



## ***SEVERE THUNDERSTORM OVER EAST MADRID AND THE HENARES VALLEY ON SEPTEMBER 20, 2002***

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Here is a review of the thunderstorm that swept Madrid and the Henares valley in the afternoon of September 20, 2002 with intense electric activity and severe hail (4-5 cm stones). We include pictures and some breathtaking videos showing the violence of this episode, particularly severe in the eastern districts of the Spanish capital and in the metro area (Coslada, San Fernando de Henares, Torrejón y Alcala de Henares). Also included are radar pictures showing reflectivities of 54 dB and echo tops of 14 km, plus several miscellaneous maps. Here is the account given by forumer Rayo from Hortaleza.

"I made it at last! Not too bad .... September 20, season nearly over ... and I didn't have to go too far too. The storm caught me by surprise as I was watching the numerous multicells developing just everywhere over the Madrid metro area. Around 7:10 pm a particularly active cell was travelling west to east above the city centre. I was in Park Juan Carlos I at the moment, on the eastern fringe of the city. The Peineta stadium, which was going to be my unexpected reference, can be seen from the sixth picture on, with flashlights at full power. I got into the car and drove on to try to get a clear view. The wind howled like crazy. Every time I opened the window to take pictures torrents of water and hailstones got me wet and my camera wasn't spared either. I had to dry it every now and then to prevent damage. Rain was pouring down so heavily that sometimes even stifled the roar of thunder.

All through the afternoon unrest could be sensed in the air. From my window eastwards Cu congestus could be seen quickly developing into Cb calvus over the Guadalajara plains. The picture shows one pileus. It was 5:45 pm.



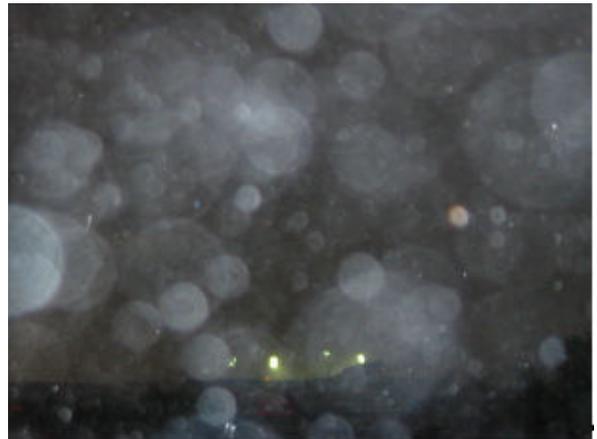
Towards 7 pm a cell with severe convection developed right above the city, with two active areas: one over Vallecas-Moratalaz (south-southeast) and another one over Chamartín-Hortaleza (centre-northeast).



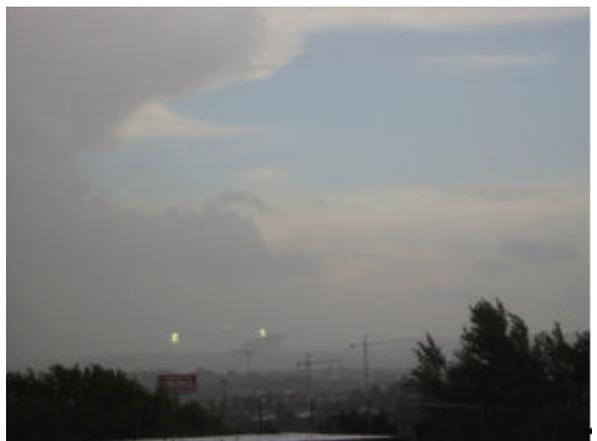
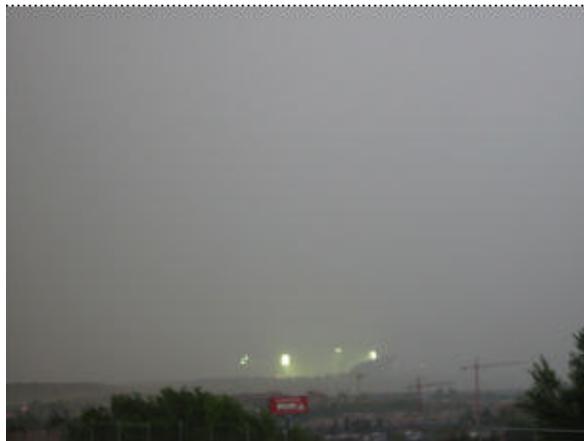
Both were moving from southwest to northeast, but independently from each other. Cloud-to-cloud lightning was non-stop. Thunder was heard like a harsh continuous roar that got closer and closer. For a moment I thought I glimpsed a turning pattern at the cloud base. A mesocyclone? Checking time is over. Enormous, heavy raindrops begin to pour down on me. Off again into the car.



The cell located further south is now drawing very near the Peineta stadium, the venue for the Athletics World Cup that day. The competitions had to be put off for an hour. As it traveled further east, the storm got more and more severe: cloud-to-cloud lightning was now permanent but I couldn't capture any single bolt. Suddenly an incredible downpour of rain and hail broke on and a wall of night fell over the city.



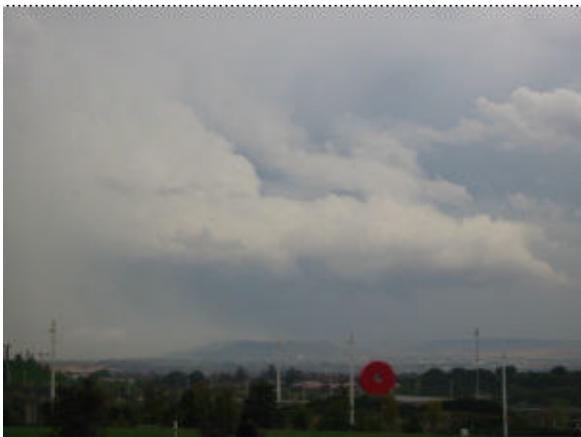
After this deluge daylight comes again, from the southwest, we're not "out of the woods" yet, as rain is still heavy, particularly southeast of my position.



Anyway, in the end the rain eventually petered out and the sky looked as if going to clear up, with lightning still seen in the distance. The Peineta could now be clearly seen again. Huge Cbs towered high in the east, spectacularly lit by the setting sun. The show was now in the Jarama-Henares valley, as the cell that had just passed above us shows its vigorous inside currents. New convective nuclei loom over the Torrejón-Alcalá area. The display of lightning between the towering clouds and the gigantic anvil of the now fugitive storm was simply awesome. The roar of thunder was continuous. The white trail of precipitation (hail obviously) came ahead of the huge main tower located on the west fringe of the cell.



Now the core of the storm was heading for Torrejón and Alcalá, at maximum development stage. You can see in the picture above the two gigantic convective towers with a really extraordinary vertical development, breaking into the anvil of the system (located around 11 km high) and likely to keep growing higher as an "overshooting" (reaching a height of 14 km), as would be later on proved by the INM radar imagery.



Now the thunder was becoming more and more inaudible and wind was just a mere breeze. Fabulous colors lightened up the sky. The Peineta was quiet, basking in softly glowing lights and blue velvet. 8:13 pm. My first decent storm this year. Let's hope it won't be the last."



Simultaneously, forumer Mammatus was having his own particular experience of "the monster". Here is the account of what he saw from the town of Coslada:

"It looked like an ordinary afternoon, just like any other afternoon of this not particularly hot summer in Madrid. That afternoon wasn't hot either. Everything looked as if we were going to have a near-miss again.

I had taken a nap. When I got up again and looked up, I said to myself: "well, it's just like I thought. Much ado about nothing". Clouds were developing just about everywhere. As usual. Some of them even threatening. As usual. Superb "cauliflowers" popped up here and there; a chance of thunderstorm had been forecast. Again as usual. Always the same but in the end just nothing happened.

I was home with my wife but every now and then I took a peek out of the window to catch a glimpse of the beautiful sky over Coslada.



All those magnificent clouds were traveling northeast and I took comfort in just watching them, marveling at their beauty. Toward the south, I could see some curtains of precipitation. Showers became more and more numerous, but only in the distance.



Around 7 pm the sun set. I couldn't see the clouds coming in my direction, as my windows look east and the circulation that day was southwest to northeast. But after a while I could see an impressive huge anvil looming over our building. Quite threatening it looked, it had even light mammatus hanging on it. I realized immediately that something serious was getting closer: if you look at the picture, you will notice that the Cbs in the background were not receiving any light from the setting sun, which obviously meant that there was "something" midway between the anvil and the ground.



I didn't make a big deal of it, as I'd had enough of disappointment the previous days, and I kept watching TV with my wife. But after a few minutes she said "darling, it's getting really dark now". That precise moment, strong gusts of wind began to sweep the trees in our street and I heard heavy raindrops spattering on the pavement. Big drops they were, and with this I mean really big; very seldom I had seen before any raindrops that size. As they hit the ground they left a huge blob: some 5 cm diameter.

I grabbed my camera to take some pics but the fact is I could hardly put my head out the window. The wind gusts were really strong and the scattered raindrops actually hurt as they hit me in the face! As usual I began to take pics from north to south. As I turned my head to the right, this is what I saw:



Look at the hill and the houses in the background. They can hardly be seen in the picture, but they're actually only some 200 m from my place. It was the only picture I took, because as I saw what things were beginning to look like, I set the came on video mode and started recording (please click twice on each image to download the videos).



Seacerca.avi



incredible.avi



incredible2.avi



incredible3.avi

After this, what else can I say except that old cliché that goes “once picture is worth a thousand words”? Well, once I had gotten over the “shock” and after the “cloud” had passed (if you could call that thing a “cloud”, I kept recording what was going on. The intensity was not the same but the views of my “skyline” were equally spectacular.



lactalma3.avi

Some friends that had arrived moments before the storm broke out were now with me. And if I could hardly believe what had happened, just imagine what my friends (no weather buffs at all) thought of the whole business. I took some pictures too, as very seldom you have the chance to admire such an impressive cloud hovering over your head. Lightning struck almost non-stop, but the bolts (cloud-to-cloud) were so high up in the cloud that the thunder came like a sort of whisper.



This view in particular caught my attention, as I thought I saw two anvils at different heights, that is, one on top of the other. In one of the videos I can be heard speaking of a "microrráfaga" (microburst). Some minutes later I tried to get that idea out of my head: a microburst is not such a common thing in our latitude. But the next day, after having viewed some pictures from my friend Rayo, I could confirm that it actually could have been a microburst.

Minutes after the storm was over, police and firemen sirens could be heard in the area, so I went out to the street to see the effects of the downpour.





I can't give any "technical data" for this downpour but I could see some widespread damage such as trees cut down or even torn out, heavy rubbish bins turned upside down etc. The next day I was in Vicálvaro where the rain must have been more violent, as the damage was worsens. My brother's car and many other vehicles in the street had their windscreens completely smashed by the hailstones. My mother had picked some of these stones, and according to her, they were as big as golf balls.

"Before the storm broke out, I saw a very strange dark cloud, with some greenish hue, moving very fast and in a bizarre way", she added.

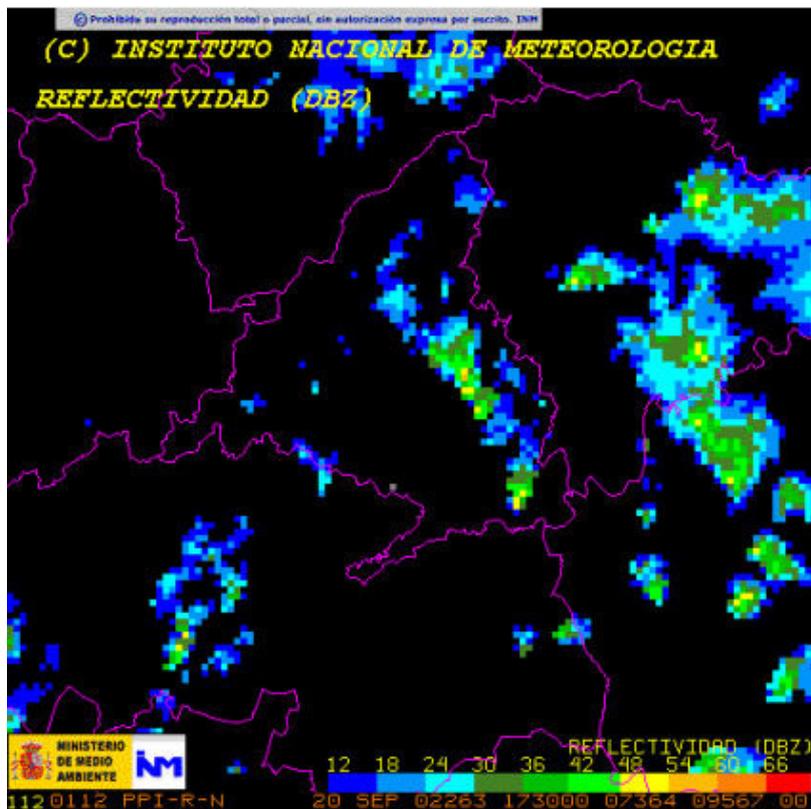
Many roof tiles were blown away by the wind and ended up on top of cars. According to my mother:

"Water was spurting out of the sewers and we had to fetch the rubbish bins which had been carried two or three blocks away".

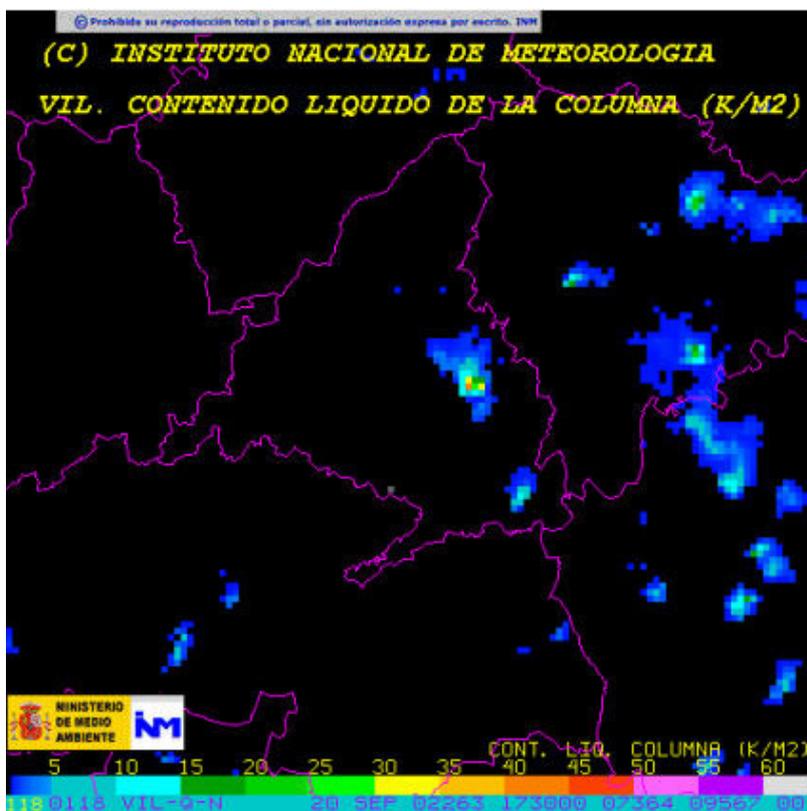
What I ignore is the amount of precipitation. I would say around 15-20 mm, but in the course of just five minutes, which gives a remarkable intensity. In a word, I think it was the most tremendous shower I've ever lived, more even than the brutal downpours I "suffered" a couple of times during DANA episodes in Murcia.

After the storm on September 20, I know now the other "dimension" of the Cbs.

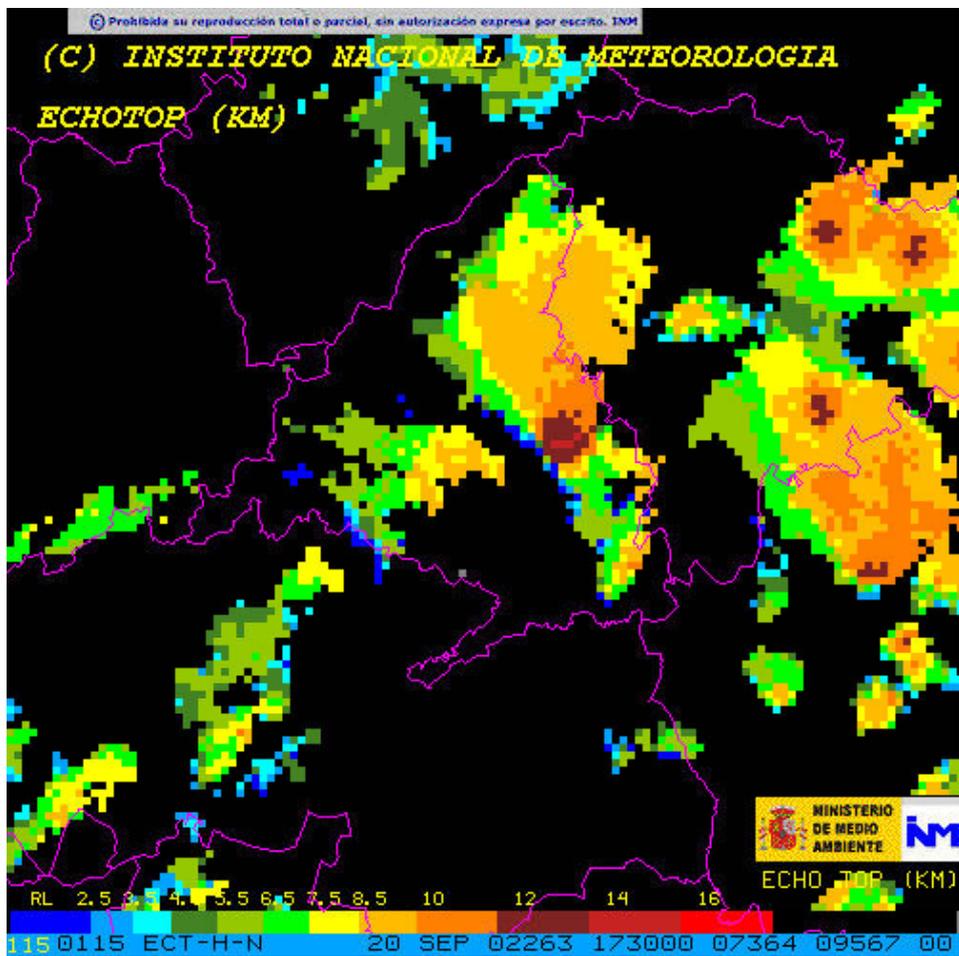
Here are the most significant maps of that September 20:



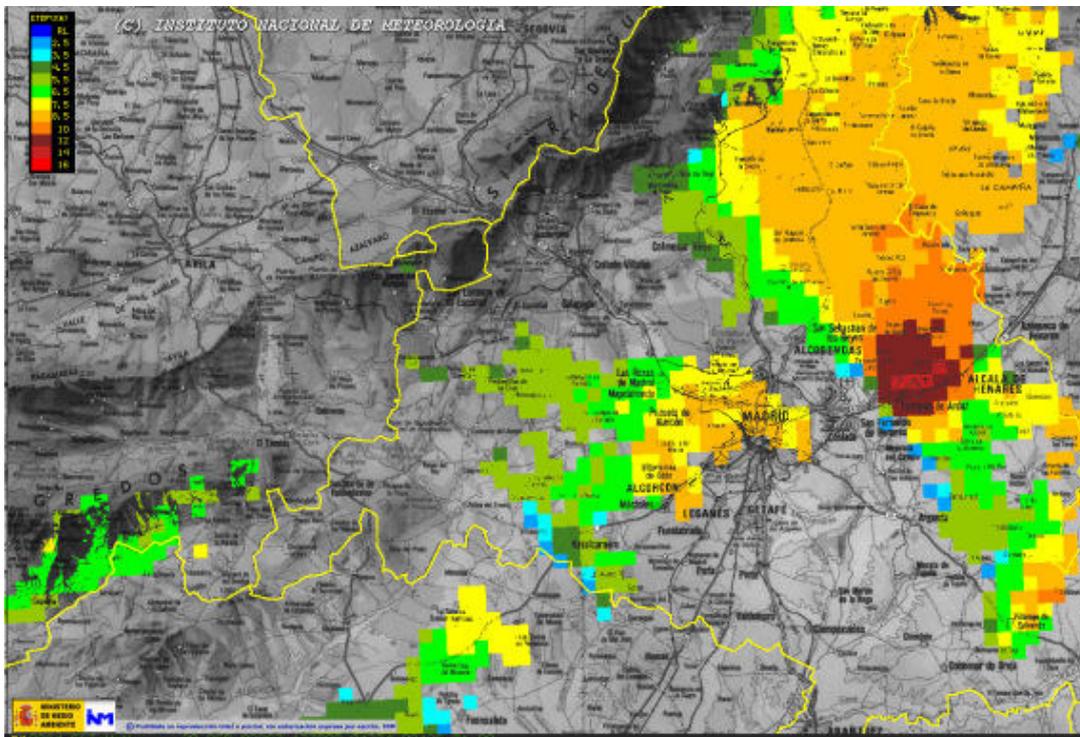
Reflectivity as shown by the Madrid Radar (INM)



Vertically Integrated Liquid (VIL) as shown by the Madrid Radar (INM)

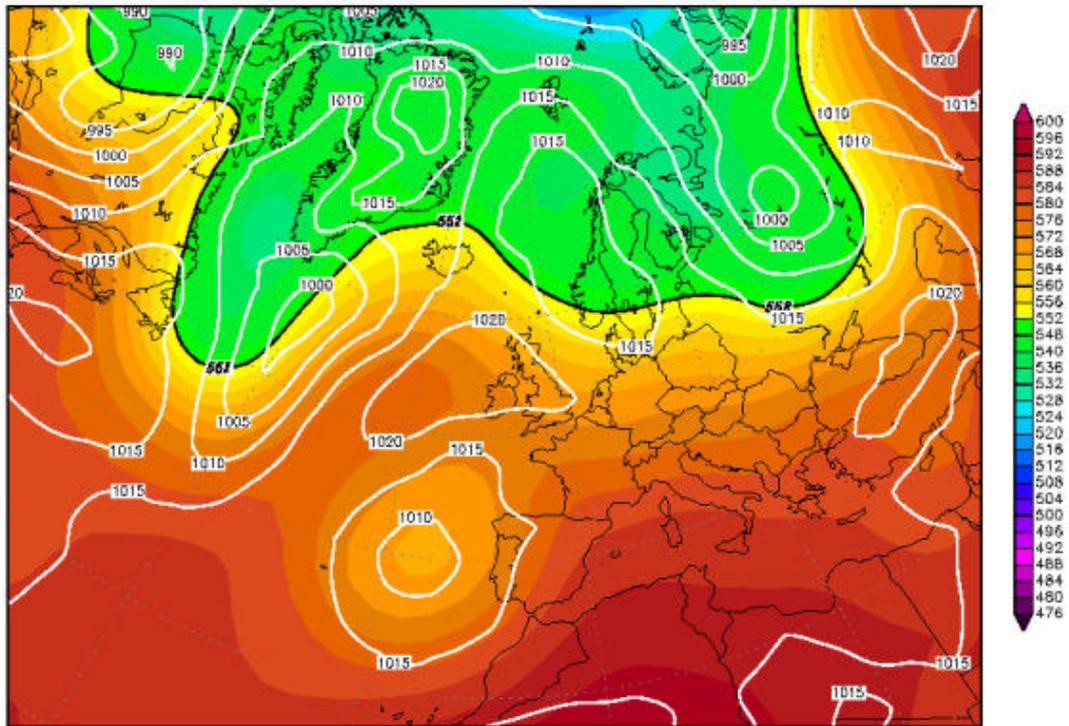


Echo tops as shown by the Madrid Radar (INM)



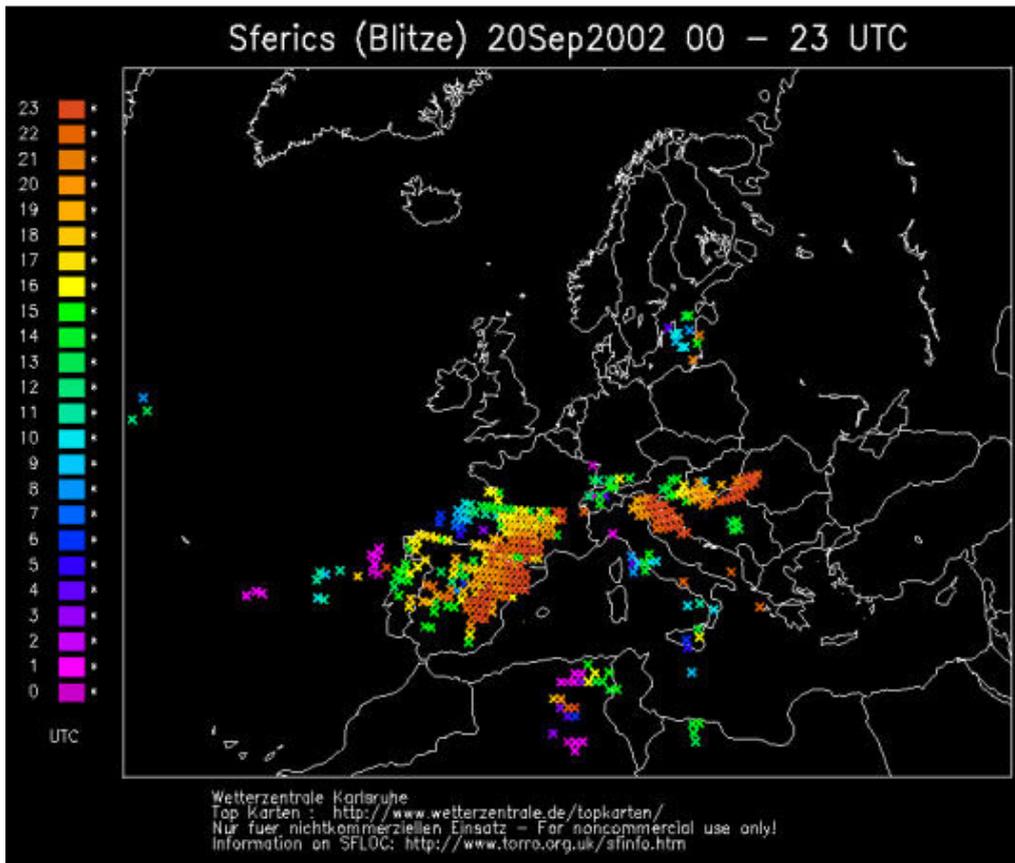
Echo tops as shown by the Madrid Radar over digitalized map (INM)

### 500 hPa Geopotential (gpm) und Bodendruck (hPa)



Daten: Reanalysis des NCEP  
Wetterzentrale Karlsruhe  
Top Karten : <http://www.wetterzentrale.de/topkarten/>

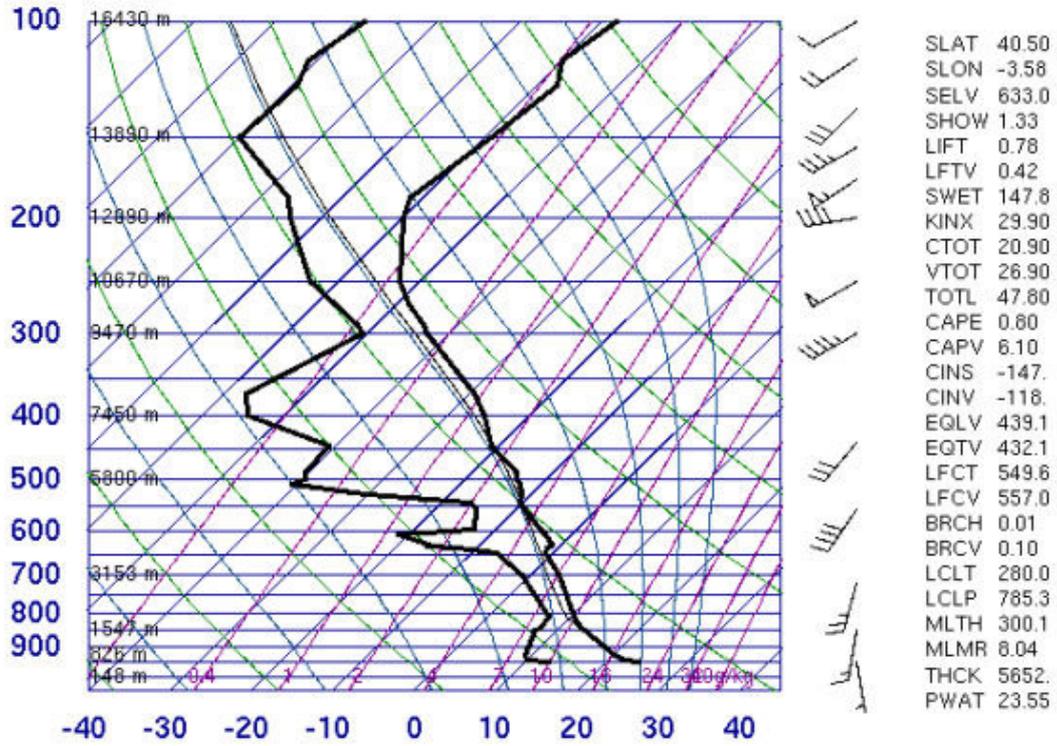
Surface pressure and 500 hap geopotential (Wetterzentrale)



Wetterzentrale Karlsruhe  
Top Karten : <http://www.wetterzentrale.de/topkarten/>  
Nur fuer nichtkommerziellen Einsatz - For noncommercial use only!  
Information on SFLOC: <http://www.torro.org.uk/sfinfo.htm>

Map of lightning bolts (Wetterzentrale)

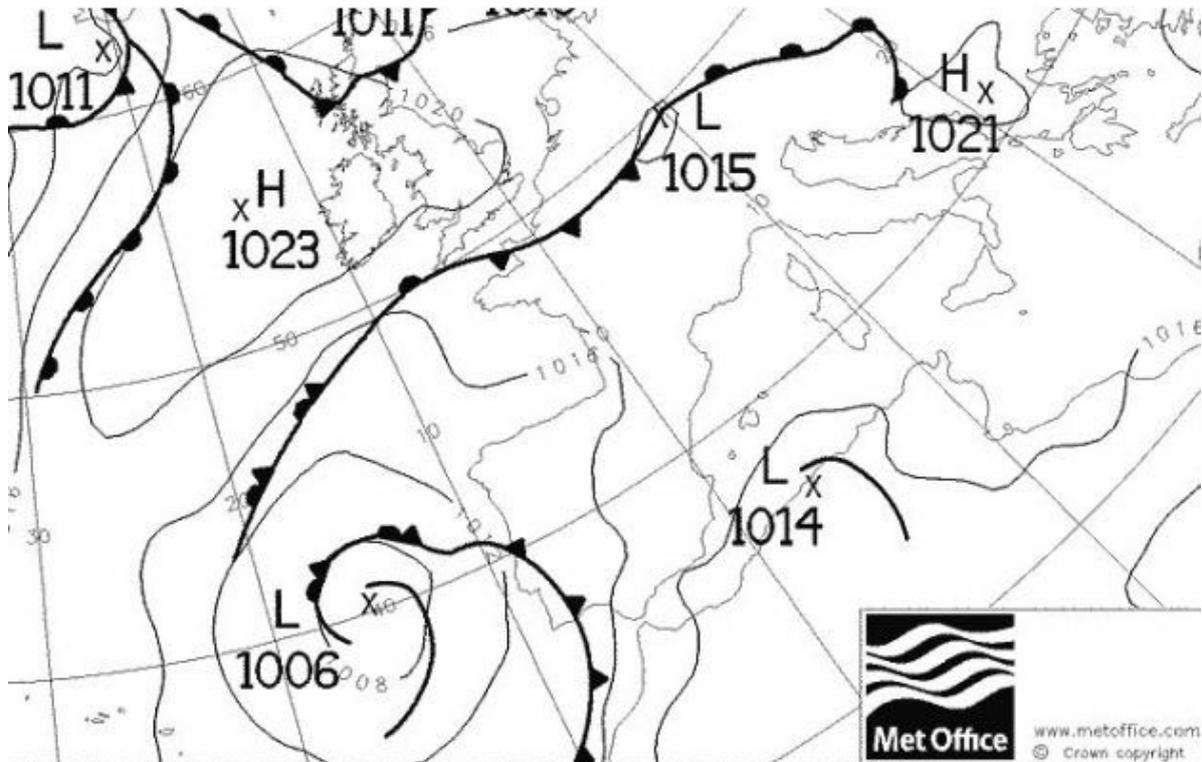
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12Z 20 Sep 2002

University of Wyoming

Madrid-Barajas radiosounding at 12Z (Univ. of Wyoming)



Synoptic situation (MetOffice)

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