FOEHN PHENOMENA IN THE WESTERN CRETE. PART I. THE SYNOPTIC SITUATION AND FLOW FIELDS COMPUTED BY THE ARPS MODEL

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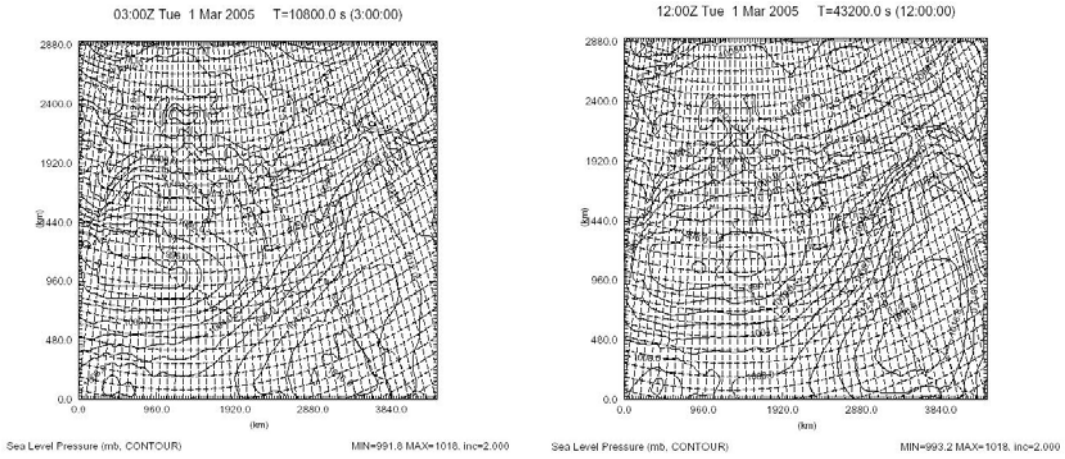
Foehn phenomena are quite common in the western Crete. The main reason for that is the high mountains located in the middle of Crete which separate the island in two different districts (the south and the north).

The south winds are coming from the Libyan sea, climb up these mountains, causing wet and cool weather conditions at the south side of the island. After that when they are climbing down to the north side of Crete the weather conditions become warmer and drier. The temperature regime in some places in north Crete, depend on the exact direction of the wind.

In this work we examined a case of Foehn winds in the north part of Crete happened at Marc 01, 2005.

For the analysis we used the Advanced Regional Prediction System (ARPS) model (Version 5-http:/www.caps.ou.edu/ARPS). The main grid is covering an area with dimension 70x70 km, and the terrain analysis is 30'' arc seconds (1x1 km).

The Foehn phenomena seem to affect the weather and consequently the air quality in the town of Heraklion (>150,000 Habitants) the capital of Crete.

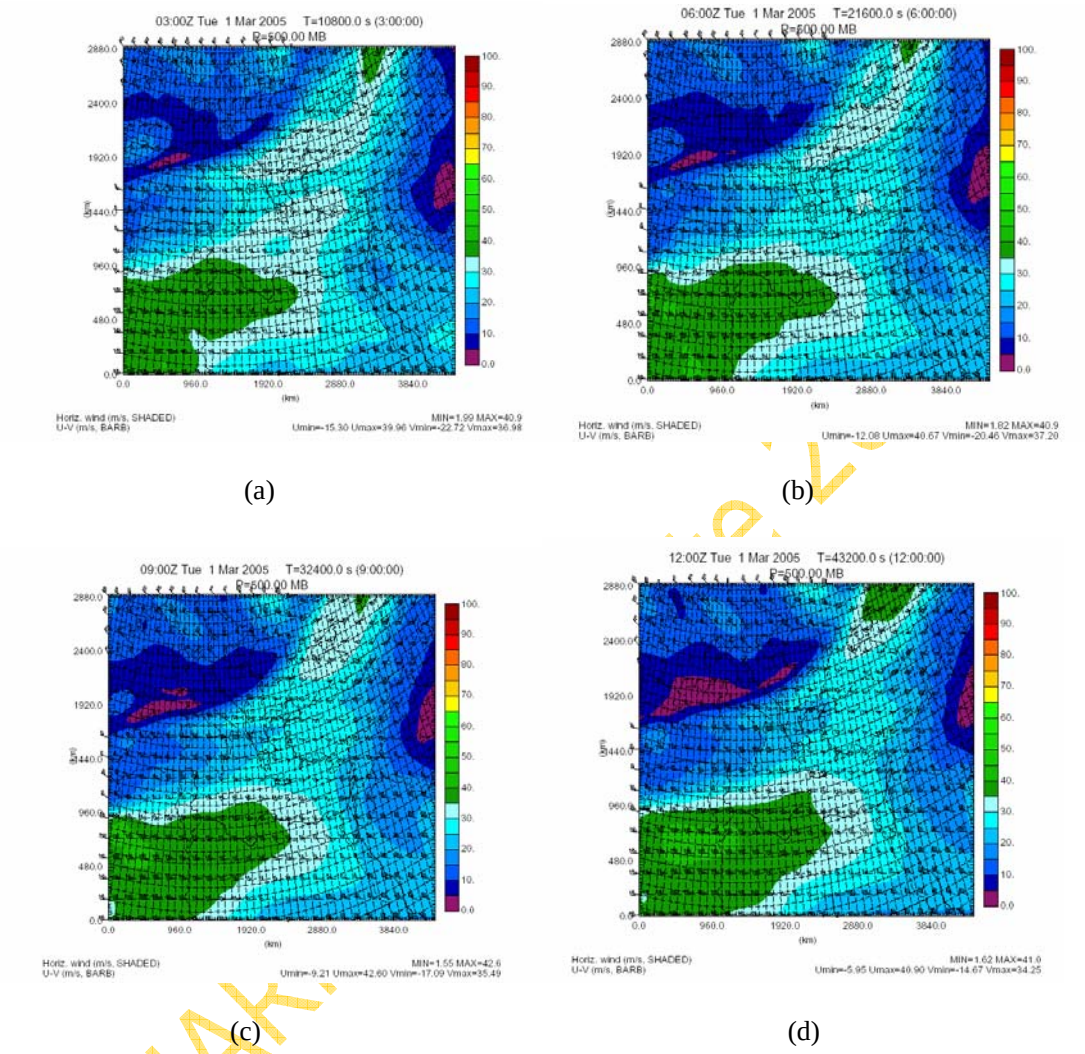


(a) (b)

Figure 1. The synoptic charts during (a) 0300 and (b) 1200 UTC of March 1st, 2005.

In a first stage we examined the synoptic situation in the area of Crete, which was affected by a rather fast moving low level system located during the night over Algeria and during the noon south of Sicily. In the area eastern of Crete a very strong pressure gradient was detected bringing warm air masses over the eastern Mediterranean and Cyprus (Figure 1).

The wind regime at the isobaric level of 500 hPa (e.g. to a height of ~5500 m above ground) was during the night from western directions quite strong over Crete.



(a) (b)

(c) (d)

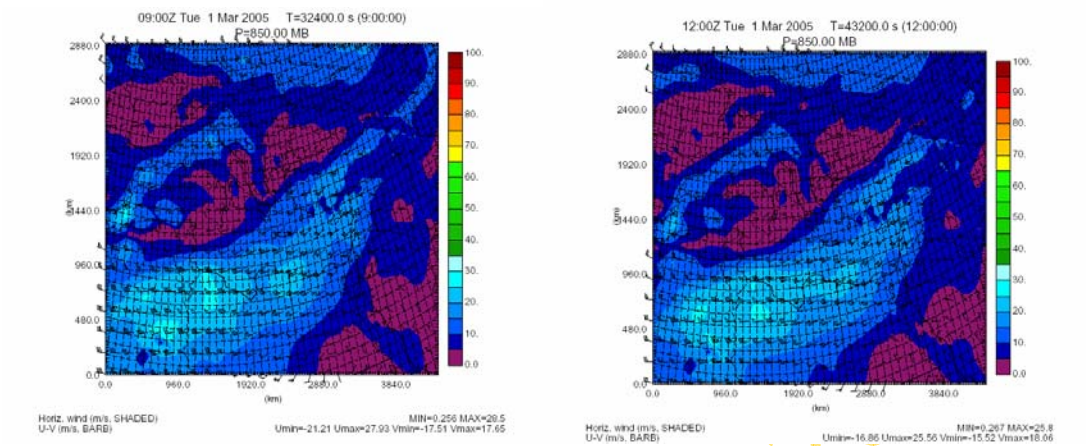
Figure 2. Horizontal winds (U+V) in the level of 500 hPa during (a) 0300, (b) 0600, (c) 0900 and (d) 1200 UTC at March 1st , 2005.

During the day the winds over Crete were remained from western directions strong enough, but they are not intensified. A small turn of the wind flow from WSW directions was detected during 1200 UTC (Figure 2).

At the isobaric level of 850 hPas (e.g. ~1500 m above ground) the wind regime was found to turn from SW directions over Crete during morning and noon hours. The intensity of the horizontal winds was about the half of the relevant winds in the isobaric level of 500 hPas (see Figure 3).

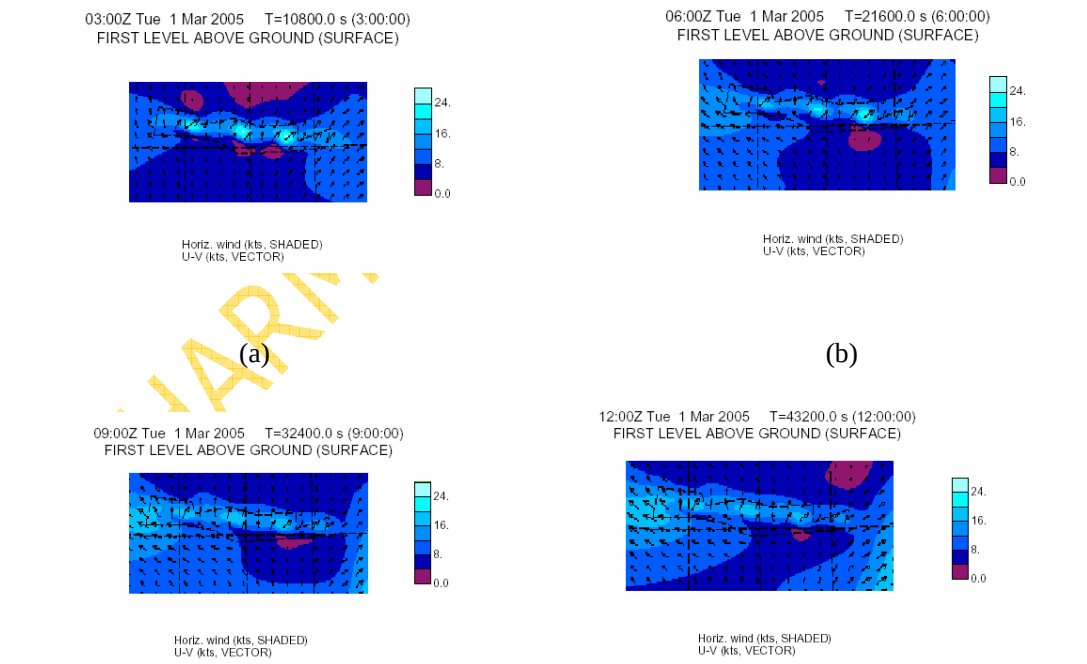
At the surface the winds were SW over Crete during the night and early morning hours, but during the morning and the noon hours were turned to south winds. The winds were strong over the mountains of western Crete during the night (~24 Knots) but during the noon were significantly weakened (~12 Knots). The wind regime over the mountainous area of Western Crete favoured the establishment of Foehn winds over the area near the capital of Crete (Heraklion city). These

phenomena are quite common during the transient seasons of the year (Spring and Autumn). The wind regime at the surface, over Crete, is shown in Figure 4.



(a) (b)

Figure 3. Horizontal winds (U+V) in the level of 850 hPa during (a) 0900, (b) 1200UTC at March 1st , 2005.



(a) (b)

(c) (d)

Figure 4. Horizontal winds (U+V) at the surface during (a) 0300, (b) 0600, (c) 0900, (d) 1200 UTC at March 1st , 2005.

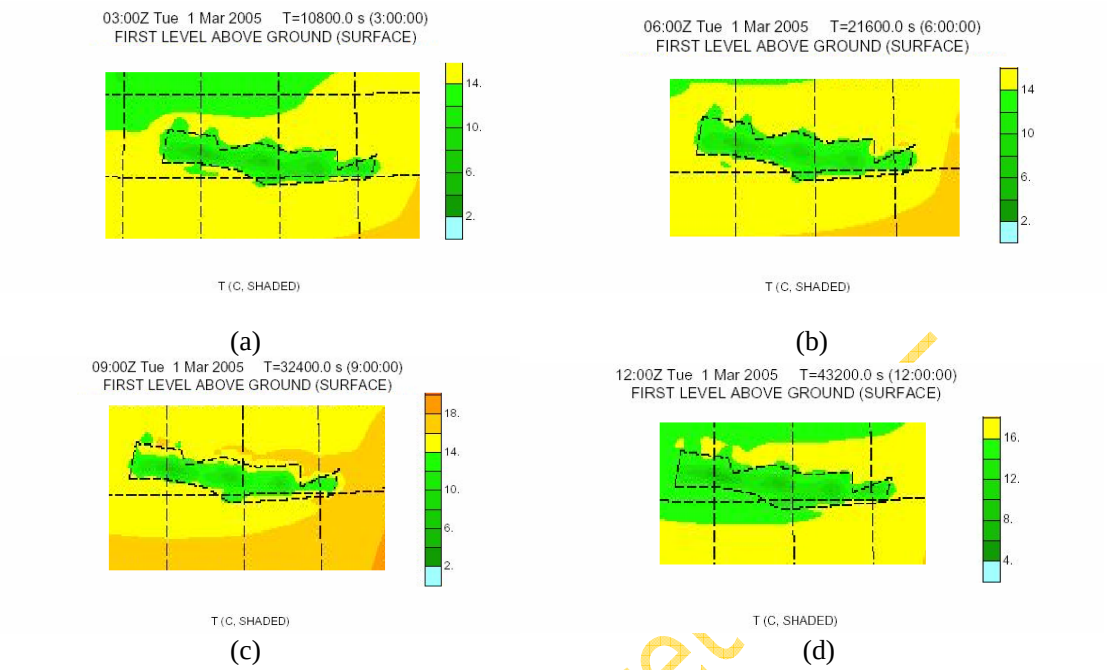


Figure 5.Temperature fields at the surface during (a) 0300, (b) 0600, (c) 0900, (d) 1200 UTC at March 1st , 2005.

Concerning the temperature fields over Crete (Figure 5) during the night, over the mountains the temperature was lower than 6°C while during the noon was about 10°C. Over the plains the temperature was higher than 10°C during all the night and 14°C during the day.
It is also interesting to see the dew point Temperature fields during the day and night to have an idea of the water content of such winds.
Figure 6 shows the dew point temperature for 0300, 0600, 0900 and 1200 UTC over Crete. During the night the dew point temperature over the mountains of Western Crete, was about 0°C and in some cases lower than 0°C. During the morning and noon hours the dew point temperature was found to be significantly lower than 0°C reaching values as "high" as -6°C.
The paper summarises the synoptic situation under which foehn winds could establish over Crete. It is the first part of a work which is under way now.

Acknowledgements.

We would like to thank the University of Oklahoma/ Center for Analysis and Prediction of Storm for the model which kindly offered to us through internet.

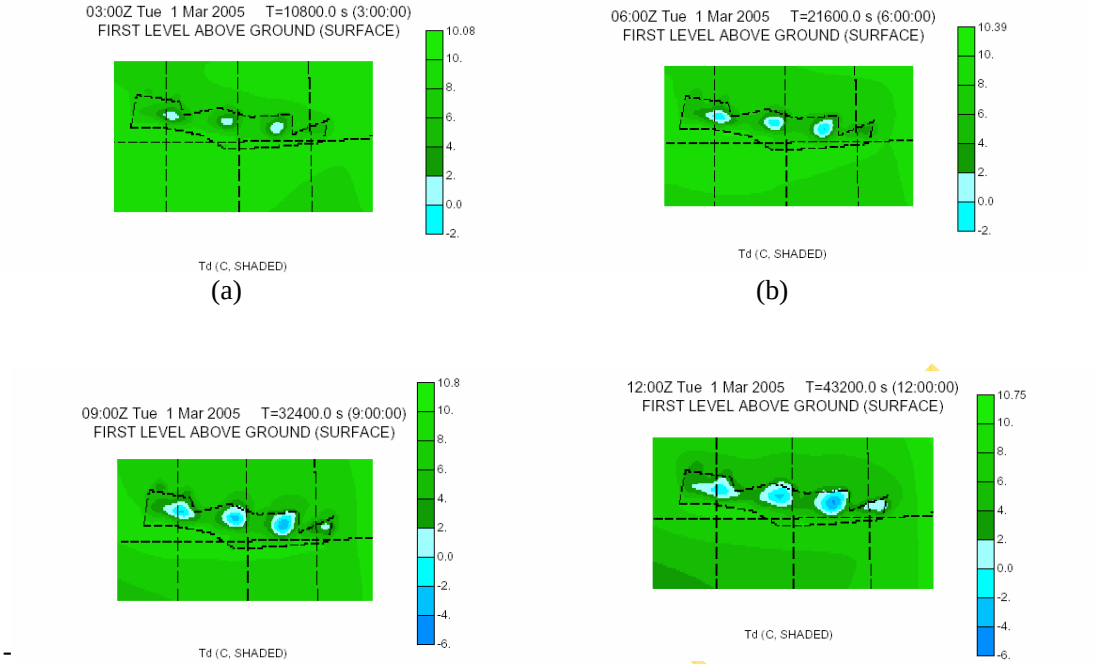


Figure 6.Dew point Temperature fields at the surface during (a) 0300, (b) 0600, (c) 0900, (d) 1200 UTC at March 1st , 2005.