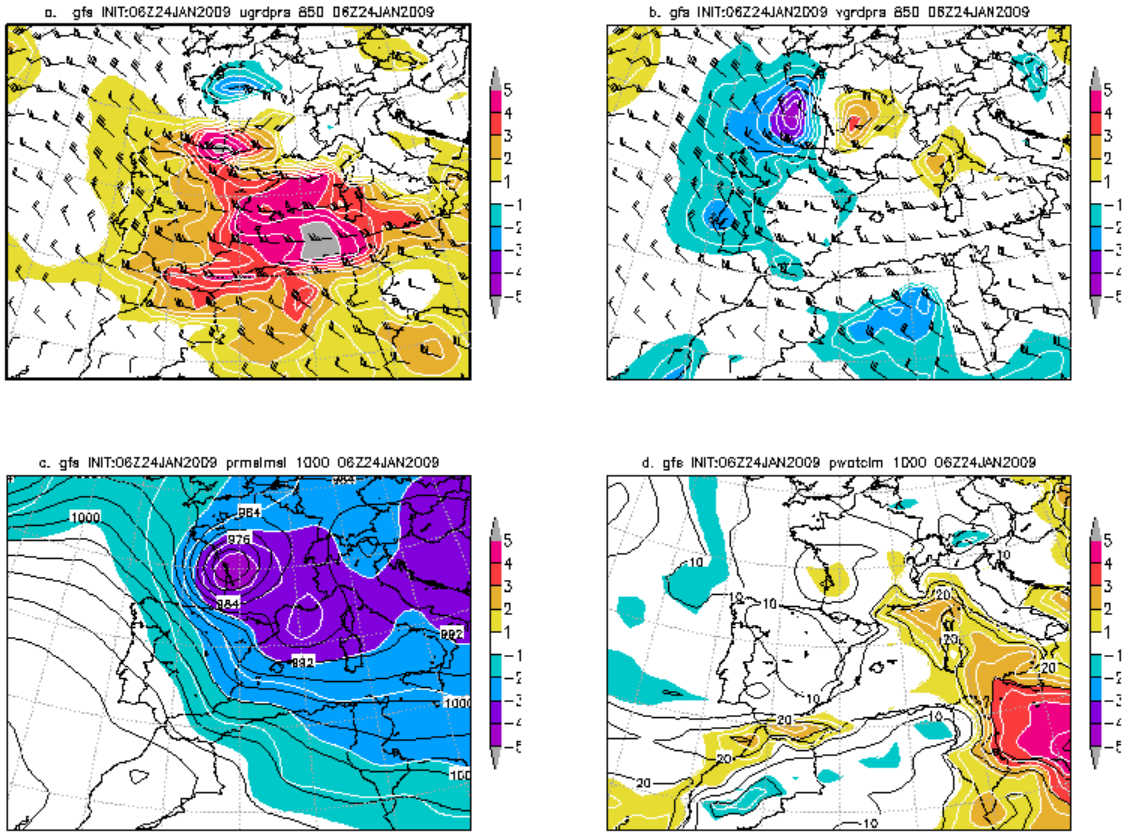

Figure 2. As in Figure 1 except valid at 0600 UTC 24 January 2009.

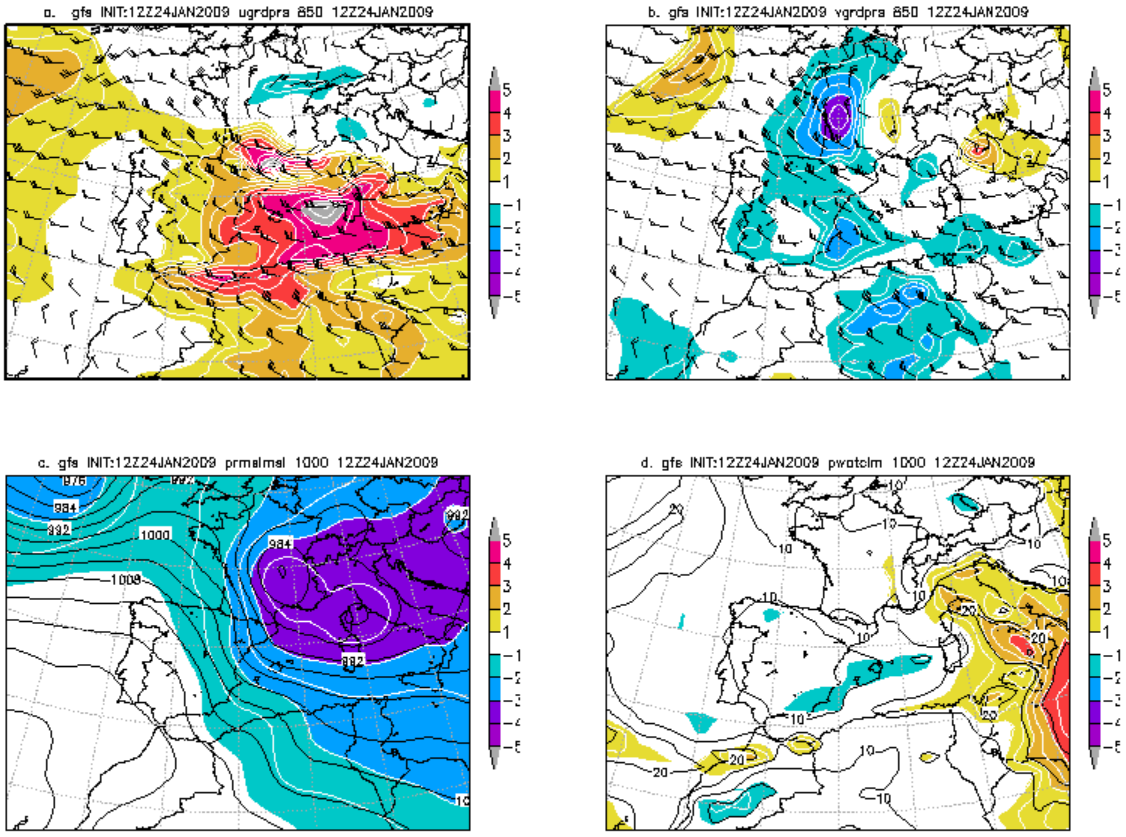

Figure 3. As in Figure 1 except valid at 1200 UTC 24 January 2009.

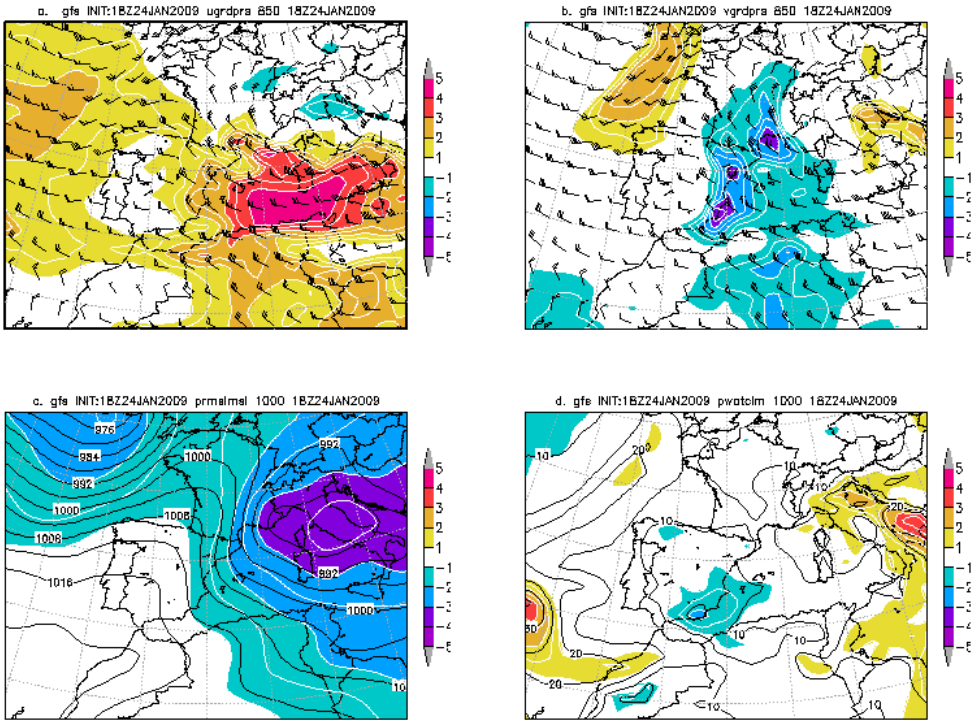

Figure 4. As in Figure 1 except valid at 1800 UTC 24 January 2009.

northerly winds (Fig. 5b) were still

present west of the storm with strong westerlies to the south, though the winds were weaker than observed in the previous 24 hours.

3. FORECASTS

Figures 6 and 7 show forecasts from the NCEP GFS and the NCEP Global Ensemble Forecast System (GEFS). The GFS correctly predicted the surface cyclone (Fig. 6a) which was anomalously deep, the forecasts showed a 976 hPa cyclone over southern France at this time.

In addition to the deep cyclone the GFS showed the strong wind about the 850 hPa cyclone center (Figs. 6a & 6b). Forecasts initialized on the 22nd and 23rd seem to all predict this strong cyclone.

The 850 hPa winds are from the GEFS, initialized at 1200 UTC 22 January 2009 are shown in Figure 7. The upper panels show the u-wind anomalies. The forecasts are valid at 0000 and 0600 UTC 24 January. At both times the GEFS predicted anomalously strong low-level westerly winds over Spain and France. The stronger winds at and after 0600 UTC may have affect northeastern Spain, in the vicinity of Barcelona.

The winds were quite anomalous as forecast by the both the GEFS and GFS. The GEFS showed a high probability of 25 ms^{-1} or greater winds over northern Spain between 0000 and 1200 UTC 24 January 2009. The mean winds (lower panels) showed the regions where the higher winds were forecast by the GEFS. These fields reveal considerable uncertainty in the areas of strong gradients.

4. SUMMARY

A deep cyclone brought strong winds to portions of southern France, northern Spain and Italy on 24 January 2009. Tragically, the winds caused considerable damage and resulted in about 21 deaths.

The deep Biscay cyclone, which tracked across southern France and into the eastern Mediterranean and into the Adriatic, brought the strong winds to the region. This cyclone appeared to be quite predictable by the NCEP GFS and GEFS. The both forecast the deep cyclone (shown only from the GFS) and the strong 850 hPa winds quite well. The wind probabilities suggested winds of 25ms^{-1} were a high probability outcome. The observed winds were considerably stronger than the forecasts.

The east-west orientation of the Pyrenees Mountains may have played a role in the locally high winds in both southern France and northeastern Spain. Note the couplet of high winds (Fig.4b) north and south of the Pyrenees in southeastern France and northeastern Spain. Barcelona lies in close proximity to the v-wind maximum south of the mountains. The maximum in the GFS likely lies closer to Tarragona than Barcelona.

Local effects such as the orography and static stability likely played a role in this event. However, the GFS and GEFS

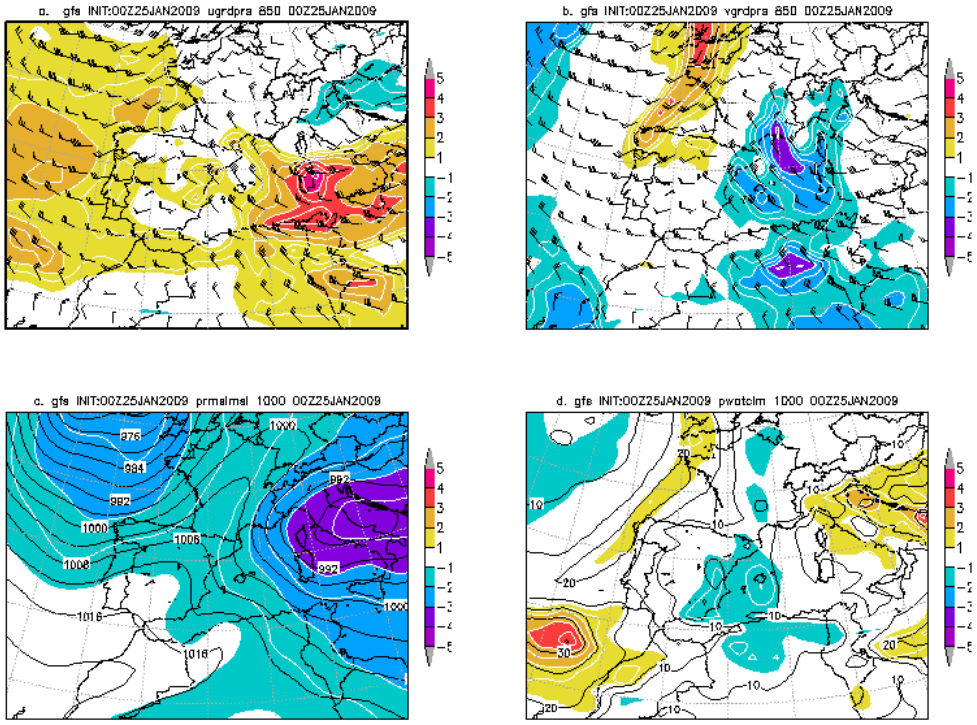

Figure 5. As in Figure 1 except valid at 0000 UTC 25 January 2009.

showed that highly anomalous winds were likely in the region. Shorter range forecasts, downscaled wind data, and high resolution models may have better predicted the locally destructive winds. However, the larger scale GFS and GEFS clearly identified a potential high wind event with significant lead time.

This case shows the value of anomalies and EPS probabilities in quickly identifying the threat high winds. However, the details and the magnitude of this event was likely not captured well by these relatively coarse data.

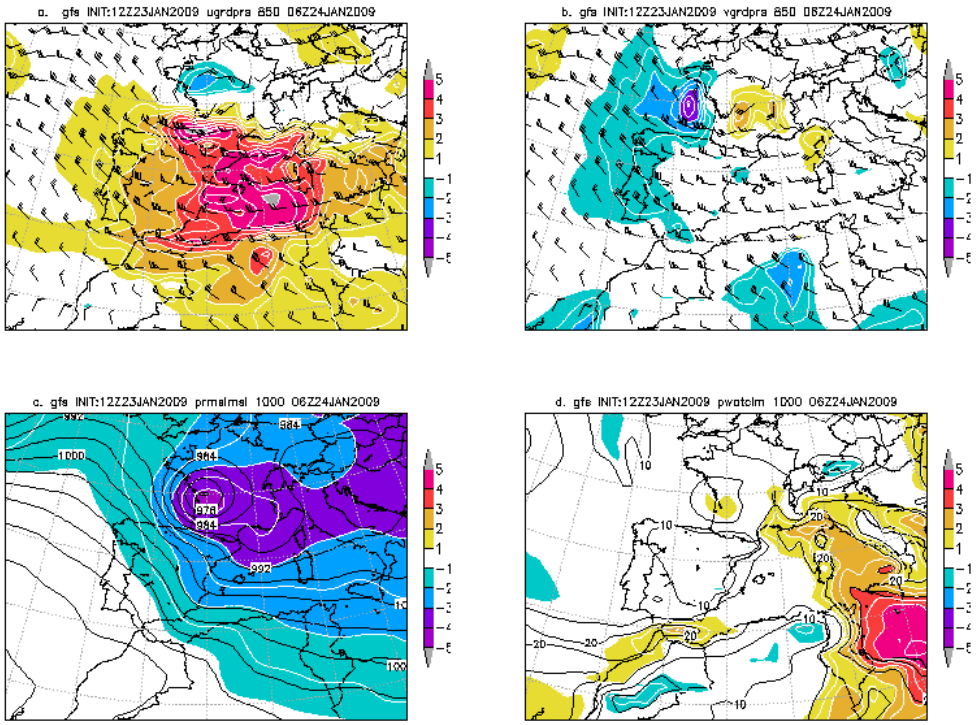

Figure 6. As in Figure 1 except forecast initialized at 1200 UTC 23 January 2009 valid at 0600 UTC 24 January 2009.

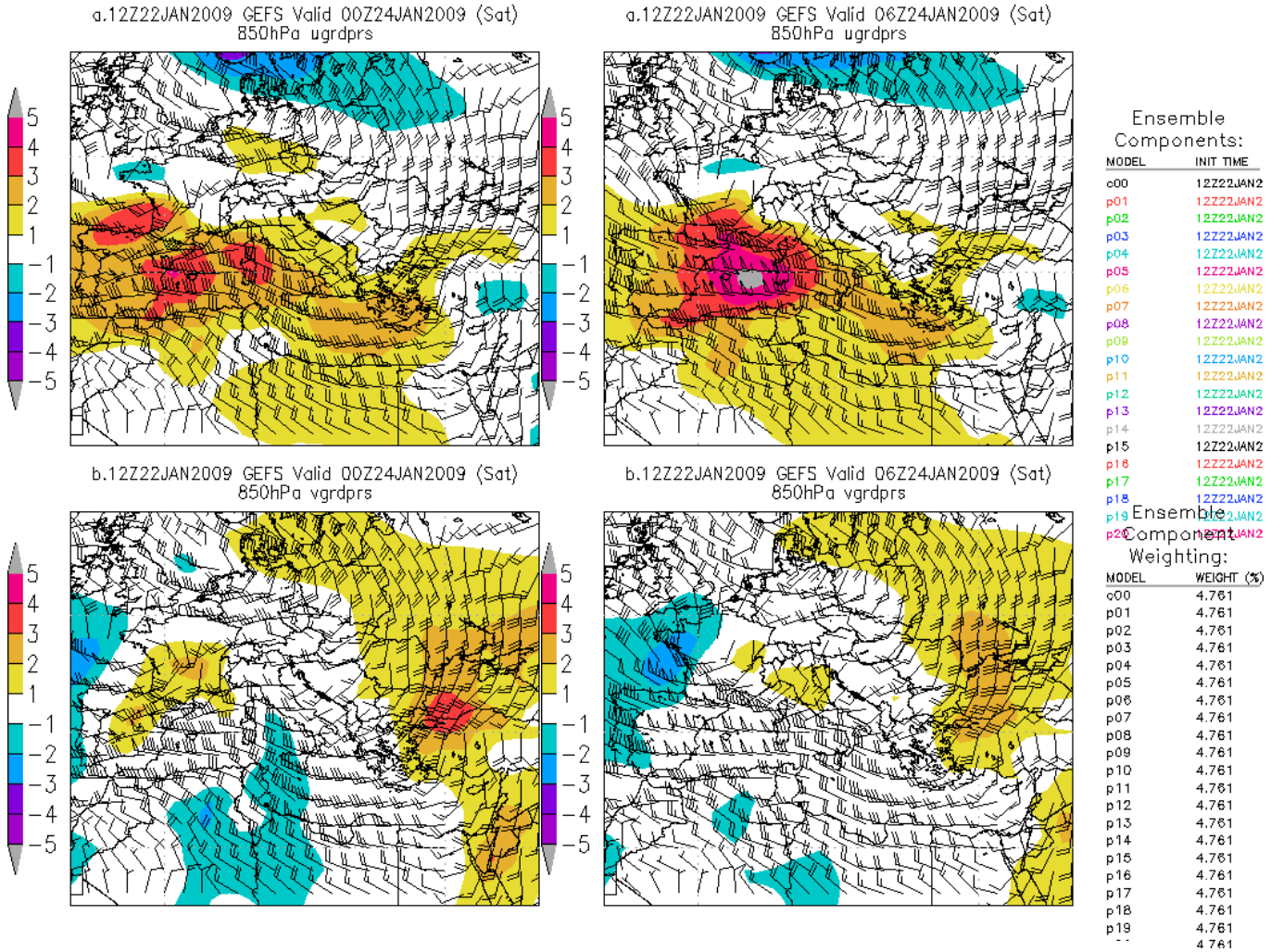

Figure 6. NCEP GEFS forecast initialized at 1200 UTC 22 January 2009 showing 850 hPa winds valid at (left) 0000 and (right) 0600 UTC 24 January 2009. Upper panels show the 850 hPa winds (kts) and the u-wind field departures in standard deviations from normal. Lower panels show the 850 hPa winds and the v-wind anomalies.

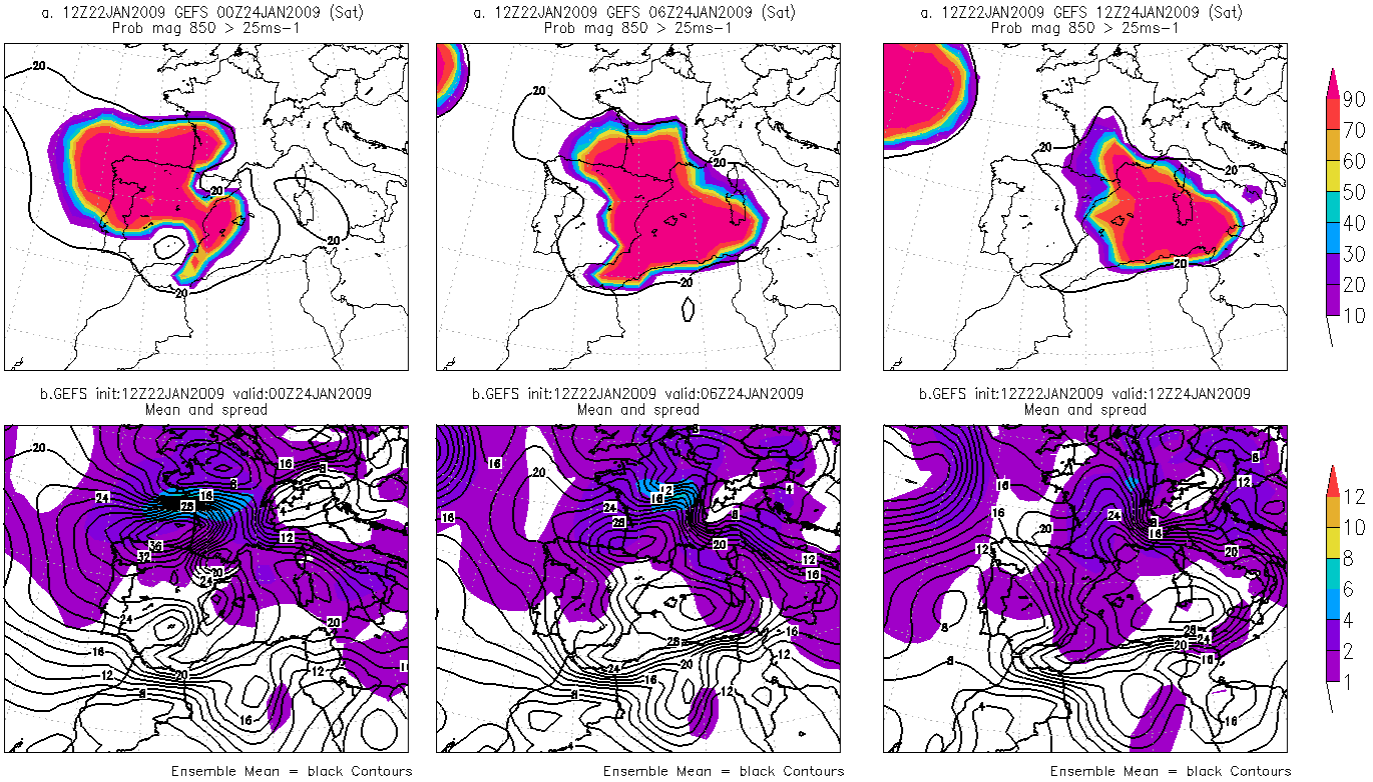

Figure 7. As in Figure 6 except showing the probability of the 850 hPa winds exceeding 25ms-1. Each two panel images show the probability of the 850 hPa winds exceeding 25ms-1 (upper) and the 25ms-1 contour from the ensemble mean. Lower panels show the ensemble mean wind (ms-1) and the variation of all members about the ensemble mean.