SOME CHARACTERISTICS OF EXTREME EVENTS IN WINDCLIMATE OF SZOMBATHELY AND ITS CONNECTION WITH WEATHER SITUATIONS

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I. INTRODUCTION

The higher wind speed and wind-force of western part of Hungary is well known from the statistical data (Bartholy et al., 2003, Tar, 2004, 2006, Szentimrey, 2005, Bihari, 2005, Wantuchné Dobi et al., 2005). The wind speed has a regular system: maximum in March, November and July and minimum in September.

We made an examination on daily mean wind speed values, measured at Szombathely (Hungary) between 1961 and 1990. We pointed our research to wind speed values and the connection with different weather situation.

II. MATERIAL

We produced the frequency distribution according to daily mean wind speed categories for every 10 years and also for whole 30 years period.

We examined the terminal values of the frequency distribution - the daily mean wind speed is over 10 m/sec (Fig. 1), and under 10 m/sec - on the days when the mean wind speed was strong. We also examined the Péczely-type weather situations during the mentioned days.

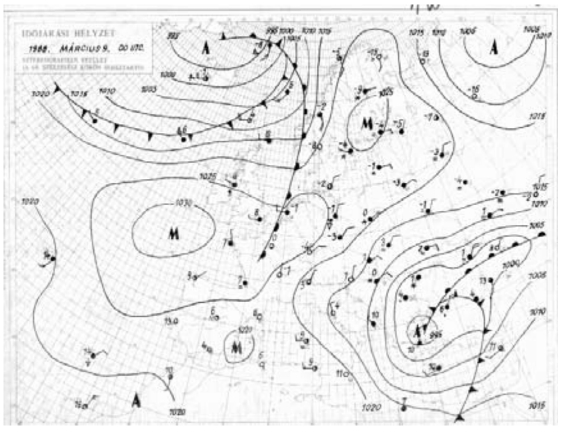

Fig. 1 The surface wind pressure field when the daily wind speed is over 10 m/sec (9th March 1988)

III. CHARACTERIZATION OF THE PÉCZELY'S MACROSYNOPTIC WEATHER SITUATIONS

The macrosynoptic typifying which can be considered as pertaining to the area of the Carpathian Basin was elaborated by Péczely (1957, 1983). The daily macro-synoptic weather situations which were determined on the basis of the baric field at ground level were classified into 13 types by him. Since 1983, typifying has been continued, and the daily code numbers are published by Károssy (1987, 1994, 1997).

The data interpretation period for each type is 24 hours belonging to a calendar day. The one single criterion for coding is the definition of the type which pertains for a longer period of time during a day, so the type-shift may as well differ ±12 hours from the time of the change of the calendar date. The progression of the changes in time, as well as the tendency of particular types to endure and the empirical frequency of the occurrence of situations replacing each other differs significantly.

Following Péczely's work in the field of typifying macrosynoptic weather situations, his collaborators elaborated on the particular weather situations with regard to some weather elements and included a detailed data-base. In the following, with the continuity of the typifying ensured, the examinations of the elements relating to the macro-synoptic situations were also performed.

Here are the 13 Péczely-type macrosynoptic weather situations:

Meridional, northerly oriented situations
mCc (1) Cold front from the meridional situations
AB (2) Anticyclone over the British Isles
CMc (3) Cold front arising from a Mediterranean cyclone
Meridional situations with a southern direction
mCw (4) Warm front arising from a meridional cyclone
Ae (5) Anticyclone located east of the Carpathian Basin
CMw (6) Warm front arising from a Mediterranean cyclone
Zonal situations with western direction
zC (7) Zonal cyclone
Aw (8) Anticyclone located west of the Carpathian Basin
As (9) Anticyclone located south of the Carpathian Basin
Zonal situation eastern direction
An (10) Anticyclone located north of the Carpathian Basin
AF (11) Anticyclone located over the Scandinavian Peninsula
Central anticyclone
A (12) Anticyclone located over the Carpathian Basin
Central cyclone
C (13) Cyclone located above the Carpathian Basin

IV. METHOD

It can be a statement the days under 10 m/sec mean wind speed are in majority in Szombathely. The top wind speed was 21,5 m/sec. There were 165 days during 32 years when the daily mean wind speed was more than 10 m/sec. It can be seen (Tab. 1 and Fig. 2) the distribution of Péczely-type macrosynoptic situations on these days.

Code number	Péczely-code	%
1	mCc	6,7
2	AB	6,1
3	CMc	8,5
4	mCw	4,2
5	Ae	1,8
6	CMw	27,9
7	zC	0,0
8	Aw	16,4
9	As	0,0
10	An	20,6
11	AF	2,4
12	A	0,6
13	C	4,8
		100,0

Tab. 1 Proportion of days over 10 m/sec wind speed with Péczely-types

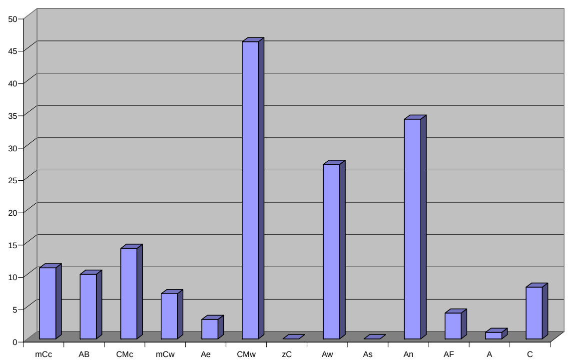

Fig. 2 Number of days over 10 m/sec wind speed with Péczely-types

V. RESULTS AND CONCLUSIONS

There are days with 10 m/sec mean wind speed when Péczely-type 6 (CMw) can be found (27.9 %). This meridional situation with southern direction is followed by a zonal eastern direction situation (An) during the 30 years among days with strong wind speed. We can find these opposed streaming types in about 50 % in all the cases. There are not any day with 10 m/sec mean wind speed in zonal cyclone (zC) and South European anticyclone (As).

The most important features are the follows. There are two different air pressure formations (cyclone and anticyclone) in the airspace in Central Europe. The distance between the two pressure centre is about 500-600 kilometres. That is why the baric gradient is so high. The anticyclone is over the British Islands or Western Europe, but the cyclone is at the Adriatic Region. According to the Péczely-type macrosynoptic weather situation in this case there is a cold or warm front of Mediterranean cyclone or a central cyclone can be found in the Carpathian Basin. Both situations can change very quickly or they can pass to East Europe, so we can not wait permanently over 10 m/sec wind speed in the Carpathian Basin.

The intensive change of streaming field (increase or quick termination) can be explained with opposed air movement as a cog. This time the dominant wind direction - especially in Szombathely - generally is northern.

Worth while to take into consideration the frequency of strong winds is not typical in Hungary. The top windy territory of our country can be found in the northern part of Transdanubium, where the yearly mean wind speed is more than 6 m/sec in 100 m high. The daily mean surface wind speed is 3.4 m/sec in Szombathely, calculated from 30 years data (1961-1990). The value of standard deviation is 2.3. It is just at the lower level of thrift in point of view of wind energy utilization. At the same time the characteristic northern wind direction shows more favourable situation in point of view of wind energy utilization.

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