STRONG FOEHN AS A TYPE OF SEVERE WEATHER

P. Hächler

MeteoSchweiz, Zürich, Switzerland
E-mail: patrick.haechler@meteoschweiz.ch

Abstract: Strong foehn winds have caused severe damages in Switzerland for centuries. But how often and in which part of the year stormy foehn winds are taking place in the north of the Alps? The synoptics of very strong foehn cases are discussed briefly, and the Swiss warning system is also presented.

Keywords *– ICAM, MAP. Foehn, Warnings*

1. INTRODUCTION

For centuries foehn plays an important role in the alpine valleys of Switzerland. In these areas foehn produces stronger gusts than westerly winds. For 140 years we have regular meteorological information of several stations. And since the 1960ies we have measurements of one second gusts which allow to establish a climatology and a special analysis of extreme wind peaks. Nowadays it is also possible to make warnings of foehn gusts, which was not possible until the 1980ies.

2. AN EXTREME EXAMPLE

For Altdorf we have gust-statistics since 1965, that means over exactly 40 years. The highest wind peak with foehn was measured on December 13th 1981: 155 km/h (Figure 1). December is not a typical foehn month, but usually a month with strong westerly winds. The synoptic situation shows indeed a strong upper windfield nearly exactly form west at the end of the day. At the surface we find a deep low centered over England. Central Europe shows southwesterly geostrophic winds and an important pressure fall. The result is a very strong shallow foehn. It started during the day and reached very high peaks at several stations: 164 km/h at Jungfraujoch, 155 at Altdorf, 122 at Gütsch and 100 at Vaduz. As we can see it was not only a strong wind touching down from the summits into the alpine valleys, but we had an important acceleration in the valley itself. This usually happens with falling pressure. Another extreme foehn case happened in November 1982 and was presented in former papers and conferences. During MAP the strongest foehn gust in Vaduz was 111 km/h and happened on October 24th.

3. CLIMATOLOGY OF EXTREME FOEHN GUSTS

As mentioned above we have 40 years of “exact” wind measurements of Altdorf. We tried to define an extreme value statistics, inspired by the method of Gumbel used for hydrologic purposes. The extrapolation to the 80-years extreme value gives slightly more than 160 km/h, and the mean of the probable one year gusts is about 130 km/h, while a 100 km/h foehn seems to be nearly the absolute minimum of the one year maxima. For Vaduz the respective values seem to be about 5 km/h lower.

At what time of the year can we find the highest probability of the maximum? Not in April which is the month of most foehn hours, but in the winter months December to February, when the frontal zone is strongest.

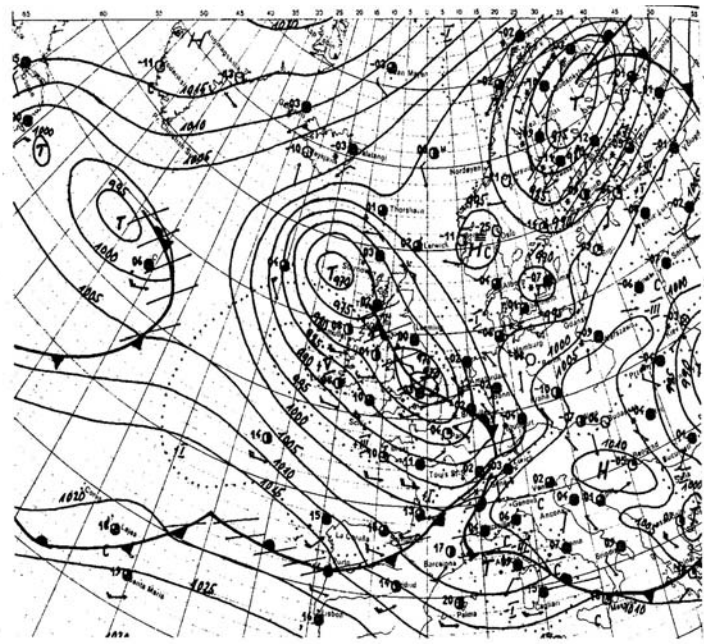

Figure 1: Synoptic situation of December 14th 1981 00UTC

4. THE SWISS WARNING SYSTEM

MeteoSwiss has established a procedure to warn population and authorities in case of severe weather several years ago. We warn stormy winds reaching 100 km/h on more than 50 percent of the surface. In the foehn valleys we have only few stations, where Altdorf and Vaduz seem to be very well exposed. As a consequence we have defined an adjusted limit of 120 km/h.

Warnings are issued 1 to 3 days in advance with indications of the probable maximum wind and the most probable time. The authorities of the Swiss cantons are informed by intranet while the population can get SMS or Fax. The quality of all these warnings (rain and wind) was quite good: in 2004 the POD reached 94 and the FAR 48 percent. Generally such warnings are produced on the base of the Swiss model ALMO and issued by the forecasters. We hope better modeling will help us to improve foehn and other warnings further. But extreme weather always needs a very professional interpretation!

5. CONCLUSIONS

Foehn will be a dangerous phenomenon also in the future. But the warning system of MeteoSwiss is able to give good information to the interested people in order to prevent damages. The forecasting systems should combine a good fine mesh model and human contributions in synoptics and climatology.

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