Supercell with tornadic episode in Camp de Turia and Camp de Morvedre

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Link to the related topic in Meteored Forum:
http://www.meteored.com/foro/index.php?board=13;action=display;threadid=14935

Introduction:

The past day 4th September, 2004, at first hours of the night, a great storm swept the northwest zone of the city of Valencia. The most affected zones were Sierra Calderona, mainly the town of Náquera, and the strip that goes from Sagunto to El Puig, passing through Puçol. In short, 24 towns of Valencia and Castellón suffered a lot of damages and floods.

Let us see maps of the zone:

Photo 0 (Map of the zone)

Synoptic situation

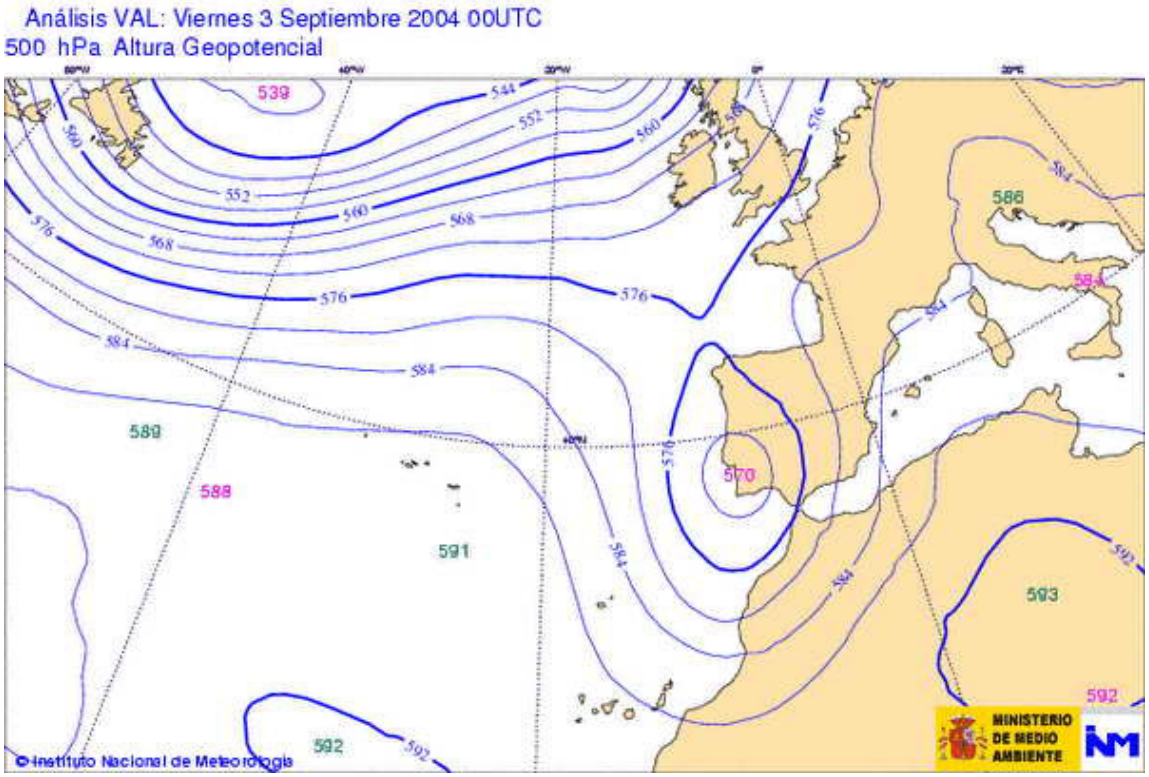
During several consecutive days, the presence of cold air in the highest levels of the troposphere and the establishment of an East wind regime in the Mediterranean zones, have produced this and other adverse meteorological phenomena. This episode could be considered as a Cut-off Low

The 1st of September, in SSW, the possibility of this situation was forecasted. This was the news:

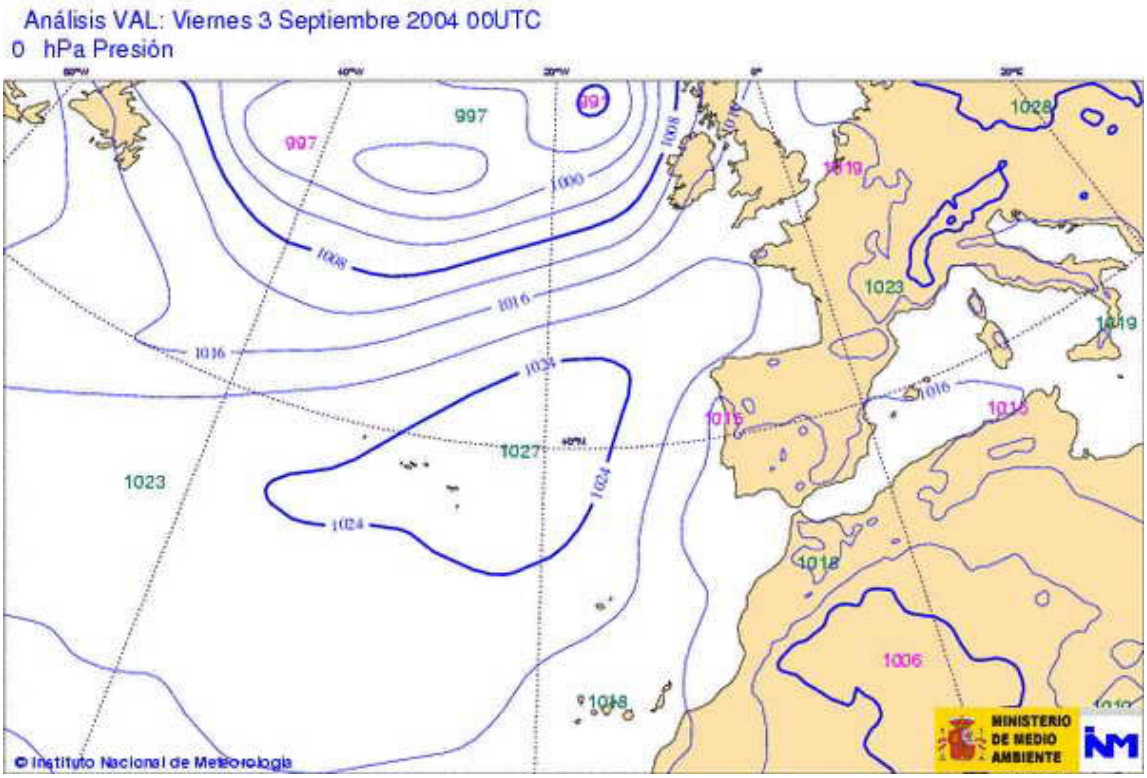
"If the forecasts that the pass of the ECMWF gives for the next weekend, Friday and Monday included, are confirmed, we could be in presence of the first clear situation of "Cut-off Low" of the season. The Cut-off Low locates on Friday over the Gulf of Cadiz. The model forecast that later it will move from south to north throughout the coast of Portugal, to arrive Galicia on Monday".

In fact, the low pressure aloft was formed and brought about so much convective episodes, that were being re-fed when they reached the Mediterranean zone. In these zones several determining factors were conjugated, great dynamic forcing, great difluence in 500mb, and a strong instability, up to -8 of Lifted Index and 1500 of CAPE. Practically without isobaric gradient and a slight flow E-SE, with the Mediterranean Sea at 27º, the conditions was the most suitable to some severe event took place.

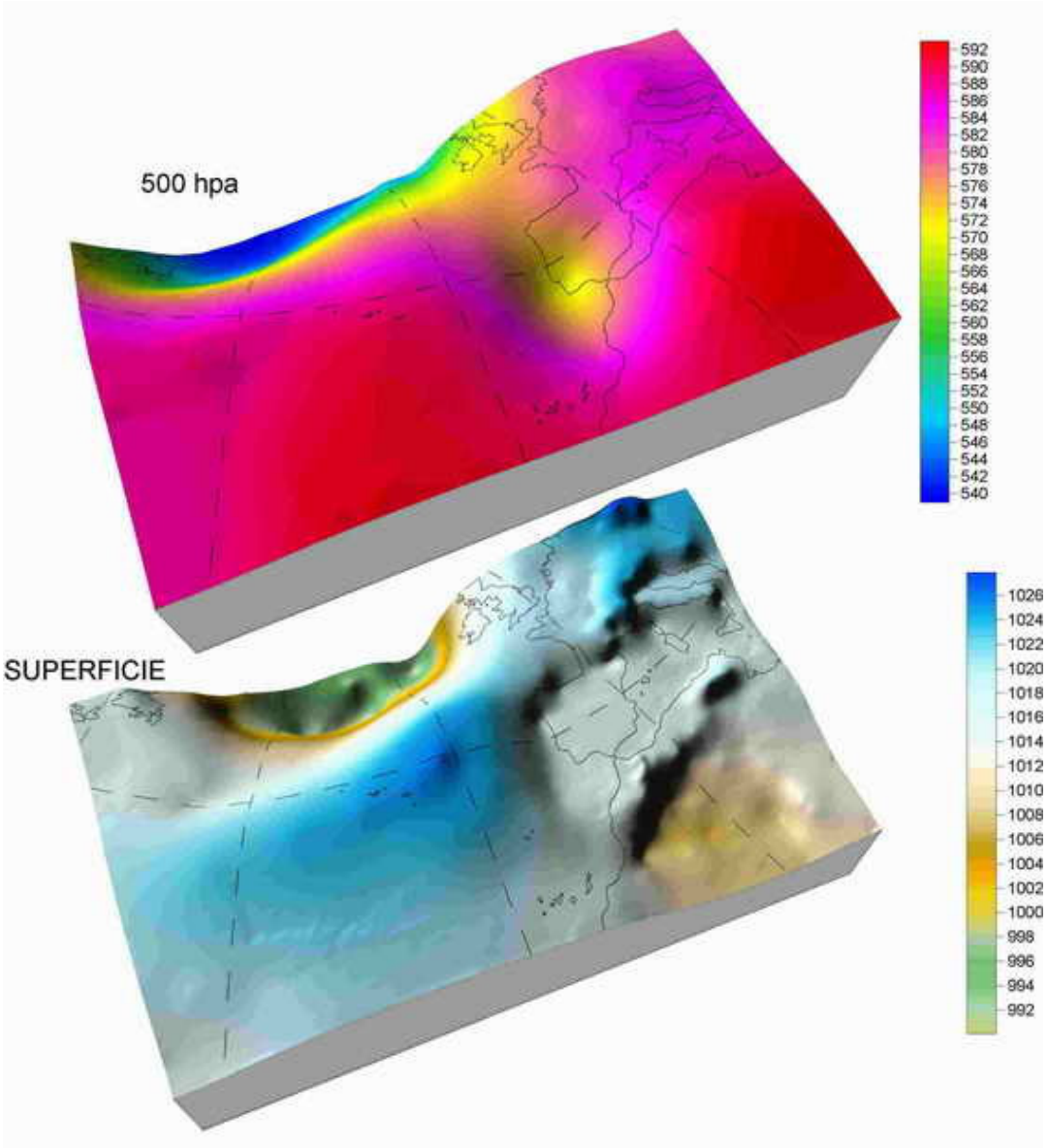
Let see some maps of the situation:



Picture 1 – Analysis of 500hPa

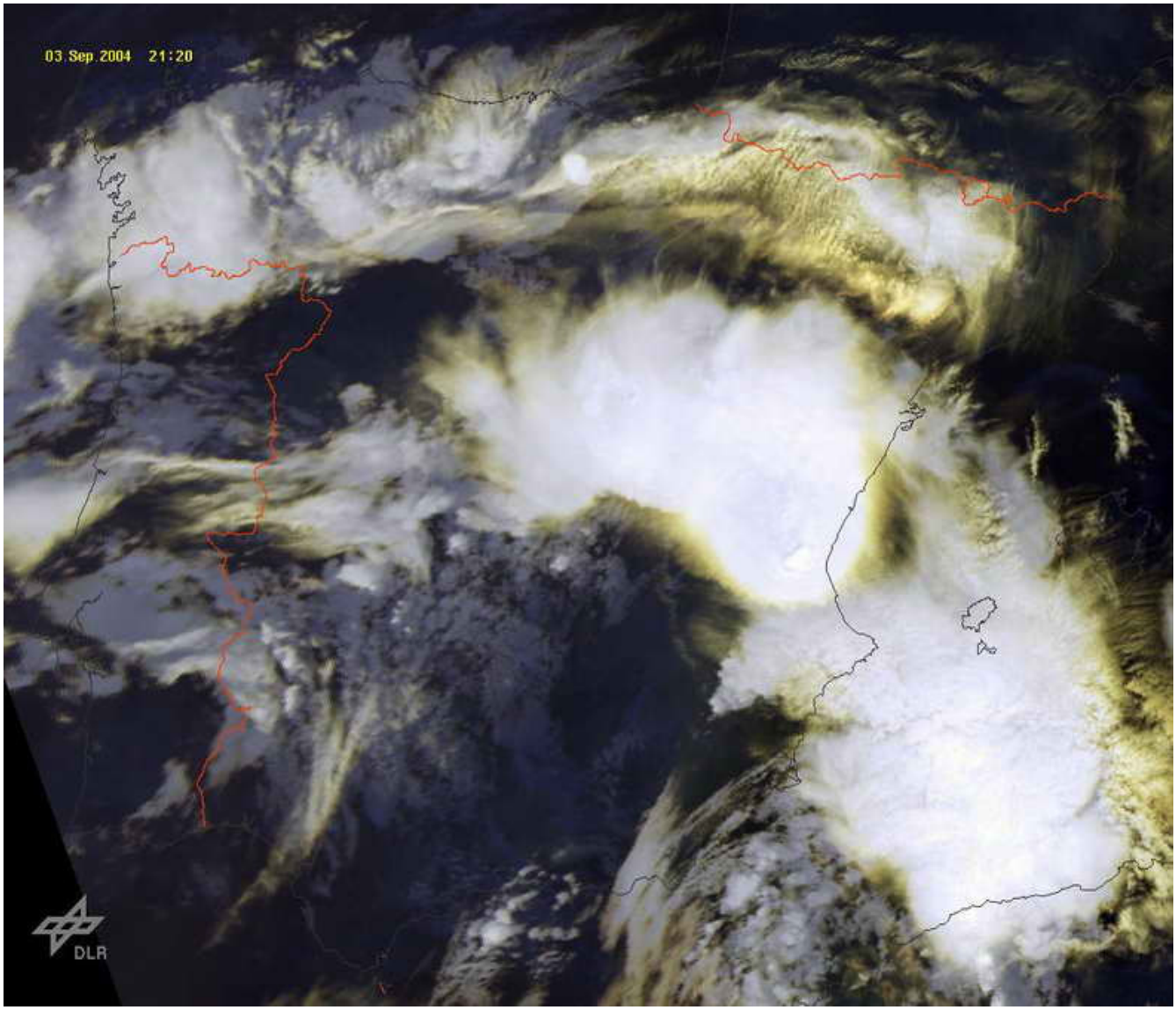


Picture 2 – Surface analysis



Picture 3 – 3D Image by courtesy of Ignacio Alonso Fernandez – Coppel

Let see some satellite images, to form us an impression of the situation at that hour.

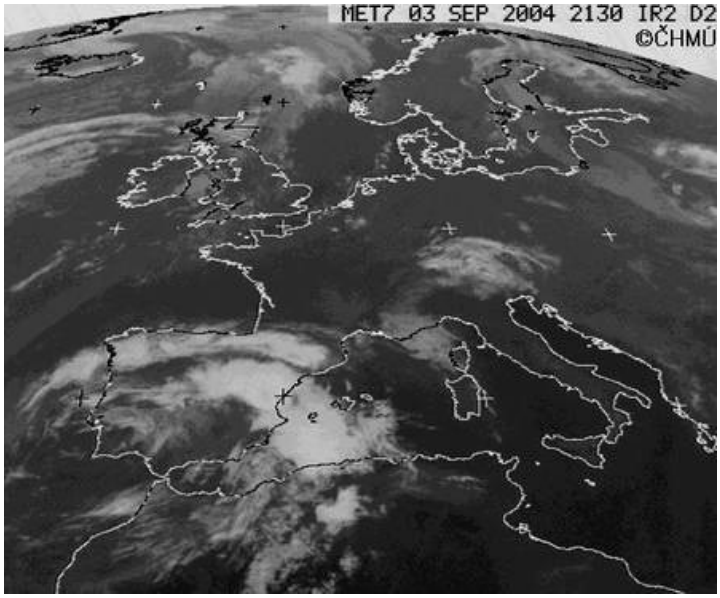


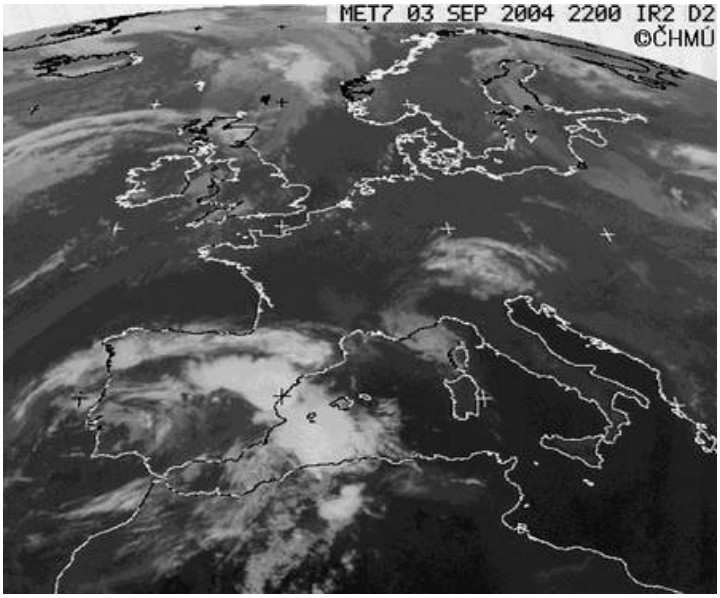
Picture 4 – Visible image of the 3rd September at 23.20.

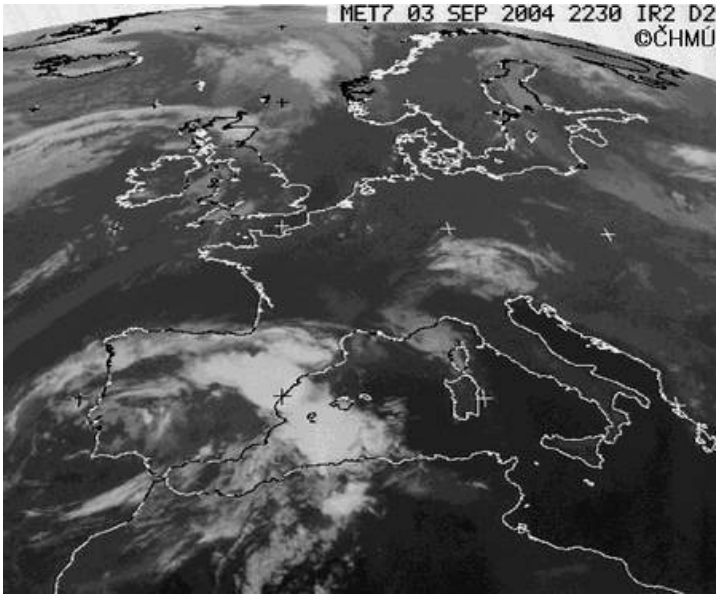
In the right image, in a zoom of the zone, the most compact convective core can be observed, showing clouds with great development, with an echo tops over the rest, just over the zone. It was the beginning of the disaster to many zones of Camp de Turia, Camp de Morvedre, l'Horta y la Plana.

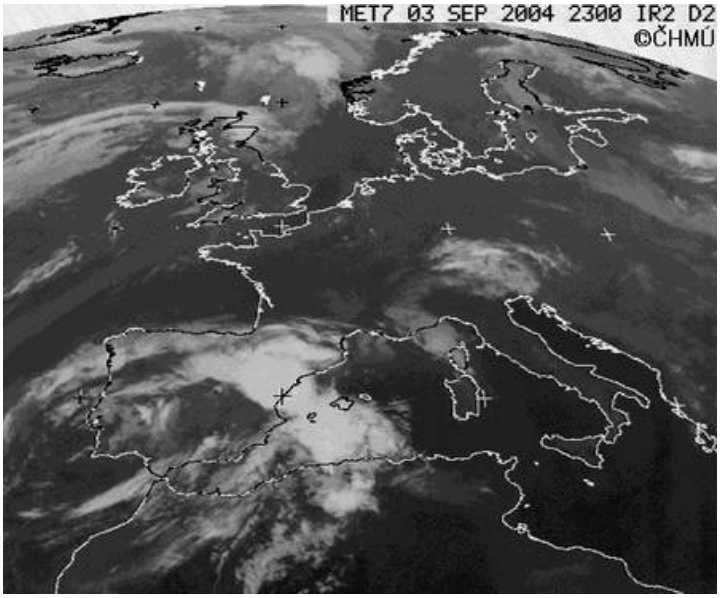
Picture 5 – Enlarged image of the affected zone (3rd September at 23.20)

Other pictures of the infrared spectrum are included also, corresponding to 23.30 of the 3rd September and the 00:00, 00:30 y 01:00 of the 4th, official time.









Pictures 6 to 9 – Images of the IR-radar

In 4 hours, the spectacular storm left a path of devastation throughout the riverbed of the Palancia river. So many newspapers and televisions attributed the event to a tropical storm. In this splendid exposition of Jose Antonio Quirantes, Rayo in the Meteored forum, he gives us guidelines to differentiate them:

"This is not a tropical storm, neither by its space dimensions, nor for their origin, nor by its evolution, nor by its structure, nor by nothing of anything..... in case, the unique characteristic that can be comparable with a tropical storm, it is the intensity of the precipitation, intensities of 300mm./hour are more typical of tropical storms than of storms produced in the middle latitudes.
Without an official confirmation, all the signs take to consider this storm as a supercell. In fact, these storms are exclusive of the middle latitudes, where exist much more vertical wind shear in the atmosphere (and therefore more possibility of generation of vertical vorticity) and do not occur in the tropics, because there this ingredient lacks"

Remembering the supercell definition:

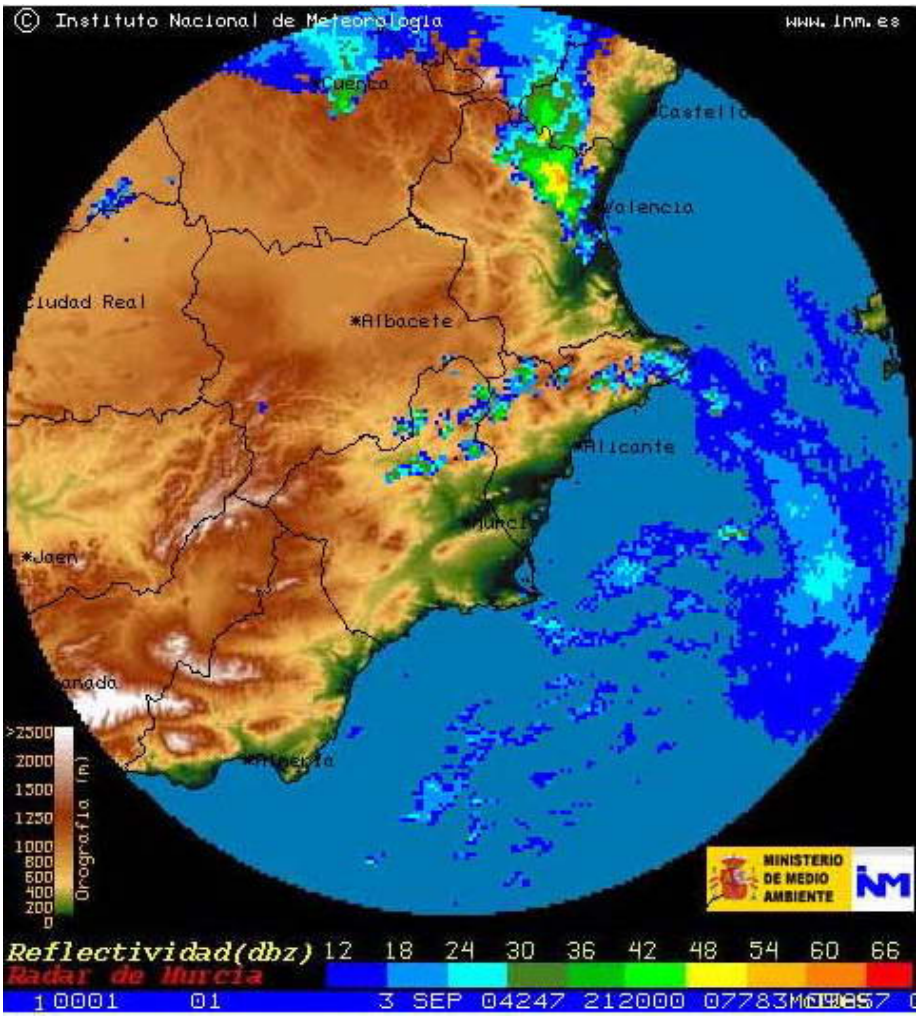
A supercell is a great cumulonimbus that has been developed of an exceptional form as much in vertical dimension (15-20Km) and horizontal (Semiaxis M. 50-200km) as in its persistence (1 to 10 hours). In addition, it entails some type of severe weather the most of times. (20% or 30% produce tornados)
Its unique and distinguishing characteristic is to have a zone of ascending and descendent vigorous currents in rotation, located in low and/or middle levels, call mesocyclone. It means that this type of storms is different of all the others in which they rotate. The cycle of life of a mesocyclone is about 1 hour. If a supercell, as this case, go on for 10 hours, is because it has changed of mesocyclone several times.

Each mesocyclone can produce one or several tornados, or no. A mesocyclone is only identifiable by the radar in Doppler mode. It is not a visual characteristic of the SP, although sometimes the rotation can be appreciated at a glance, other times it is hidden between the precipitation or lower clouds.

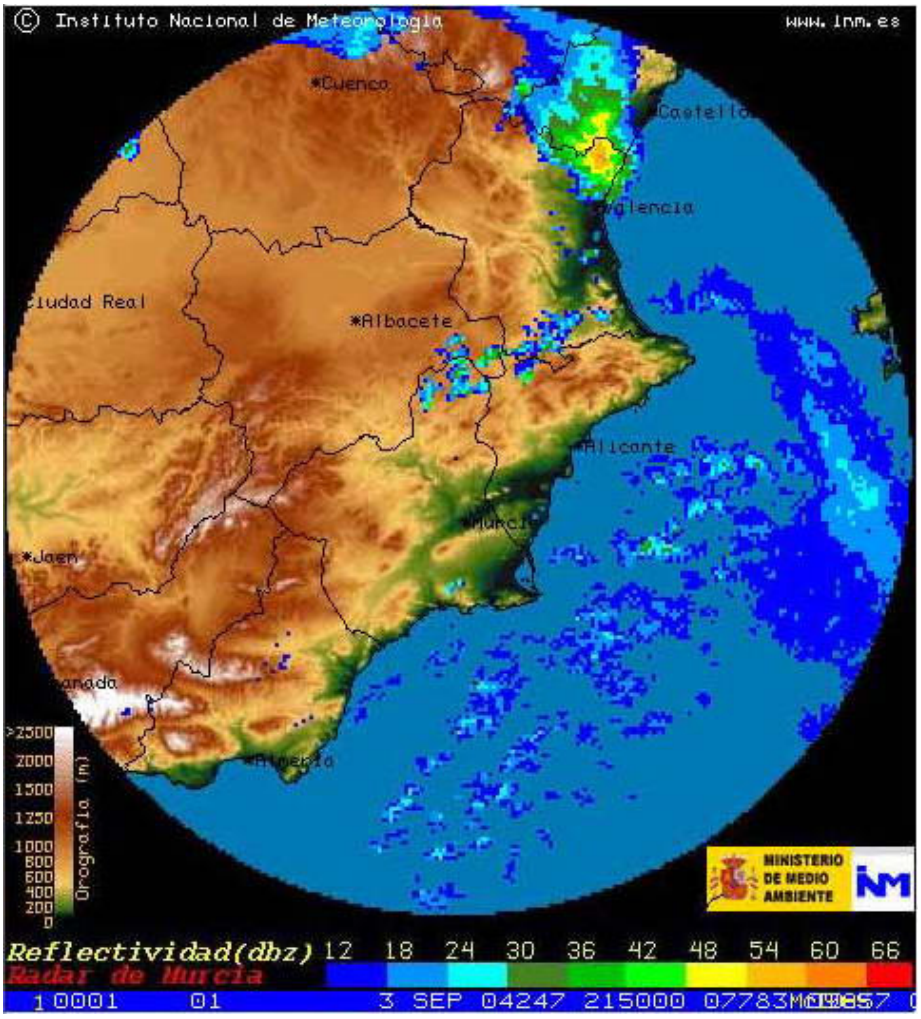
Mesocyclones are, then, the name that receives the intense, deep and persistent ascending and descendent currents in continuous rotation, which the supercells contain. They have an approximated diameter between 5 and 10Km. and a life cycle about 30 or 60 minutes.

It exists three types of supercells:
1 - LP - Low Precipitation.
2 - HP - High Precipitation.
3 - Classic supercells or with Moderate Precipitation.

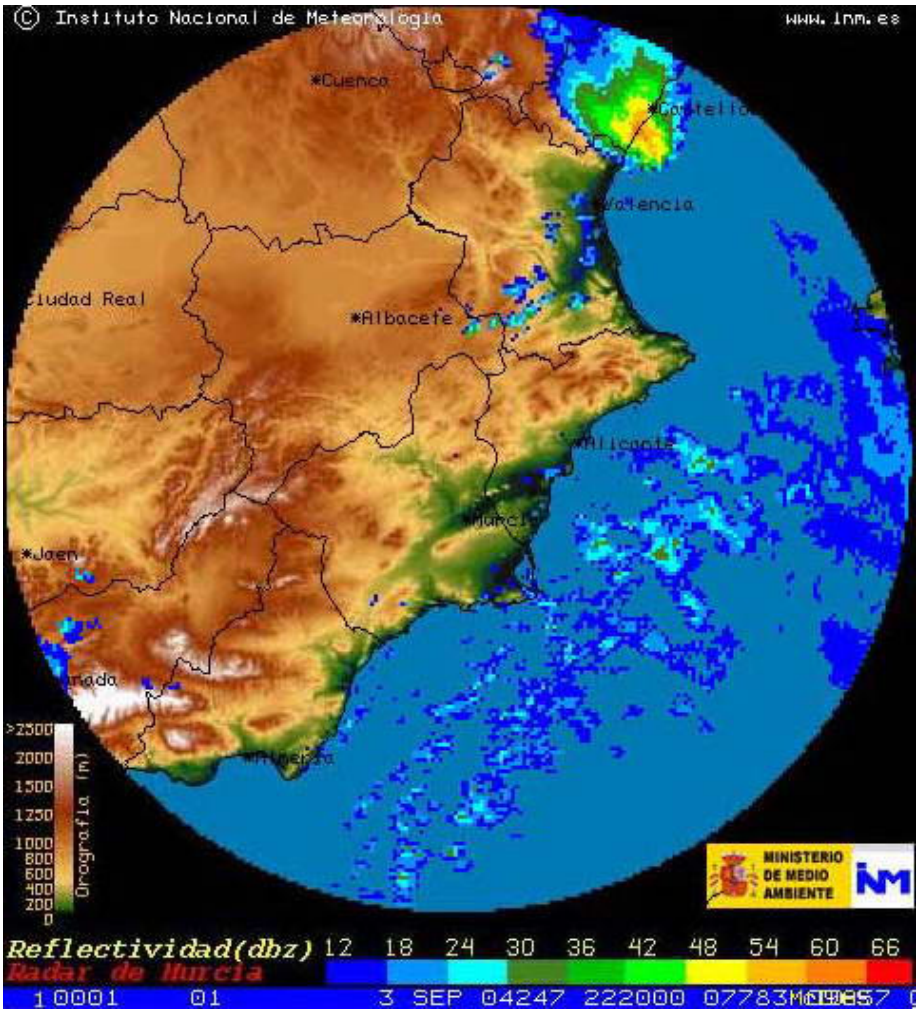
Now let see the study of the images of the radar of Murcia, in where we can see signals of high reflectivity in the entire zone, and a hook form characteristic of these great storms:



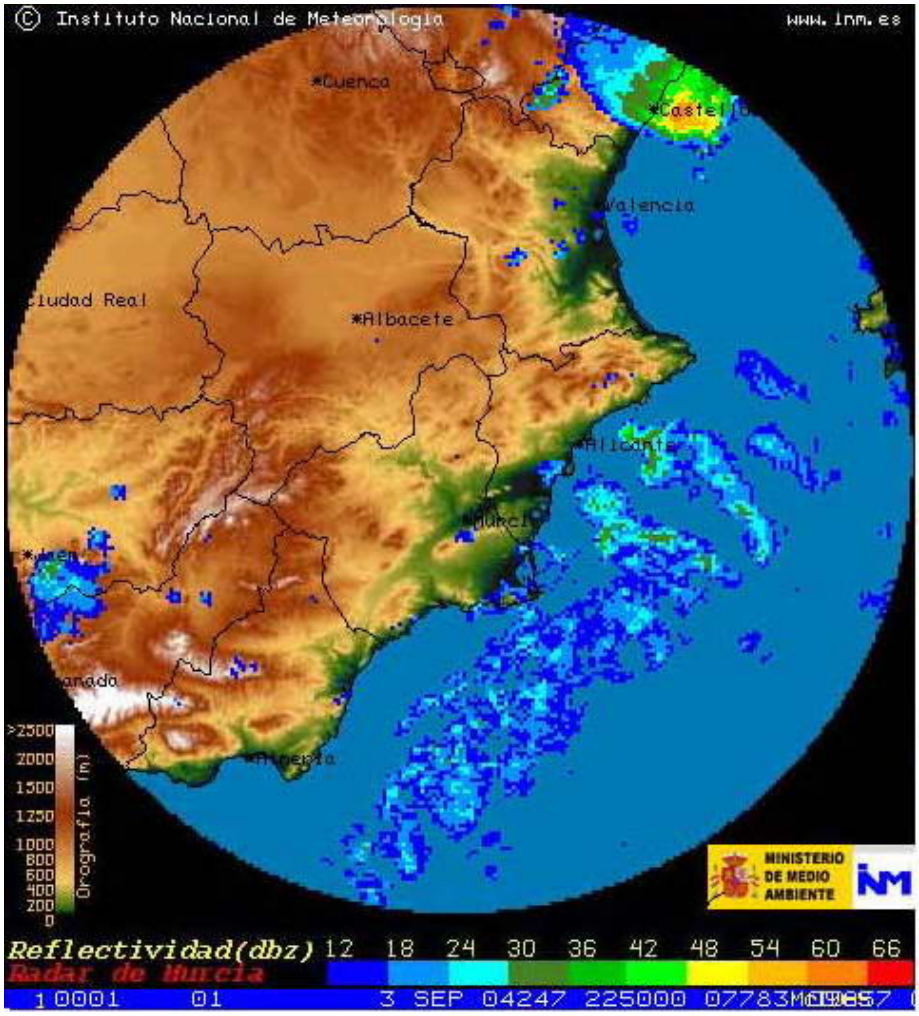
Picture 10 – Supercell on Sierra Calderona (23:20)



Picture 11 – Supercell on Camp de Morvedre (23:50)



Picture 12 – Supercell to the south of La Plana (00:20)



Picture 13 – Supercell going into the sea (00:50)

How I lived it

That night I was at home, in Valterna, 5 km to the northwest of Valencia, preparing me to watch the soccer match Spain-Scotland, that by the way, was celebrated in the near City of Valencia Stadium, playing field of Levante CF and located a little more to the north. The sky already displayed symptoms of which something was going to happen. Continuous brilliances to South-eastern of my situation warned me, in addition my Head call me from L´Eliana and ask me if " that what was happening had some name", because he had not seen something like that in his life. It was before he and the whole town run out of telephony net until the following morning…

When the match began, the thunders were not heard, for that, I was not on the alert. Nevertheless, when resting few instants to the interval of the match, the wind gusts were already made patents and strong thunders were listened long-distance. In the interval I decided to raise the roof, to have a better vision of which was approaching (I already had confirmed it watching the radar and satellite images).

I armed myself with digital camera, reflex camera, and with the tripod and I rose. To open the door cost work to me, because the wind blew strongly in my direction. I left and first big raindrops riddled me. I tried to place the tripod in position, rather in the dark, and to locate the reflex camera in the exposure position, to obtain good photos. But it was in vain, not only by the wind that increased in intensity, but because when looking up, and illuminated for two and three rays per second, it was shown the form of an impressive arcus, advancing from SE to NW, and this, left me paralyzed. It was impressive, majestic, black over the black night, illuminated by tens of discharges.

I concentrated me again in the obtaining of images, while rain got worse. It seemed that only the left side (when I saw how it approached) of the immense cloud was going to pass over me.

And thus it was, but the attempts to use the reflex were failed, and I was centered in the digital. I made some photos and some video, but the quality is very bad and those do not offer no clear image of what it was happening. I came home; the match had begun, but the truth is that I had not much interest by it, because an impressive deluge had untied. A water curtain fell dense, strong and horizontal, accompanied

by very strong air gusts of wind. I went to verify windows and bolts, the blinds bounced and the sound of the water (in my zone did not fall hail) was deafening. Passing by the lounge I paid attention to TV, and I show that in the stadium had gone away the light. I thought… "you have not seen anything yet", because the arcus took that direction. In 10 minutes it began to rain torrentially that way, and… the light at home went away. I saw nothing else, neither in TV nor in Internet, until much later.
It continued pouring during about 25 minutes, in which my pluvio measured 43.5 mm, with a rate of more than 90 mm per hour (the day before it had gathered 72mm in 2 hours). As soon as the downpour finished, about 23:50 (in Valterna), I raised the roof again. In the darkness and between great water rafts (the water-drainages did not give supply) the supercell was fitted in Sierra Calderona and more to the east, until Sagunto. Again an incredible spectacle, of which I tried to take photos with reflex, but I did not put enough exposure and they did badly, very black. I have another video of quite bad quality of the supercell in its apogee. The temperature had lowered at 17º, and after half an hour contemplating that, I gave the day by finished.

The 4th day, by personal reasons, I could not hear the news, so, I found out about the great flaws a little later, when some members of the forum communicated me it. Therefore, day 5th, Sunday, I arranged myself to visit the affected zones, although first I bought all newspapers to inquire me well.

I left in the direction of Náquera, where it seemed that were the greater damages. Here you have some images taken that morning:

Picture 14 – The workers strives in clearing trees and lights towering of the houses.

Picture 15 - Flaws in a tile roof, in the highway towards Náquera.

Picture 15_2 – Big trees uprooted. There were some greater

Picture 16 – Containers treated like cardboard small boxes, so much was destroyed.

Picture 17 – Big doors of some companies destroyed, in an industrial estate near of Naquera

Picture 18 – Windows out of hinge, by everywhere, in the same industrial estate.

Picture 19 – More overturned containers, the force had to be incredible.

Picture 20 - Great cranes tried to organize the disastrous panorama.

Picture 21 – Two days later, there were still water rafts like this

Picture 22 – The anchorages of this poster, completely doubled, although it was so much solid.

Picture 23 – A workers' house also was overturned by the wind force.

Picture 24 – The same house, from the other side, on the verge of demolishing a lamppost.

Picture 25 – The Carrefour of Sagunto tile roofs flew and collapsed.

Picture 26 – Because of the hour in which the tornado took place, there were not damages in people and cars.

Picture 27 – Here there was a roof for parking. Observe the thickness of the anchorages.

Picture 28 – The sports center of Sagunto lost the ceiling, and was practically destroying.

Picture 29 – Riddled by the hail, and devoid of protection plates, will be difficult to reconstruct it.

Picture 30 – Posters in this state laid out all the highways between El Puig and Sagunto.

Well, up to here, the destructions were quite evident, throughout a strip that began towards Náquera and Serra, and with northwest direction, crossed the N221 for Puçol to finish in Sagunto, a little more to the north.

In Sagunto it knew about the existence of some fallen pylon, I had seen some pictures in the newspapers, so I was decided to look for it. Near the highway that goes towards the port of Sagunto, I saw it, but it was in the middle of the oranges orchards. A place called Gausa. A small road passed close, but I did not know where to take it. Almost one hour cost to me to arrive near, after to splashing with mud the car by the muddy ways and convincing the police that I was making a news article and I needed to enter by that cut highway… I was not lying, of course, here you have the evidence.

From there, between the fields of oranges, I saw perfectly the trajectory of the tornado that had knocked down a great amount of pylons in a narrow strip, leaving intact small towers at 50 meters.

Armed of my digital recorder and the two cameras, I arrived next to where the Iberdrola (Spanish electric company) workers strove in replacing the supply. The spectacle was tremendous. In that place I could interview to Alejandro Sainz and Paco Salts, people in charge of Iberdrola, who very kindly told me that 250 people were in the zone repairing (from Saturday 4th to 00:30 hours), the fallen pylons. Neither more nor less than 3 towers of 220.000 Kilovolts with about 35 meters of height, 3 of 66,000 Kilovolts, and several of 20,000 Kilovolts and posts of braided networks, of aluminium, of copper, until a total of about 150. I assure that to see one you of those twisted towers it impress, the wires fell in a road and luckily, for the hour, they did not produce problems, although did flaws.

Like data, Alejandro Sainz confirmed me that the line of 220,000 Kilovolts can provide energy to all the city of Valencia, and each tower resists a weight of 36 tons. As you can verify after seeing the photos, which threw them down, had to be something very strong.

Here I show you the pictures that I could take, before the cranes retired the towers:

Picture 31 – One of the three towers of 66.000 kilovolts doubled like smoke paper, in Gausa

Picture 32 – Another angle of the same tower. Great work of the Iberdrola workers.

Picture 33 – One of the three towers of 220.000 kilovolts. It resists neither more nor less than 36.000 kg of weight.

Picture 34 – Detail of the same tower of Gausa, while the workers worked to cut it.

Picture 35 – The heavy wires was extended throughout hundreds of meter, between orange trees.

Picture 36 - A tower, not only fallen, but surprisingly twisted.

Picture 37 – Big head of land uprooted in the road to the cemetery of Sagunto.

Tornado's category

As you know, to clasify a tornado, it is necessary to see the destructive effects that it has had, because the winds at the moment which it takes place cannot be measured. Let us see in first place, the Fujita classification, in its three first categories:

F0 -- Weak

Winds: 65 to 115 km/h
Slight damages: Damages to some chimneys, broken branches of trees, trees of low height turned around, damage to signboards, some broken windows.

F1 -- Moderate

Winds: 116 to 180 km/h
Moderate damages: Surface of the ceilings given off, rolling houses extracted of its foundations or turned around, small movable structures destroyed, vehicles in movement turned aside of the roads, wind beginning with hurricane speed.

F2 -- Hard

Winds: 181 to 250 km/h
Considerable damages: Ceilings extracted of the houses structure, destroyed rolling houses, houses of weak structures moved, great trees uprooted or broken, light objects in the air turned missiles.

The damages

Well, let see a list of flaws to complete which has already been related. These has been extracted from testimonies in press, television and radio:

- In Godella, in the Caballer Pirotecnica Street, part of the ceiling of a house fell down and a load wall collapsed in the Constitution Street. (*Las Provincias*, *5-9-04*).
- The wind burst all the windows of a gas station. (*Las Provincias*, *5-9-04*).
- The fort wind was able to take of the ground enormous trees as if they were feathers. (*Las Provincias*, *5-9-04*).
- In Sagunto, the strong winds took of the roofs of the firemen park and of the sport center. (*Diario de*

Valencia, 5-9-04).
- In Albalat dels Tarongers, the wind force took of curdle tens of centennial pines that were scattered by grounds in a strip of 5 km (*Levante, 5-9-04*).
- *"Los rest of the fire (in Náquera) of a month ago, flew without control breaking crystals, nailing in the cars, closing some of the ways"*. Maria Bou Soler, neighbour of Naquera. (*EL PAIS, 5-9-04*).
- The neighbours of Serra or Estivella saw as burned trunks nailed in their gardens, windows and vehicles, seeding the chaos. (*EL PAIS, 5-9-04*).
- In towns like Náquera or Serra, affected by a tornado electrical posts flew, uprooted of curdle by the violence of the gusty wind. (*EL PAIS, 5-9-04*).
- *"The noise impressed, as if there was thousand of horses trotting with force on my head, and the sensation of which the sky fell down"*. Neighbour of Náquera. (Levante, 5-9-04).
- In a camping of El Garbí, tens of broken glasses and cars completely dented by hail stones as large as golf balls. (*Levante, 5-9-04*).

Conclusion

During this episode, did not work the radar of Valencia in Doppler mode, reason why couldn't confirm the mesocyclons that had to happen in all its development and evolution. Nevertheless, there are other radar signatures that describes the storm like a supercell. It is more, was an anticyclonal SP (with anticyclonal mesovortex) until it entered the sea, to become later in a cyclonal SP until its dissipation to the north of Majorca.

The same day it seems that formed 3 Convective Systems of Mesoescale, one to first hours of afternoon on Cuenca-Guadalajara-Soria, with NW direction, later another one, on Albacete-Teruel with NNE direction, and third on the north of Algeria that, crossing the sea, arrived until the environs of Ibiza. It seems to be that Supercell formed in "the tail" of the second SCM between this and the Algeria SCM.

In spite of that several newspapers, the following day and without no type of explanation, assured the presence of, not one, but several tornados, it is evident that the damages were very important. All this, accompanied with the pictures and the exploration in-situ that I could make during Sunday 5th, take me to think that in the zone it was developed at least a tornado, with winds over 180 Km/h, that in moments were surpassed and obtained category F2 in several concrete zones, like Náquera and Gausa (Sagunto). During the rest of the time, it was a F1 or F0. If it was a single tornado or were several is something that I cannot assure, although I dare to think that they were two different tornados, because it does not appear a continuity in the destructions between a zone and the other. But I have my doubts.

The tornadic episode could be combined, in addition, with a downburst or cold air collapse, although in the zones that I have mentioned before, it is not very probably that this effect took place alone, because can be appraised without no doubts the sign of the tornado, that left intact towers not very robust at less than 50 meters of the destroyed pylons. And we can see that the 3 greater pylons are in straight line, perpendicular to the front advance. Many orange trees lay down similarly, in that direction, and in some zones a track with a width of about 80 meters was observed. The way in which some towers were also destroyed indicate that, in addition to an horizontal force, there was a rotation force, that twisted them on themselves, as you can see in the pictures.

Some others, nevertheless, are simply doubled, towards the advance direction of the storm. These could be affected solely for the fort currents produced by the previous downburst before of the passage of the convective nucleus.

14 Septiembre 2004 - Emilio Rey (Cumulus Humilis) - SSW [KOKAM-KOKAL]

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