

Programme DC14 : Tropospheric Studies

Mission 2001/02

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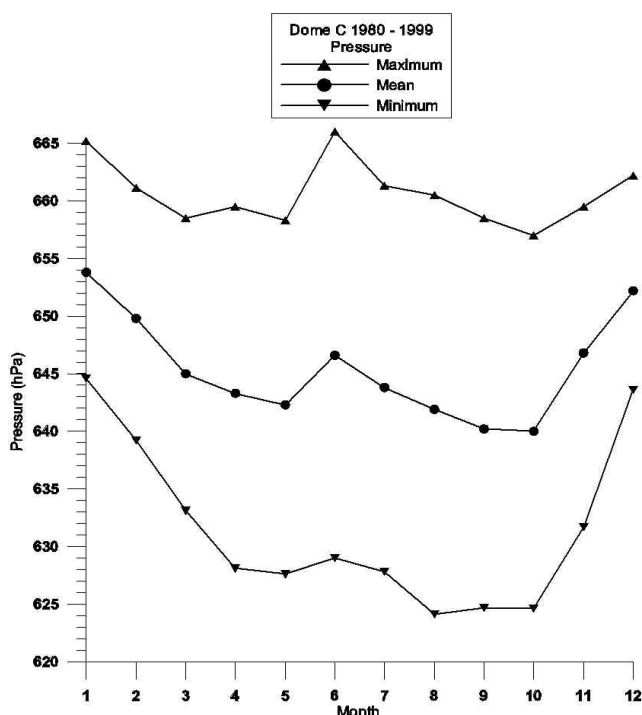
Report N° 5

Brief study of the climate of Dome C from AWS data

Introduction

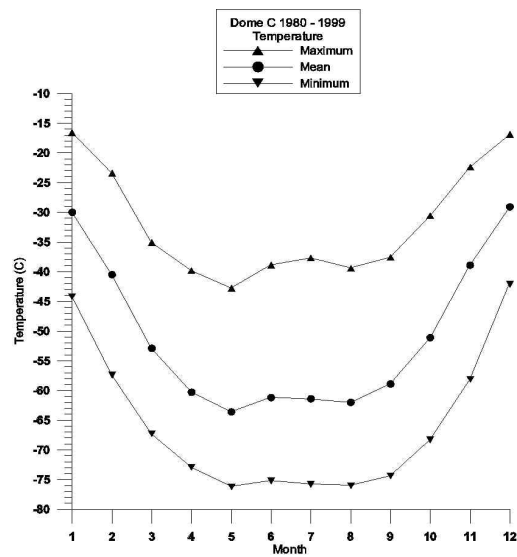
This study aims to make a rapid overview on the climate of Dome C by using the data of the Dome C Automatic Weather Station (AWS) over the period 1980 - 1999. The only parameters available were studied: pressure, temperature, wind speed and direction. For each one of these parameters one calculated on the sixteen years series the monthly average of the parameter and its maximum and minimum. One will show then the anomalies of each one over the period. The results are presented in the form of graphs and are briefly commented on.

Pressure



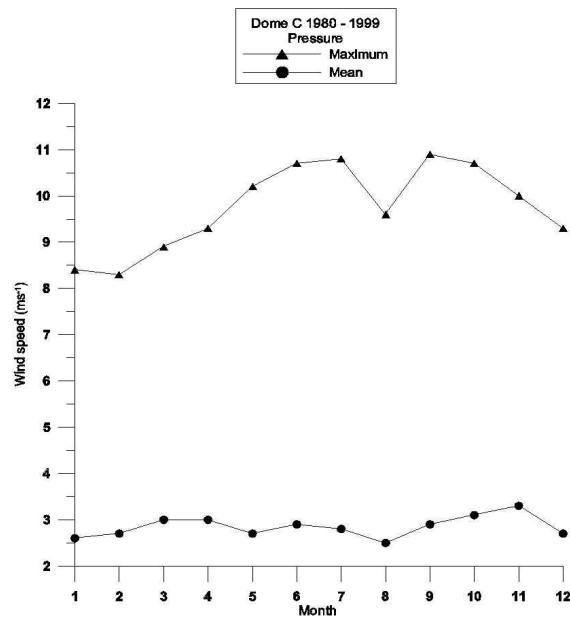
One observes the semi-annual oscillation of pressure with two minimum in May and October and two maximum in January and June. The winter maximum in June is reached when the extent of sea ice is maximum. The minimum in October indicates that at this period the depressions are more frequent and penetrate farther inside the Antarctic in connection with the sea ice retreat.

Température



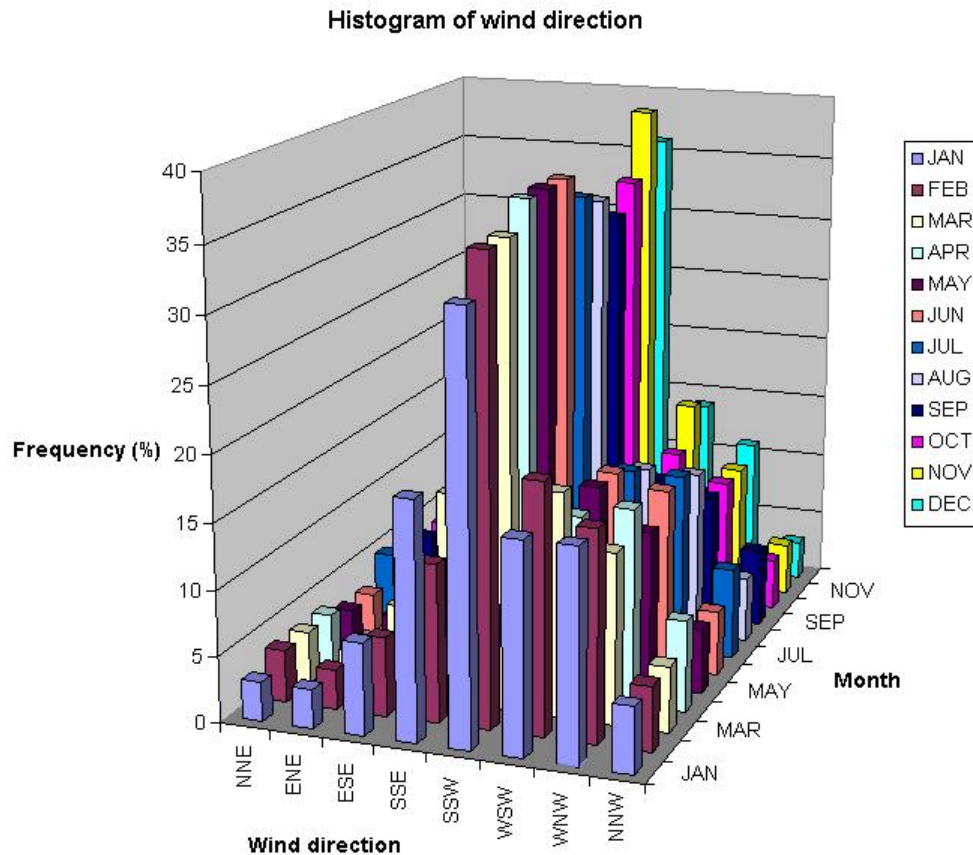
It is seen that the temperature passes in winter by two relative minimum in May and August separated by a warming with a relative maximum in June which corresponds so that one calls corress winter which results from the inversion of the variation in temperature gradient on a large scale through the mean troposphere. It is noticed that the temperature starts to increase at the same time as the pressure reaches a minimum what shows the influence of the air of oceanic origin brought by the depressions.

Wind speed



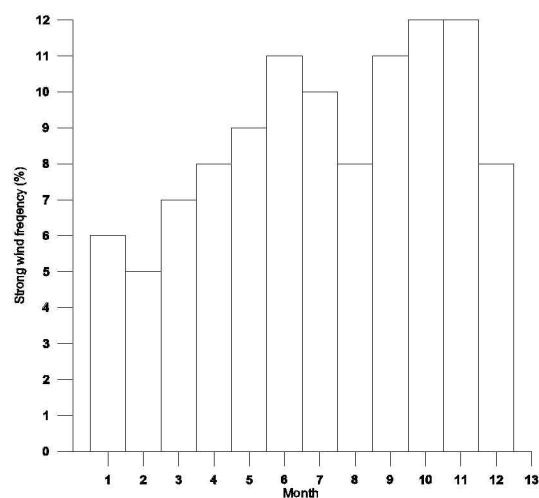
The mean wind speeds are low of about 2.5 ms⁻¹, but the maximum vary from 8 ms⁻¹ to 11ms⁻¹ with two relative maximum in June and September of about 11ms⁻¹, and with a relative minimum in August of 8.5 ms⁻¹. It is noticed that with a mean wind of 3.3 ms⁻¹, November is the month the most windy of the year and that the maximum is higher than in January. The wind speed minimum in August can be associated with the establishment of the polar vortex which creates a significant dynamic barrier.

Wind direction



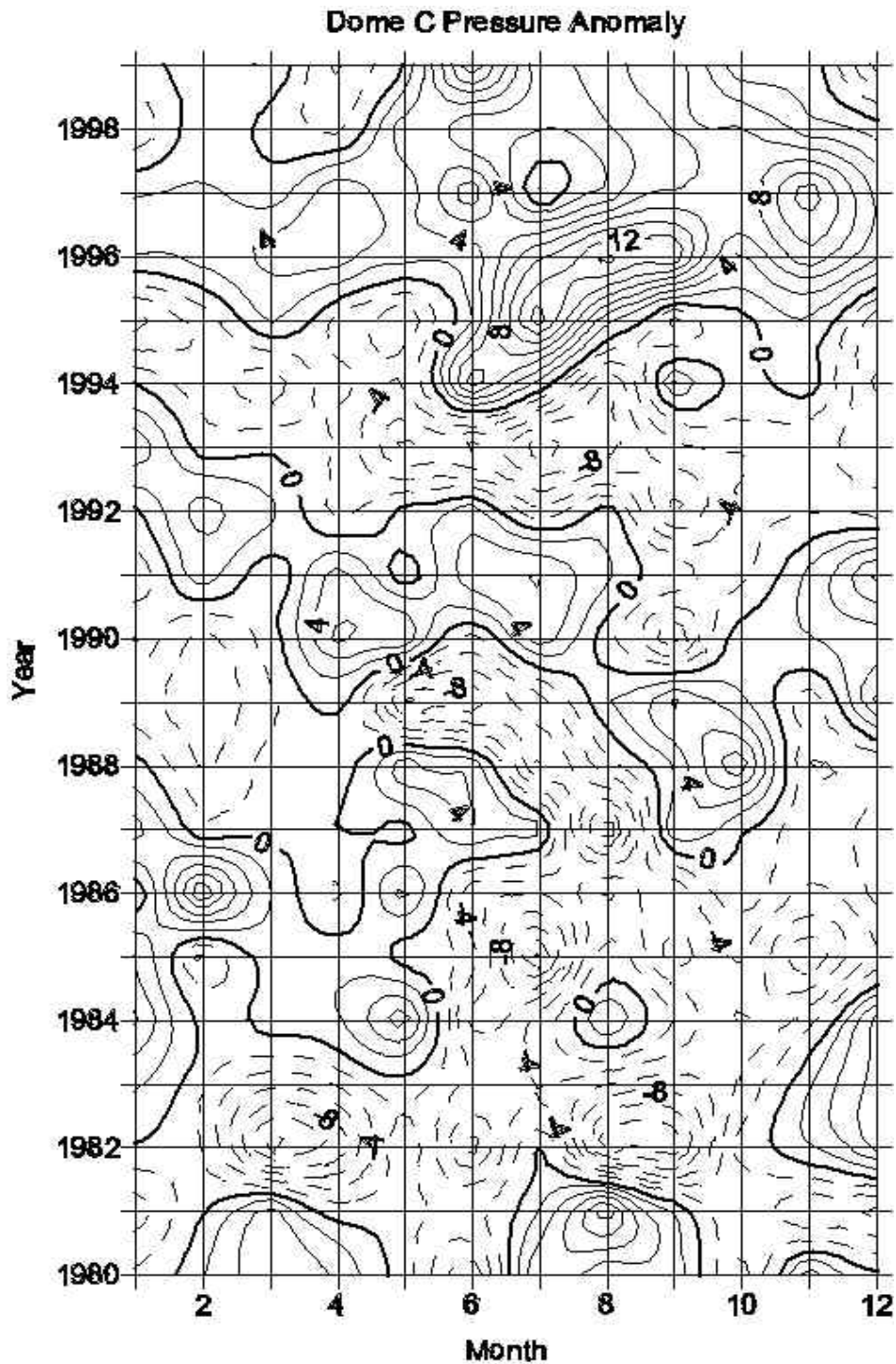
This histogram shows the frequency in per cent of the wind direction by sector for each month. It is clear from this diagram that the most frequent direction of the wind is SSW (between 180° and 225°).

Strong wind



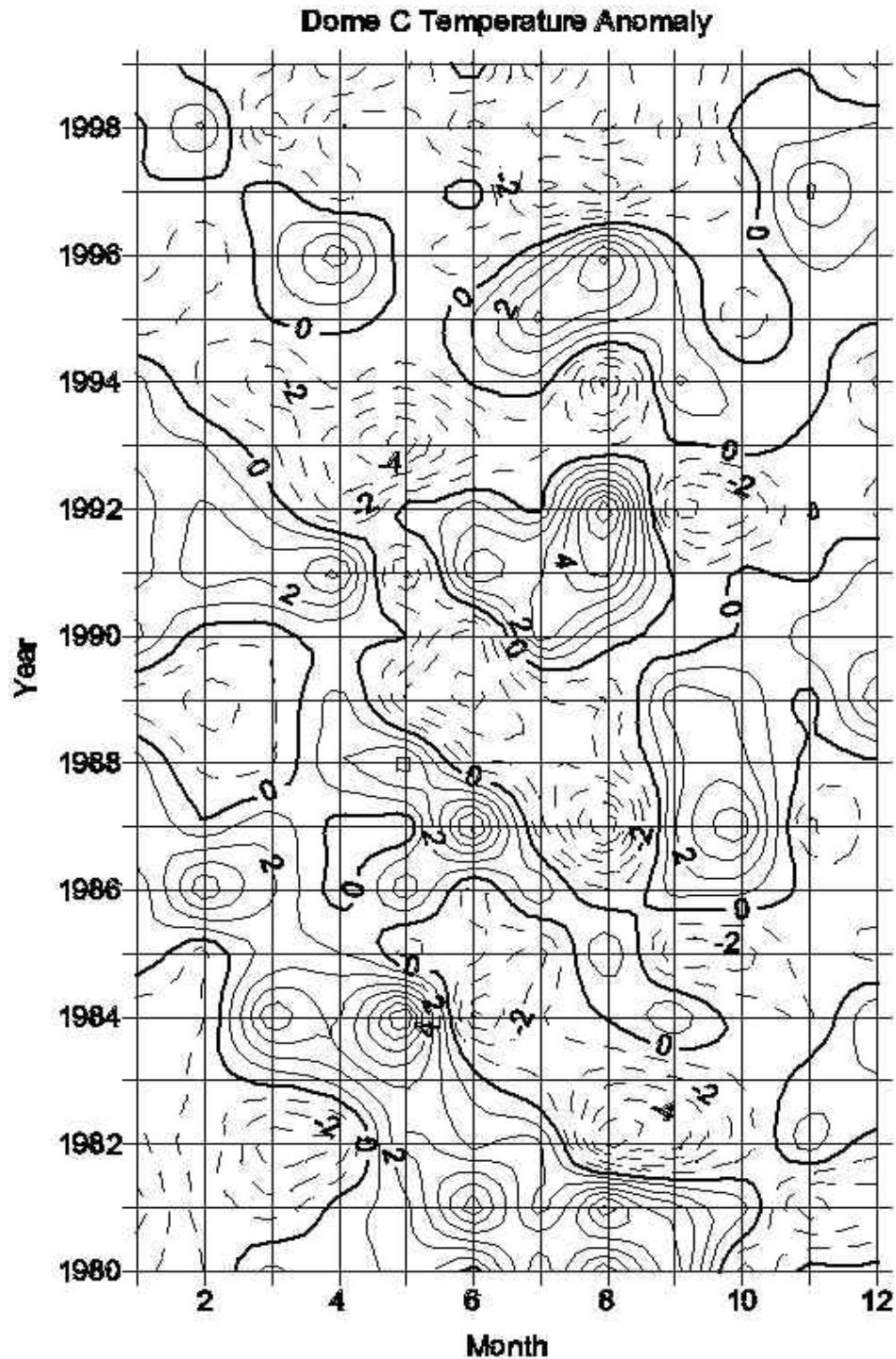
This diagram shows the frequency in per cent of wind speed higher than 6 ms^{-1} . It is not so strong but relatively significant. Then we can see that the less windy month is February and that the two most windy are October and November.

Pressure anomaly



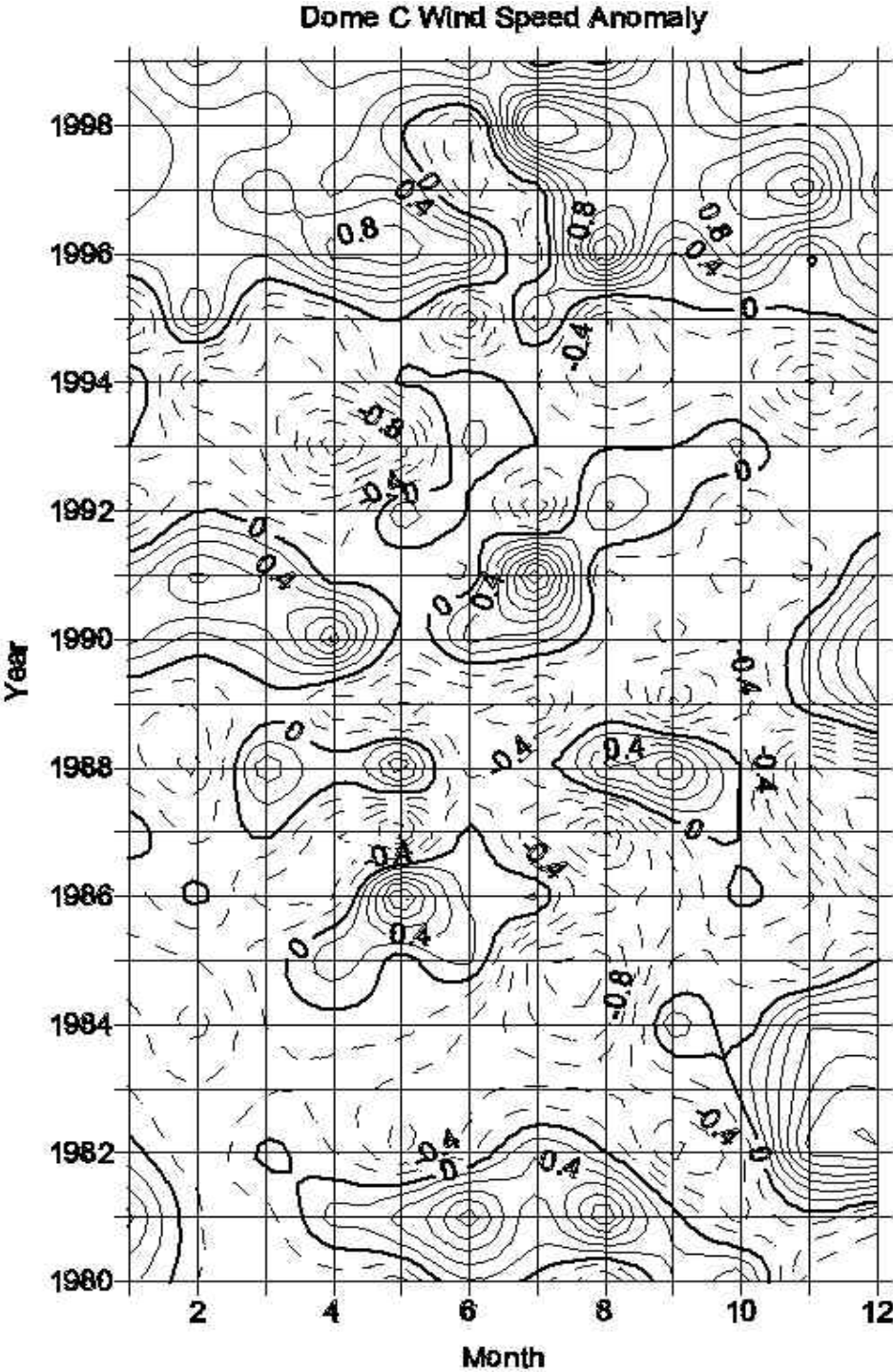
We can see that the pressure anomalies are generally stronger in winter than in summer, but we note a relatively strong positive pressure anomaly in February 1986. The strong negative pressure anomalies in April and August 1982 can be associated to the El Niño case of 1982.

Temperature anomaly



As for pressure the temperature anomalies are weaker in summer than in winter. Nevertheless we note a positive anomaly in February 1986. As for pressure we note the strong negative temperature anomalies in April and August 1982 probably associated to the El Niño case of 1982. This result suggest a wave propagating conterward with a wave length of about eleven or twelve months.

Wind speed anomaly



As for pressure and temperature the wind speed anomalies are stronger in winter, but we note strong positive or negative anomalies occur in November and December and persist over several years. As for example there is a positive anomaly in December from 1981 to 1985, then negative from 1985 to 1989 and again positive until 1992.

Conclusion

This study suggests the following results:

1. The period of spring, October at December, is more disturbed than the autumn from February to April;
2. During the summer the temperatures remain close to the climatic average temperatures;
3. The dominant direction of the wind is South South West (180° with 225°). The monthly averages of the wind are weak of about 2.5 ms^{-1} , but one observes maximum during the summer months around 9 ms^{-1} . The maximum wind speed observed over the series is 16.7 ms^{-1} in November 1995. Taking into account that this maximum wind speed is an average over ten minutes and that we used the three hourly data it could be reasonable to consider that the maximum wind speed at Dome C can reach about 20 ms^{-1} . The summer months are not the less windy of the year. One have observed as well positive as negative anomalies of wind speed occurring in November and December and persisting during several years.
4. In conclusion, from the point of view of meteorology, it seems that it is January which is the best month of the year at Dome C.