SEVERE THUNDERSTORM ON 9 SEPTEMBER 2004 (SQUALL LINE)

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I. INTRODUCTION

During the evening of 9th September 2004, heavy storms took place in the Basque Country (Alava y Guipúzcoa) in the eastern part of the North Coast of Spain. They caused heavy rainfall, large hail (45 mm in diameter) and strongs winds of more than 60 Km/h, 90 Km/h in several places (maximum: 117 Km/h).

II. PRESENTATION OF RESEARCH

In the radar images from this day, one can appreciate the convective system pattern at the maximum activity time. In the vertical profile images: CMI in "normal operational model" it is easy to see the strong development that reached the convective cells and the "echoes in balcony form" , that are typical in severe convection (Fig. 1).

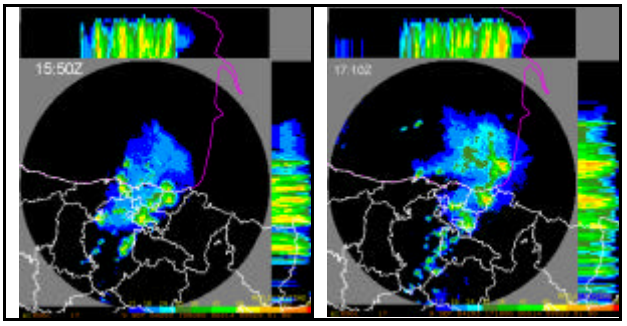

FIG. 1. Vertical profile images from 15:50Z (left) and 17:10Z (right), showing the "echoes in balcony form" and the squall line structure that the convective system had.

In the VIL images, it is possible to see the evolution of the system into the "squall line " structure.(Fig 2.)

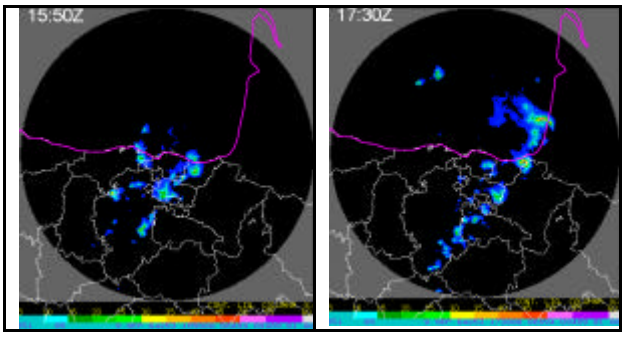

FIG 2. VIL images (left)15:50Z, 9th September 2004; (right): 17:10Z, 9th September 2004 .

The sy noptic analysis on the surface, 850 Hpa, 500 Hpa and 300 Hpa, show instability, that were also appreciated in soundings from Santander (closer than País Vasco) during the evening of 9th September , when storms took place.

Soundings revealed high values in precipitable water, potential instability from surface to 500 Hpa, strong winds from SW in all levels, a dry layer near 700 Hpa in sounding before to the storms and significant values in vertical shear (CIZBL6).

The wind Doppler images from radar show the possible presence of a mesocyclone in middle levels. However, it´s necessary to take into account that the signal was far from the place of radar (centre in image) and, for this reason, the radar data is not completely reliable. In any case, these signals were coincided with the stronger winds. (Fig.3)

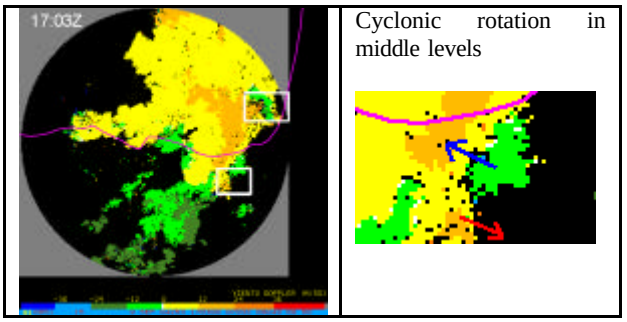

FIG.3 WINr image from 17:30Z, 9th September depicting wind structure and possible mid-level mesocyclone areas

III. RESULTS AND CONCLUSION

Radar study showing a severe convection case, with "squall line" attributes. The radar images allow us to typify the situation. For this proposal, vertical reflectivity profiles in "Normal operational mode" are presented . Moreover, relativity velocity in "Doppler operational mode" is presented too, and can prove the severity of the phenomenon .

At the moment and in relation to forecasting large hail, there is not a reliable method for forecasting it, but it can use VIL density data (VIL/ECHOTOP) because, in some cases it is better than the day´s VIL. In any case and when severe convection is expected, hail presence is almost definite, though it is not necessarily reach the surface.

All of them (radar images: VIL, wind structures in Doppler, etc) are used in operational forecasting and surveillance, and allow monitoring and warning of this kind of phenomenon.

Radar C- band; beam elevation: 0.5º; Res: 2Kmx2Km; Coverage (normal operational mode): 240 Km in radio; Wave length: 5 cm Doppler operational mode: Res: 1 kmx 1Km : coverage: 120 Km in radio.

IV. REFERENCES

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