The Climatic Maps of Central Europe.

Among the geographical factors perhaps climate influences human life and activity the most. Beside the relief features, it depends on the climate, whether a territory is suitable or not from the point of view of settling, agriculture, livestock-raising, building of cities and transportation. The vegetation zones and soils change under the influence of the climate, and determine the picture of artificial plant growth and the possibilities for agriculture. The physical and mental capacity of man, his physical well-being, his capability connected with the changes of the climatic conditions.

It is hard to define the actual climate itself. We are collecting data only about the different elements of climate which do not appear separately but combined, modifying each other. With the help of our measuring instruments only the different elements may be measured: such as atmospheric pressure, winds, temperature, precipitation, clouds, the amount of vapour, radiation etc. In order to define the actual climate, we had better examine the native plant growth, the spread and the characteristics of the different species. Beside vegetation the spread of the different types of animals is of less importance, though it should not be neglected. In the animal kingdom not the spread of those superior animals which easily change their places and get acclimatised to the surroundings should be taken into consideration, but that of the inferior ones.

Agriculture needs the most a thorough knowledge of the climatic conditions. For this reason the climate-researching institutes have developed, for the most part, in the states where agriculture is the most advanced. Agricultural products show a more and more reasonable location all over the world. Cereals are raised in the most suitable areas of North America and Europe /belts of cereals/. Other products of importance are grown in the form of one-crop agriculture in the areas best adapted for them. To promote this development of recent times the study of the climatic conditions is especially of great importance. Beside the general characteristics of the climate the numerical values of its different elements should also be known, as the researches in agriculture enable us to know numerically the needs of the different plants in most cases.

The maps represent average values based on the data of long series of years, in most cases of several decades. These maps should be, by all means, completed by such maps or diagrams which would indicate the extreme values, as well as those being the most frequent. Unfortunately, the data available at present did not allow the construction of such maps. In our provisional work but eleven of the finished twenty one maps have been published.

The climatic maps had been executed by Assistant Professor Dr. Nándor Bacsó, Chief meteorologist, with the approval and under the control of the Director of the Royal Hungarian Meteorological Institute. Some of the maps had been drawn by his collaborators. The names of the authors are indicated in the maps.

Januar Atmospheric Pressure and the Prevailing Winds of Winter.

The formation of weather not only depends on the annual regular change of the solar radiation, but also on the permanent, though irregular shifting of the wind belts. Thus the map, comparing the several decennial averages of the monthly or seasonal distribution of atmospheric pressure with the direction of the prevailing winds, serves as an efficient basis for the explanation of the climatic conditions of an area.

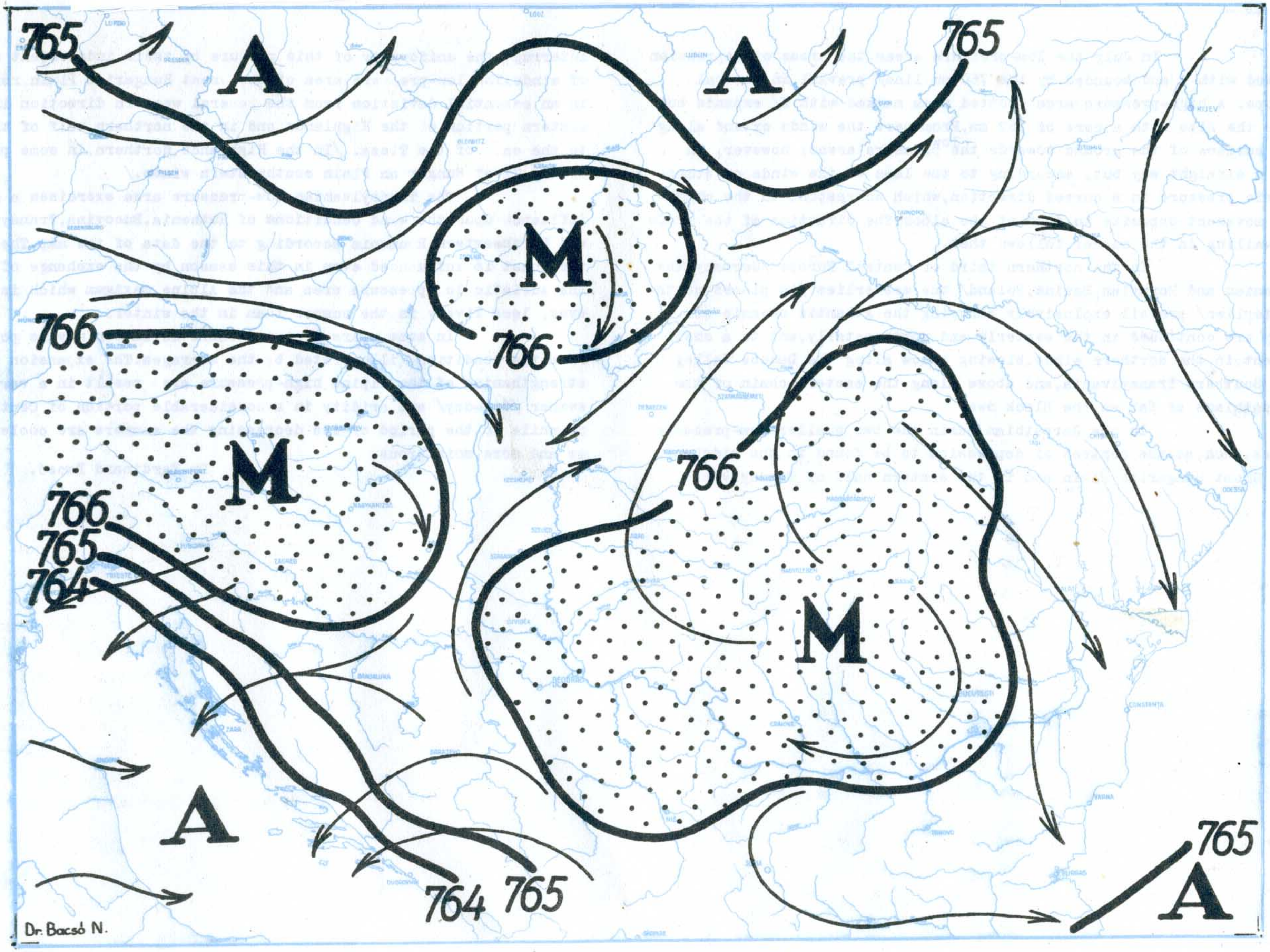
In our map the isobars connecting areas with equal atmospheric pressure surround three high-pressure areas in Central Europe./M=dotted areas/These are the condensation centres and cores of the air. Among and around them there are low-pressure canals, as well as low-pressure areas serve as a bridge in the axe of the continent between the western high-pressure area of the Azores well developed in the winter and the eastern continental high-pressure area of Russia which separate the northern and southern territories. In the wintertime a blanket of thick cold air descends over the mountains and their surroundings, and extends along the surface of the soil into the surrounding low-pressure areas. The winds tend to blow from the highlands towards the plains, basins and seas. The direction of the prevailing winds is indicated by thinner lines run with the arrows. They do not run in radiant direction, but according to the laws of the winds of atmospheric pressure, in a curved direction similar to that of the hand of the clock.

At the northern edge of the Alpine high-pressure area the westerly and southwesterly winds prevailing in Western Europe in the winter are the most frequent, carrying the moderating influence of the Atlantic. They reach the Carpathian Basin in two comparatively narrow ways, thus at the Dévényi Gate along the Danube Valley, on the other hand, through the Northeastern Carpathians in the Polish Plain far less frequently though, than they reach the basins of the upper valley of the Danube. The intermingling of the high-pressure areas, namely, prevents in some winters the penetration of the Atlantic winds. The Alpine high-pressure area sends out its waves even towards the south to the relatively warm Adriatic. In case of especially great differences in the atmospheric pressure the levelling winds may be very violent and of long duration. These stormy winds have special names by regions, such as the northern and eastnorthern cold, dry mountain wind, known as the "bora" sweeping over the Carpathians into the Adriatic; the "kossava" blowing from the Transylvanian air mass causing snow-storms and cyclonic storms along the Lower Danube; and the northeastern, eastern cold, dry wind known as the "nemere" in the Széklerland. From the second centre of the high-pressure area which may be called shortly the Tátra area, the winds blow partly in northern and northeastern direction, partly they penetrate into the northern and northeastern portions of Hungary. The Transylvanian high-pressure area causes southern winds in the Carpathian Basin, thus in the Tisza Valley southwesterly and more to the east, southeasterly winds. In the Roumanian Plain, as well as in the northeastern portion of the Balkan Peninsula and on the western border of the Ukraine northwestern-northern winds, while in the northwestern section of the Balkans /Bosnia, Dalmatia/ northeastern winds forward the air of the Transylvanian high-pressure area combined with that of the Alpine one.

There may be essential divergencies from the illustrated average conditions. In some winters the three types of the high-pressure areas or two of them are combined, eventually mingled with one of the high-pressure areas of Russia: it might also happen that one or the other declines. In general, the expansion, the strengthening and the combination of the high-pressure areas result in severe winters, whereas in case of their diminution and breaking up, mild winters prevail and make room for the oceanic /Atlantic, Adriatic/ mild winds, being prevented under usual circumstances.

Dr. Ferdinand Bacsó.

JANUARY ATMOSPHERIC PRESSURE AND THE PPEVAILING WINDS OF WINTER



Arrows indicate direction of winds.
A = low-pressure areas. M = high-pressure areas.

July Atmospheric Pressure and the Prevailing Winds in Summer.

In July the low-pressure areas, the areas of depression /marked with A and bounded by the 760 mm line/ prevail in Central Europe. A high-pressure area /dotted area marked with M/ expands but over the Alps with a core of 762 mm. From here the winds extend along the surface of the ground towards the low-pressure areas; however, in not a straight way but, according to the laws of the winds of atmospheric pressure in a curved direction, which correspond to the whirling movement opposite to that of the clock. The direction of the winds prevailing in the summer follows them.

In the northern third of Central Europe /Germany, the Bohemian and Moravian Basins, Poland/ the westerlies /in places northwesterlies/ prevail exclusively carrying the Atlantic oceanic air. They are continued in the westerly and northwesterly, and to a small extent, in the northern winds, blowing below along the Danube Valley and Southern Transylvania, and above along the eastern chain of the Carpathians as far as the Black Sea.

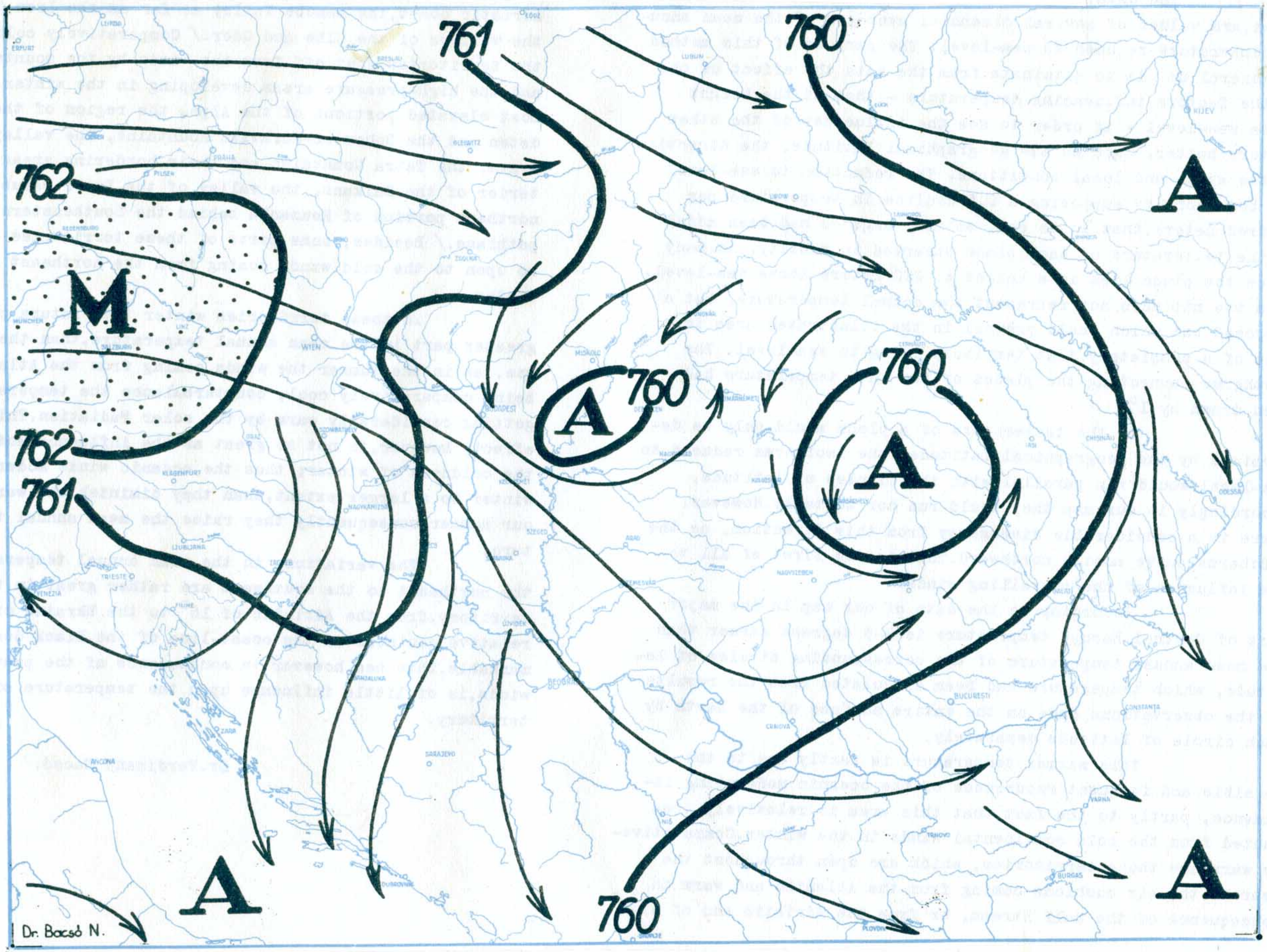
In the Carpathian Basin the two smaller low-pressure areas, such as the centres of depression to be found in the midst of the Great Hungarian Plain and in the eastern half of Transylvania, interrupt the uniformity of this picture by their independent system of winds. The low-pressure area of the Great Hungarian Plain results in an essential deviation from the general western direction in the eastern portion of the Highlands and in the northern half of the lands to the east of the Tisza. /In the Highlands northern, in some portion of the Great Hungarian Plain southwestern winds./

The Transylvanian low-pressure area exercises a great influence upon the wind conditions of Ruthenia, Bucovina, Transylvania and Northwestern Roumania according to the data of the map. The Adriatic coast is influenced even in this season by the exchange of air of the Adriatic low-pressure area and the Alpine maximum which is, however, less lively in the summer than in the winter.

In some years a considerable deviation may be possible from the conditions illustrated by the averages. The expansion and strengthening of the Alpine high-pressure area result in a very hot summer /dog-day/ and aridity in a considerable portion of Central Europe, while in the period of its decreasing the summers are cooler, windier and more moisterous.

Dr. Ferdinand Bacsó.

JULY ATMOSPHERIC PRESSURE AND THE PREVAILING WINDS OF SUMMER



Arrows indicate direction of winds.
A = low-pressure areas. M = high-pressure areas.

The data, on the basis of which this map had been drawn, are values of several decennial averages of the mean annual temperature reduced to sea-level. The purpose of this method of general use is to eliminate from the data the effect of one of the factors influencing temperature - that of the height above sea-level - in order to see the influences of the other factors better, such as the geographical latitude, the direction of the winds and local conditions. The reduction to sea-level had been done by supposing a 0.5 decline in temperature per hundred meters, that is to say, so many degrees had been added to the temperature of each place observed in reality, as many times the place lies in a height of 200 meters above sea-level. Thus the map does not represent the actual temperature, but a supposed one which would prevail in the illustrated area in case of a completely flat territory lying in sea-level. The isotherms connecting the places of the same temperature had been drawn by 1°

If the temperature of a place would only be determined by the geographical latitude, the isotherms reduced to sea-level would run parallel with the circles of latitude, accordingly in our map they would run horizontally. However, there is a considerable divergency from this direction, as the isotherms curve mostly northward. This is due first of all to the influence of the prevailing winds.

According to the data of our map in the major part of Central Europe temperature is 1-3 degrees warmer than the mean annual temperature of the corresponding circles of latitude, which temperature had been calculated from the results of the observations made on the entire surface of the Earth by each circle of latitude separately.

This warmer temperature is partly due to the possible and frequent recurrence of the oceanic moderating influence, partly to the fact that this area is relatively protected from the cold continental winds in the winter. Comparatively warm are those territories, which are open throughout the year to the air cushions coming from the Atlantic and warm in consequence of the Gulf Stream, or from the Adriatic and of high temperature because of its southern location. /The entire Adriatic coast, the Danube Valley as far as the Iron Gate, the valleys of the Elbe and Oder./ Comparatively cold are the territories shut off from the winds by the mountains and the high-pressure areas developing in the winter. /The most elevated portions of the Alps, the region of the Sudeten and the Bohemian-Moravian Mountains, the valley of the Drava, the Tatra Mountains and their bordering areas, the interior of the Balkans, the valley of the Lower Danube, the northern portion of Roumania behind the Southeastern Carpathians./ Besides, some parts of these territories are also open to the cold winds coming from the northeast in the winter.

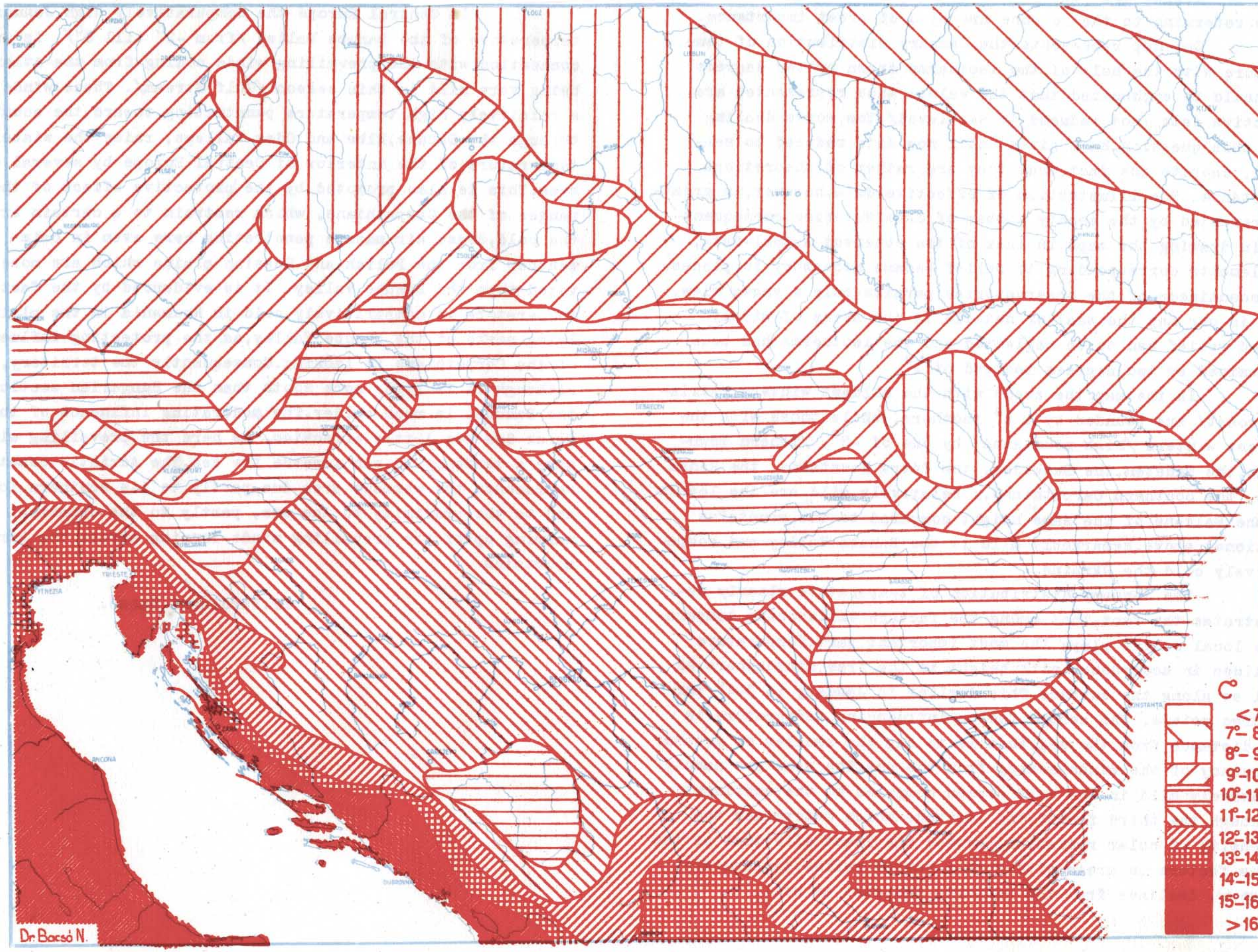
In these territories winter temperature plays a greater part in the mean annual temperature, than the summer one, as in the summer the winds coming from the Atlantic and being comparatively cool, counterbalance the temperature getting considerably warm by the solar radiation. This cooling effect, however, is not so great as the influence moderating the coldness of winter; thus the oceanic winds moderate our winter to a larger extent, than they diminish the warmth of our summer, consequently they raise the mean annual temperature.

The variations in the mean annual temperature from the northeast to the southwest are rather great in this territory, from the Adriatic of 16° to the Ukraine of 7°. The relative coolness of the coast-line of the Black Sea is remarkable. This sea, however in consequence of the prevailing winds, is of little influence upon the temperature of our territory.

Dr. Ferdinand Bacsó.

MEAN ANNUAL TEMPERATURE

Data reduced to sea-level



The Mean January Temperature.

Beside the values of the mean annual temperature those referring to the seasons are also of great importance.

Our map represents the January distribution of temperature with the help of the isotherms drawn by two degrees. It should be emphasized that the values thus represented are effective data /not reduced to sea-level/. The works dealing with this question have given until now data reduced to sea-level, despite the fact that they are rather of theoretical importance. The illustration of effective data, however, is greatly prevented by the scanty number of observatories, consequently, in drawing the maps in lack of the observed actual-data, supplements corresponding to relief became necessary in places. The scantiness of the observatories permits only a vague view, thus in our map the smaller details in the areas of widely varied relief had to be neglected and the isotherms had been determined by two degrees instead of 1^{0}

In the map the areas with the mildest winters /Adriatic coast/ are bounded by a 4^{0} isotherm, while those with the coldest winters /high mountains/ by one of -8^{0}. /Tauern Mountains, the Sudeten, the Beskides, the Tátra Mountains, the Radna Alps, the Southern Carpathians./ Relatively mild are the levels of the Balkans of the same height compared to the mountains mentioned above. Remarkably mild is the Danube Valley and comparatively cold the Ukraine.

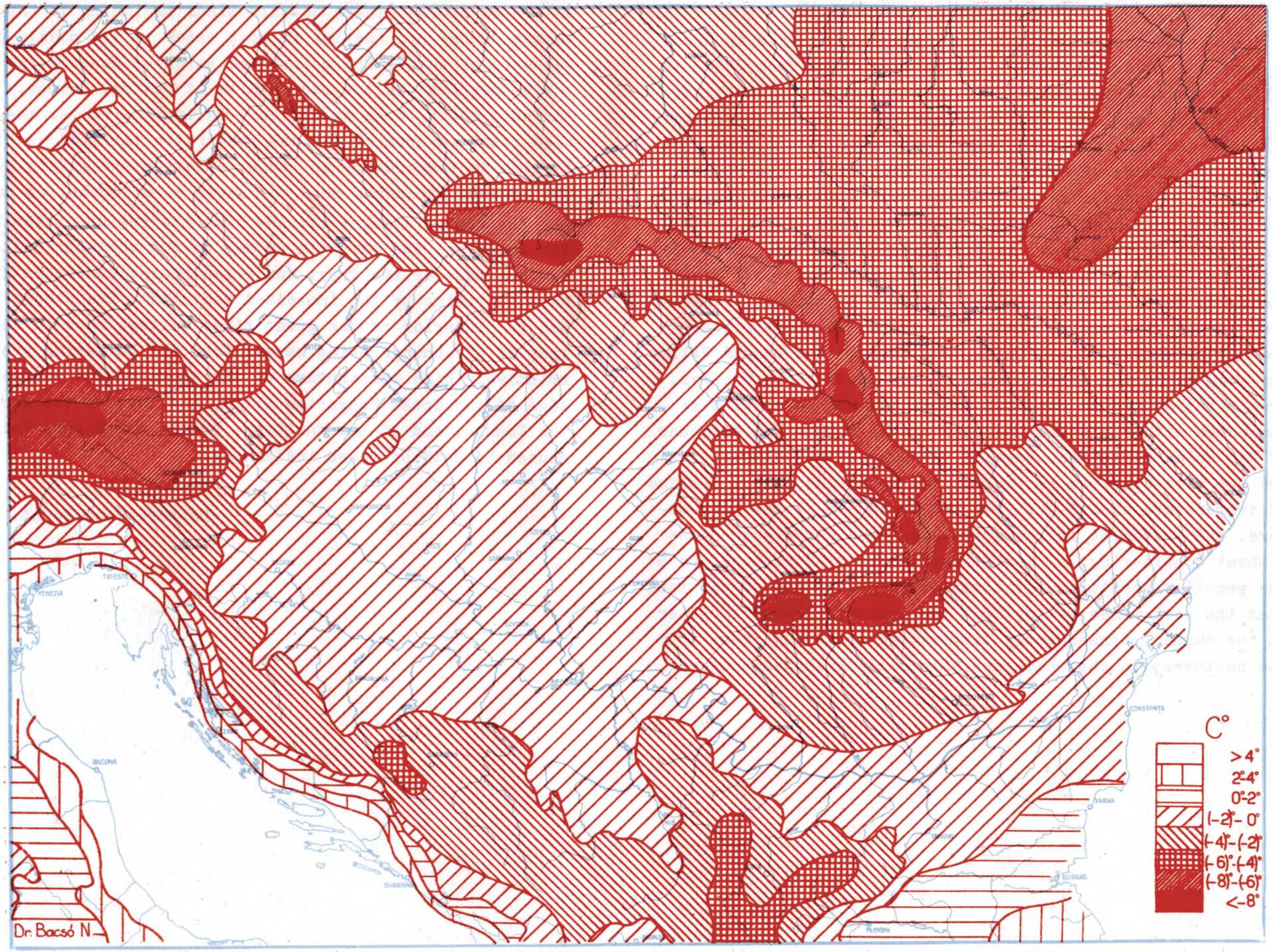
The January distribution of temperature clearly demonstrates the fact, that among the factors influencing temperature local relief plays the most important part. Temperature declines in accordance with height in the free athmosphere, as well as along the surface This decline in January is $3-4^{0}$ per hundred meters. The second factor influencing temperature is its distance from the sea, that is to say the smaller or greater frequency of the winds coming from the sea. The seas are namely relatively mild in the cold season compared to the continent. Although the third factor, the latitude which determines the intensity of solar radiation, proves the least effectual of the three factors in areas with such a varied relief, temperature, however, declines from the south to the east as well.

In Central Europe the comparatively high January temperature of the Danube Valley /from -2^{0} till 0^{0}/ is in connection with the prevailing winds coming from the Atlantic being very mild in this season /Gulf Stream/. These winds of a relatively high temperature penetrating toward the southeast through the Danube, Elbe and Oder valleys, raise the winter temperature of the interior of Central Europe by several degrees. This is also promoted by the protective effect of the ranges of the Carpathians, which restrain to a certain extent the cold, dense air masses penetrating here even in calm weather from the Polish and Russian plains which are more elevated than the Danube Valley. It is evidenced by the fact that temperature is comparatively cold in Roumania in the plain lying north of the Danube Valley, as the protecting influence of the Carpathians is lacking. Consequently the territory, although it is lying more south than the Hungarian section of the Danube, is much colder. The moderating influence of the Black Sea has little effection, as here the prevailing winds have a tendency to run towards the sea. The Adriatic coast represents the warmest area due partly to its southern location, and to the proximity to the sea, partly to the dynamical warming up of the prevailing winds running across the bordering mountains

Dr. Ferdinand Bacsó.

MEAN JANUARY TEMPERATURE

Actual data



The Mean July Temperature.

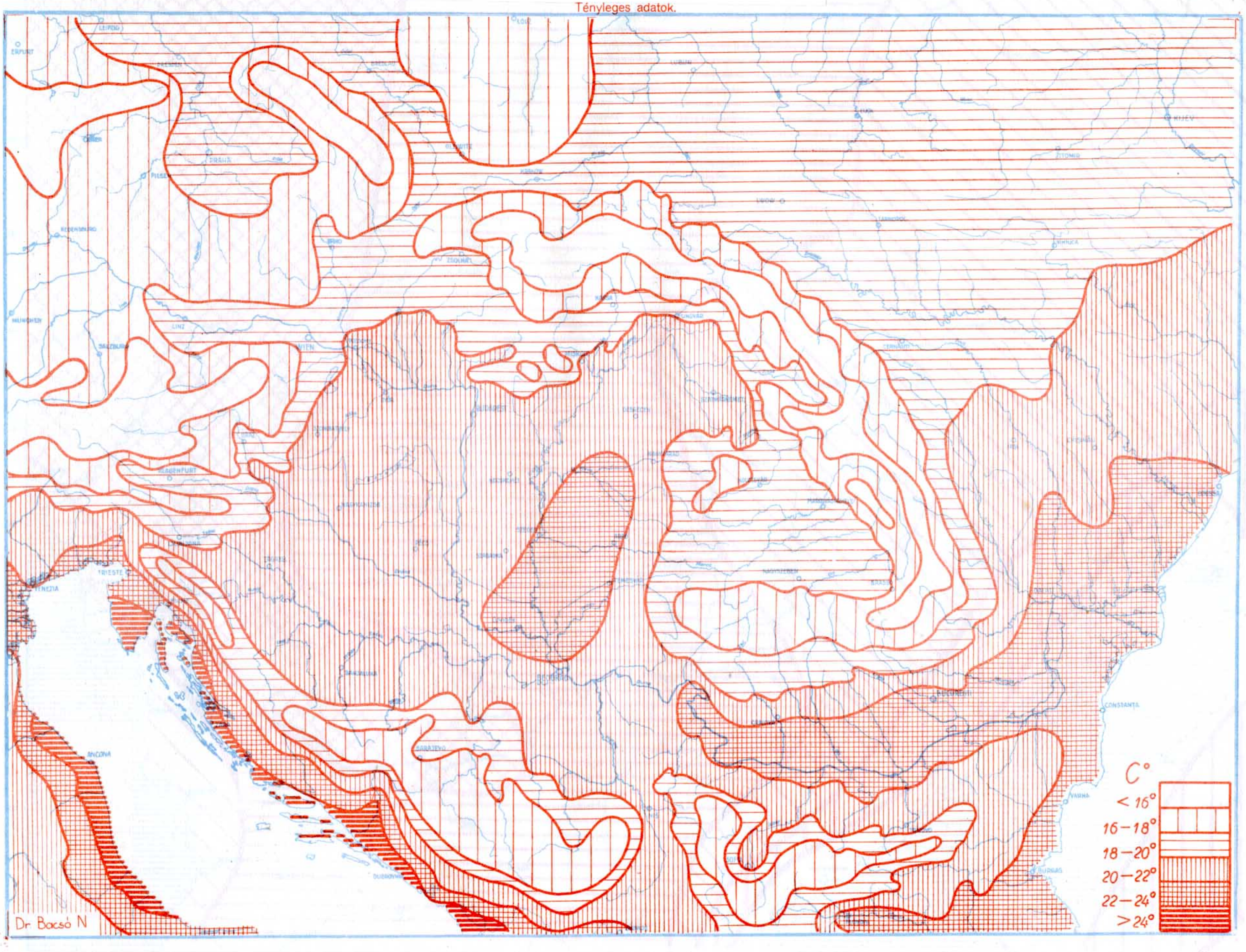
Our map, similar to that of January represents effective /nonreduced/ data of temperature, consequently it is boldly conceived and does not enter into minute details in areas of varied relief. The isotherms have been drawn from + 24° to + 16° by two degrees. Because of the comparatively small area of the higher and thus colder points there was no possibility for representing in detail lower temperatures than this. The warmest territory of Central Europe even during the summer is the Adriatic coast. This fact is due to its southern location and the solar radiation which, in consequence of the prevailing drought of this area, is very intensive, as well as to its being protected by mountains from the north. The coast of the Black Sea which is of a similar southern location, is somewhat less warm, as the cooler winds from the north and northeast are not prevented to penetrate here through the Danube Valley and even along the eastern edge of the Carpathians. Besides, precipitation has an explicit summer maximum here, which is connected with a certain increase of the clouds and decrease of the solar radiation. Even in the summer the coldest areas are the most elevated regions of the mountains with a decline of temperature of 0.5-0.7° per 100 m, thus 5-7° per 1000 meters. The isotherms follow a southwest and northeast course without considering the variations caused by structure and by the peculiar location of the Adriatic. This is due to the fact that the cool winds coming from the Atlantic become livelier in the summer, consequently temperature gradually rises from the northwest to the southeast. This decline in temperature may be followed along the Danube Valley from Regensburg as far as the Black Sea. These oceanic winds beginning in the early summer /June/ and lasting in most cases to the middle of July and even of August are called the European monsoon, and modify the summer heat in the major parts of Central Europe./ The Adriatic coast is an exception./ During the summer the cool high-pressure area of the sea penetrates the land causing a decline in temperature of longer duration and rainfall. In July the monsoon influence does not prove so effectual as in June, and the summer drought extends from the region of the Mediterranean and the Adriatic as far as the southern and southeastern edge of the Great Hungarian Plain, consequently the heat is rising by the increased radiation. The closed basins and the interior of the great river valleys show in July a lack of air-change being warmer than the bordering areas. The relatively high temperature of the southern and southeastern edge of the Great Hungarian Plain, and that of the section of the Danube, and of the Maritsa-, Drava- and Morava Valleys is caused by both of these influences.

Dr. Ferdinand Bacsó.

MEAN JULY TEMPERATURE

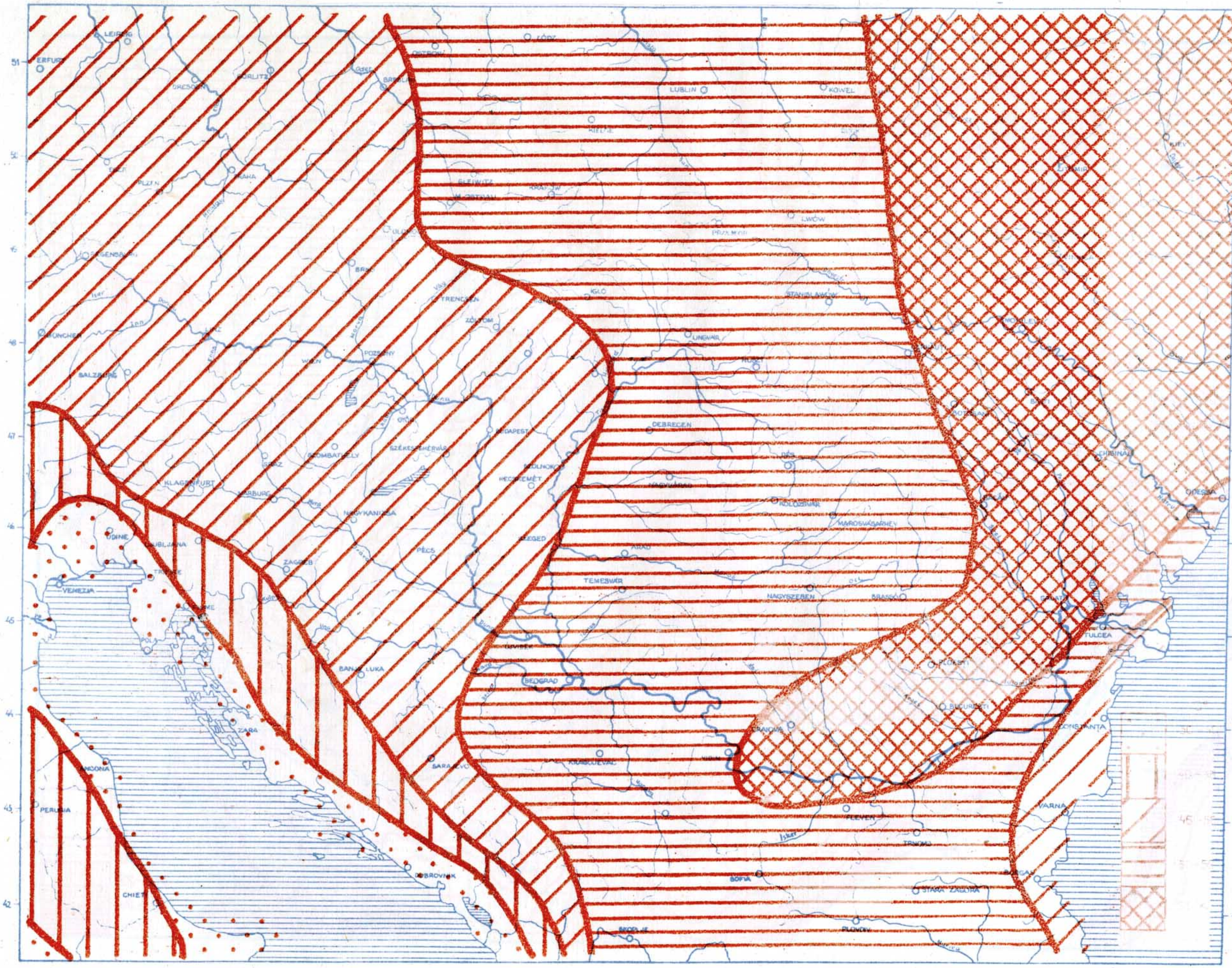
Actual data

Tényleges adatok.

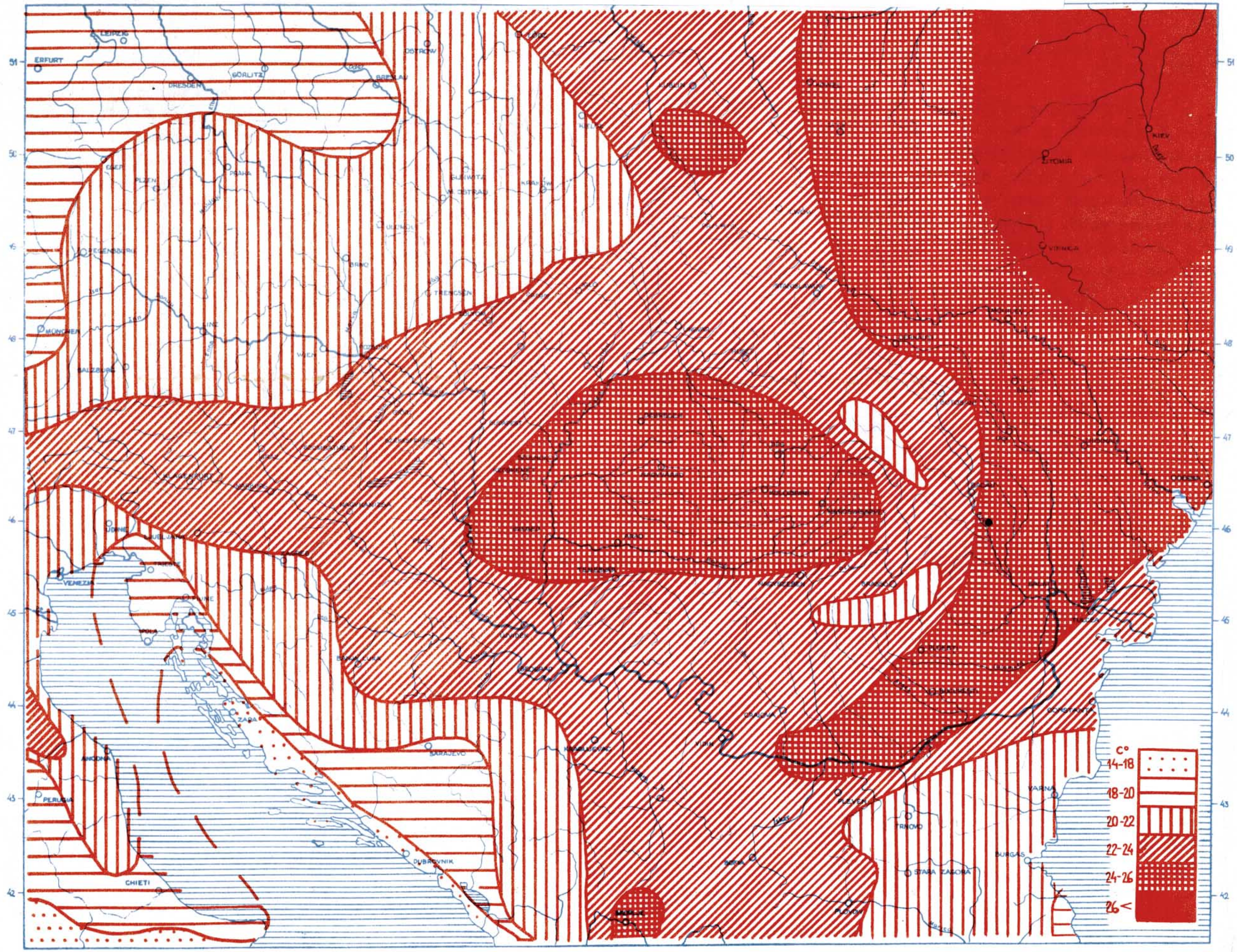


AVERAGE VALUES OF EXTREMITIES IN THE TEMPERATURE

A HŐMÉR … LAGOS ÉRTÉKEI



THE AMPLITUDO BETWEEN THE TEMPERATURE OF THE WARMEST AND COULDEST MONTH



The Annual Course of Temperature.

According to the regular change of the solar radiation, temperature in Central Europe shows a decided annual course In the map the annual temperature of 45 localities are indicated on the basis of several decennial averages. The line being similar to the sinus curve and illustrating the variations, connects the points which indicate the mean temperatures of each month The vertical line signifying 0°, 10°, and if possible that of 20° had also been presented.

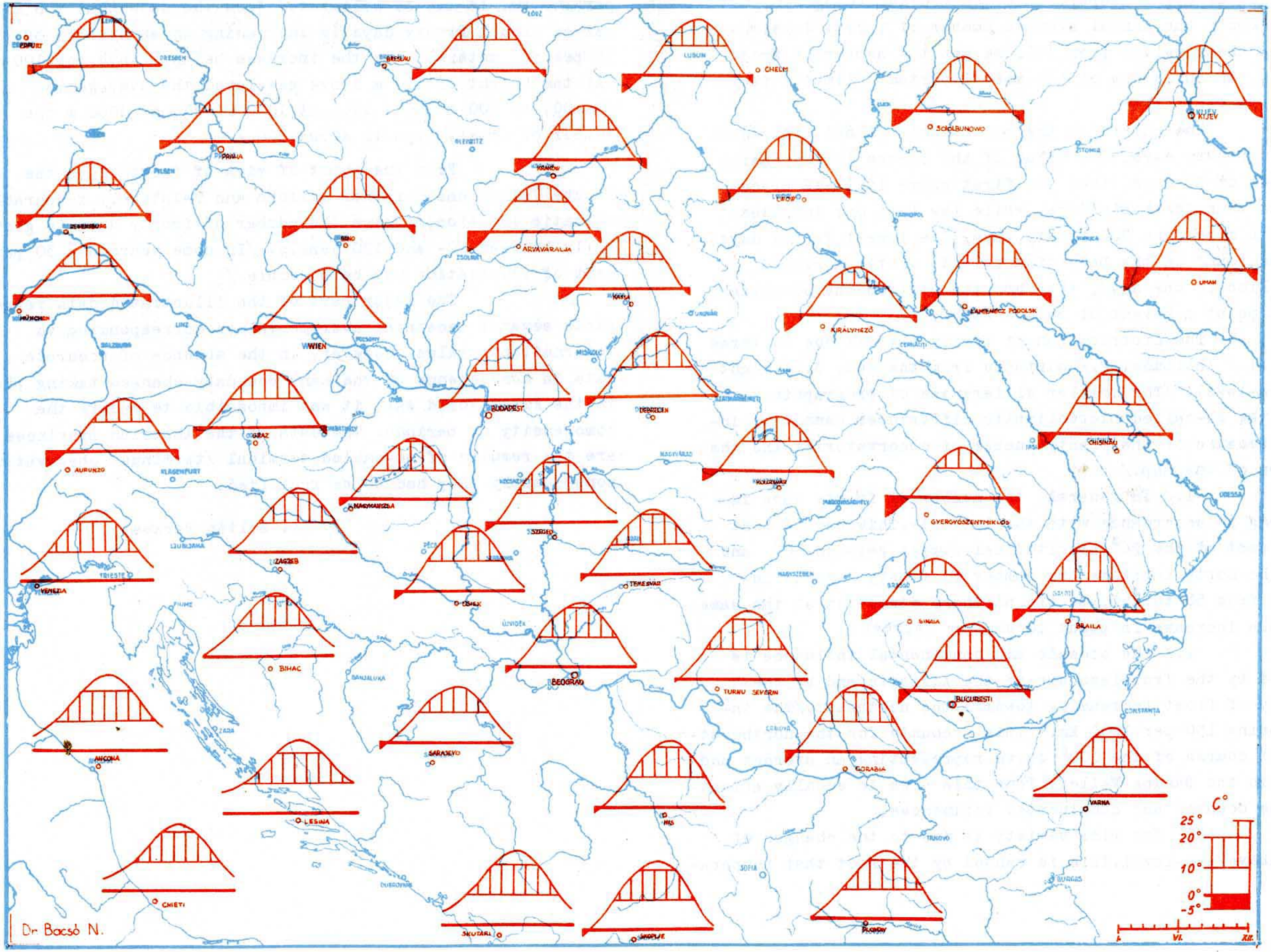
The temperature of this area has the January minimum /lower starting point of each isotherm/ and the July maximum in common, which only in Varna and in the most elevated highlands is shifted to August. The distance between the extreme values is increasing from the southwest to the northeast./In Lesina only 16°, in Kiev 24°./

The beginning and ceasing points of the more remarkable values of temperature, their time of duration respectively, had also been indicated by the map. Therefore we have presented the length and the intensity of the frost period /dark areas/, the length of the growing season beginning and ending with a 10° mean temperature /base-lines of the dashed areas/, and finally the period of the beginning of dog-days /the portions of the dashed areas above 20°/.

The frost period /mean daily temperature being below 0°/ is missing at the Adriatic coast. Naturally complying with the formation of relief, it is increasing from the southwest to the northeast and in the Ukraine it is rather considerable, more than 3 month. The period of the growing season /temperature above 10°/ is on the contrary 6-9 months at the Adriatic, while in the Ukraine but 5 month. The period of a mean temperature above 20° appears only to the south of Budapest, in the Great Hungarian Plain, and south of Chisinau in Roumania, naturally having its largest expanse also at the coast of the Adriatic.

The annual course of temperature includes the smaller periodical divergencies from the indicated regular line determined by the mean annual temperatures. /May and June decline of temperature, warm weather of autumn./ These are only [illegible] ily temperatures.

ANNUAL COURSE OF TEMPERATURE



Number of Frosty Days.

Frosty days are called the days in climatology when temperature /at the height of 1.5 m above surface/ sinks below 0° C, or still deeper, thus the minimum being 0°C. Our map represents the annual average number of frosty days; when deducting these values from 365, we get the number of frostless days, which is one of the most important climatic factors influencing vegetation.

The curves in the map connect places with equal number of frosty days. The value of the curves is increasing by periods of 20 days, thus the first curve includes places with less than 20 frosty days, while the last one includes those with more than 200 frosty days. The fewest frosty days are to be found on the Dalmatian islands of the Adriatic /Lussin-Piccolo one day/, they are the most on the Sonnblick in the Alps at a height of 3000 m /313/.

The distribution of frosty days is due to three factors: 1./ latitude, 2./ distance from the sea, 3./ height above sea-level. /The smaller differences of orographical origin, the so-called microclimatic differences cannot be indicated because of the scanty number of observatories and the dimension of the map./

1./ In general, the number of frosty days is increasing in accordance with the latitude. This can be best noticed east of the 26° longitudinal curve; between 40° and 50° of the north latitude the number of frosty days is increasing from 50 to 150; to the northern direction at the same height the increase is about 10 days by degrees.

2./ The oceanic and continental influence is evidenced by the frostlessness of the Adriatic and by the frequency of frost increasing towards the northeast./The increase being 150 per 1000 km./ This accounts for the northwest-southeast course of the 100° curve representing an average and running in the Danube Valley. Thus this area is equally affected by the oceanic and continental influences.

3./ The wide variety is due to the changes of height above sea-level. This is caused by the fact that temperature is declining in accordance with height in the free atmosphere as well as in the highlands, it is about 1/2° per 100 km. It may be calculated from the data that the number of annual frosty days is increasing on an average by 35 per 500 meters, thus the increase being 7 days per 100 m. /At the height of 100 m above sea-level the average is 80-100, at 500 m about 150, at 1000 m 200, at 3000 m the number of frosty days is about 300./

From the point of view of frosty days the Danube Valley has a rather uniform and relatively favourable climatic location, as here the number of frosty days is generally between 80- and 120 yearly. /In some years a ± 30 per cent of fluctuation may be possible./

The major part of the illustrated data represents several decennial average values corresponding to international rules. However, in the absence of accurate data in consequence of the many boundary changes taking place in the First World War, it was impossible te secure the homogeneity of periods. The data of the Austrian provinces are the results of so-called terminal /terminus/ observations consequently they had to be rectified.

Dr. Zoltán Berkes.

NUMBER OF FROSTY DAYS

The Amount of Annual Rainfall.

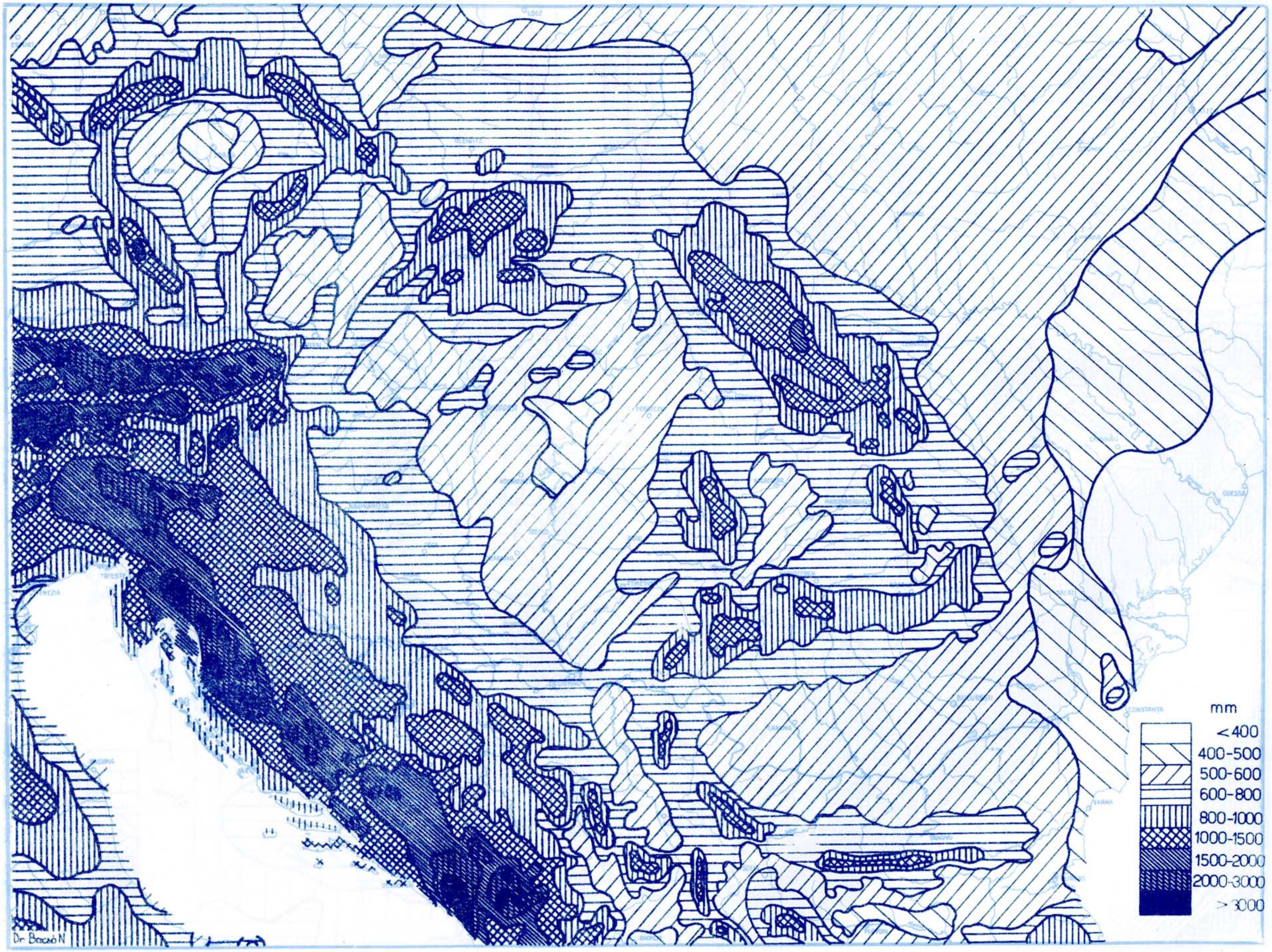
The most prominent feature in the distribution of rainfall of Central Europe is the great abundance of rainfall of the mountains compared to the relative drought of the less elevated areas, especially to that of the closed basins. The ridges of high mountains lying behind the Dalmatien coast receive the most rainfall; here, in some areas the annual average amount of rainfall exceeds even 3000 mm, /Karst, Kapella, Velebit/, and above the Bay of Kotor if exceeds even 4000 mm /Crkvice/. An annual amount of rainfall exceeding 2000 mm is also to be found in the southwestern portions of the Alps in the Juli-Alps, /in the Gail-valley of the Alps and the Karavankas/, further on in the regions of the Taurus ranges /Magas Tauerns/ and of the Salzburg and Austrian Limestone Alps. The other high mountains of Central Europe, such as the Erz Gebirge, the Böhmer Wald, the Hungarian-Moravian Border-mountains and the Sudeten, the regions of the Western Beskides and Tátra Mountains, the Northeastern and Southeastern Carpathians and finally the high mountains in the northern portions of the Balkans receive a rainfall of 1000-2000 mm per year. In the surroundings of the mountains, as well as in the basins bounded by them, the annual amount of rainfall is 600-1000 mm, the interior of the basins and some of the valleys, and at length the Roumanian, Polish and Ukrainian plains have less rainfall Than 600 mm. /The Bohemian-Moravian Basin, the Great Hungarian Plain, and Little Alföld, the Transylvanian basins, further on the Morava and Maritsa Valleys and the lower section of the Danube Valley./ Another degree of dryness is indicated by the dividing line meaning a rainfall of less than 500 mm, which running across the midst of the Hungarian and Bohemian Basins along the coast of the Black Sea starting from Burgas, curves almost as far as Jassi and Kiev, and is continued through the upper valley of the Dnyepr. The driest area of Central Europe, where the annual amount of rainfall does not reach 400 mm, extends in a wide strip along the Black Sea from the mouth of the Danube toward the northeast.

The chief condition for the appearence of precipitation is the rising of vapourous air tides to a large extent. Rising air-tides are usually formed on the windblown slopes of the mountains /relief-precipitation/, as the wind blowing toward the mountains is compelled to rise on their slopes. Thus most of the rainfall occurs on the slopes facing the direction of the prevailing winds, and on the high ridges receiving rainfall in case of a wind blowing from all directions. The presence of vaporous air increases naturally the amount of rainfall, most of the rainfall is therefore to be found in the elevated portions of the mountains lying near the Adriatic. On the Central European coast of the Black Sea the opposite direction of the prevailing winds, accounts for dryness despite the evaporating surface being present /westerly and northwesterly winds. The presence of water-surface by no means increases the amount of rainfall. Rising air-tides are also formed when new air-masses penetrate the area /front-precipitation/. Namely in case the penetrating air is warmer than the one being there, it is forced to rise along the gentle slope over the cooler air-mass, as if it had not a too steep mountain in its way /calm, regular rain or snow extending over large areas/. In case the penetrating air is the cooler one, it drives the warmer air-masses being there before itself up to the height, /cold waves, shower-like precipitation, thunderstorm, hail/. Thirdly, rising airtides are also caused by the warming-up of the air near the ground-level, the warmed-up air-masses rise rapidly. In Central Europe, however, this used to serve mostly to promote front-precipitation However, this cause alone leads in most cases only to the formation of vain cumulus, should the stimulating effect of the penetrating air-masses be missing.

The winds blowing downwards from the mountains do not bring rainfall into the area lying behind them, as the sinking air-masses are in connection with the dynamical warming-up of the air, consequently with the breaking-up of the clouds; this is responsible for the dryness of the areas lying behind the mountains, especially for that of the basins closed by all sides. /Rainshadow/ Such territories lying in the rainshadow are in Central Europe the region of Breslau behind the Sudeten, the Bohemian and Moravian Basin, the valley of the Upper Mura, the basins of the Carpathians, the deeper valleys of the Balkans /Morava-Maritsa Valleys/, the valley of the Lower Danube lying behind mountains from the point of view of the northwest wind, and the northern portion of Roumania. The scantiness of rainfall of the Polish and Russian plains is primarily due to the lack of mountains causing relief rainfalls, secondly to the rainshadow which proves effectual because of the Carpathians and the Sudeten, and at length to the decrease of rainfall with the decline of temperature from the south to the north.

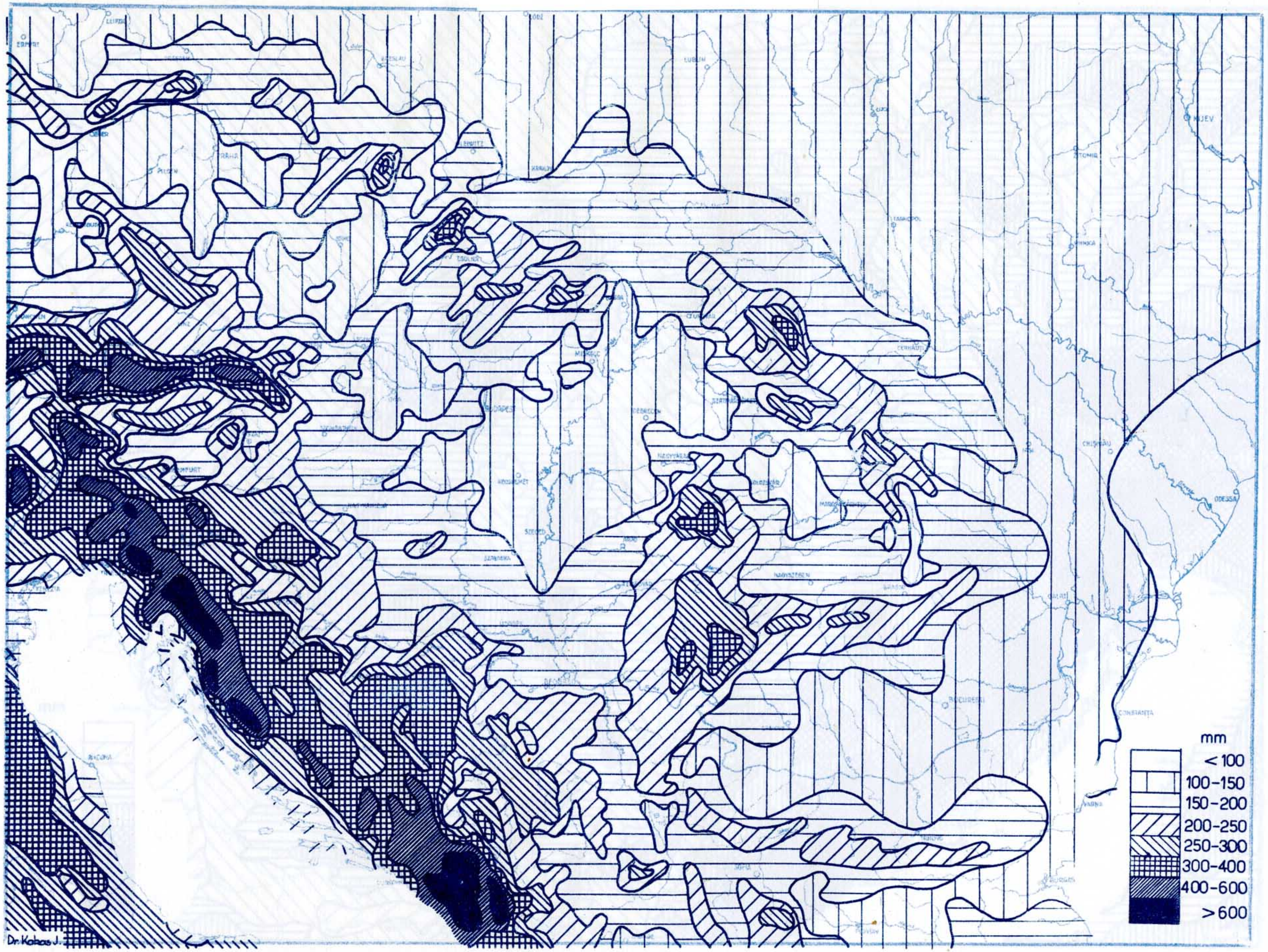
Dr. Ferdinand Bacsó.

ANNUAL AMOUNT OF RAINFALL



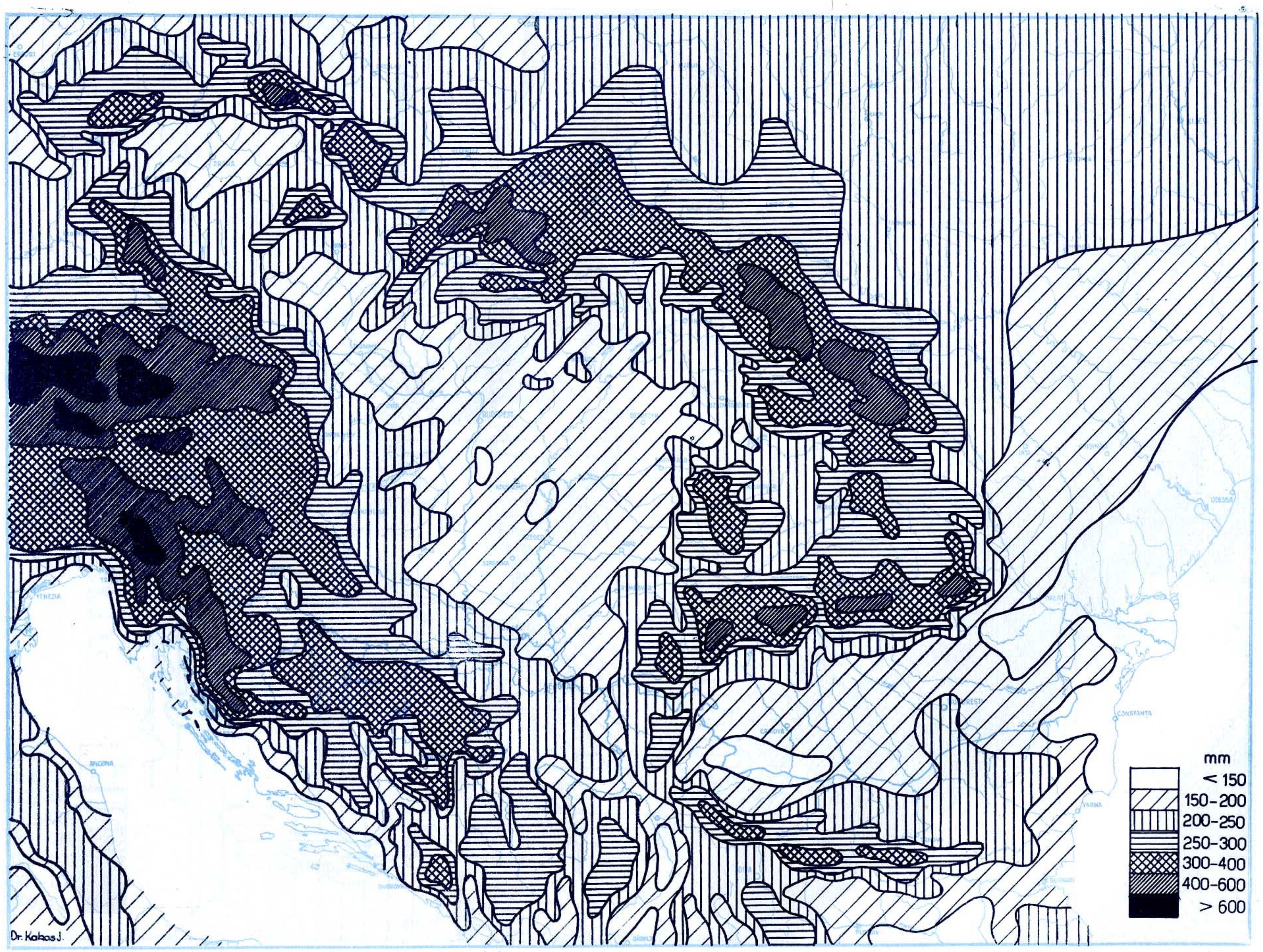
THE SPRING RAINFALL

(March, April, May)



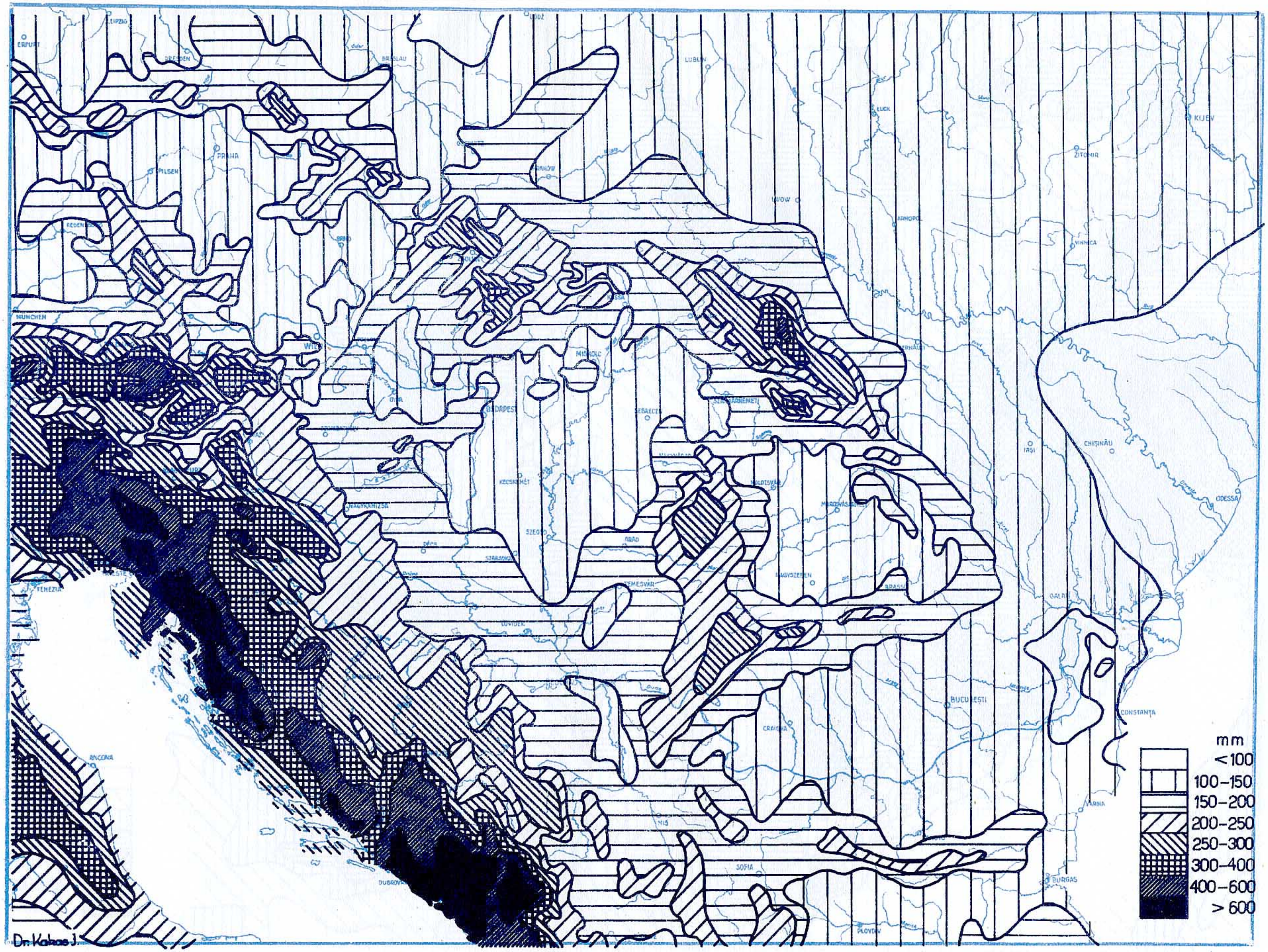
THE SUMMER RAINFALL

(June, July, August)



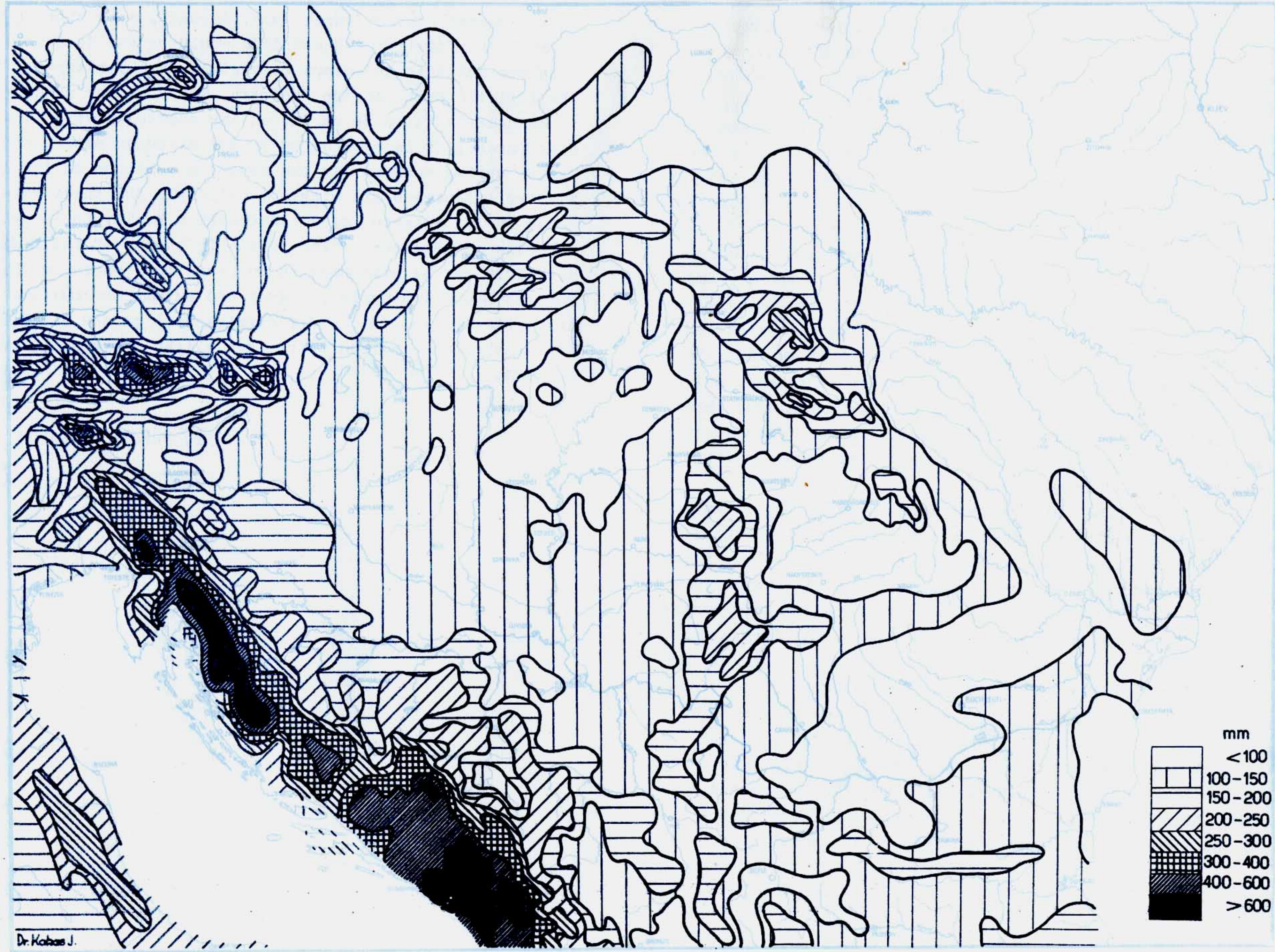
THE AUTUMN RAINFALL

(September, October, November)



THE WINTER RAINFALL

(December. January, February)



The Annual Course of Rainfall.

There is not a completely dry month in this area in the course of the year, and still less a completely dry season, as it is usual in large areas of other continents The amount of rainfall of late spring, being the most important season from agricultural point of view /April, May, June/, reaches or approaches - on an average of several decades - 150 mm even in the driest basins. The divergency from this value is even in the most arid years at most 50 per cent. The diagrams indicated in our map illustrate the annual amount of rainfall of 61 localities of Central Europe.

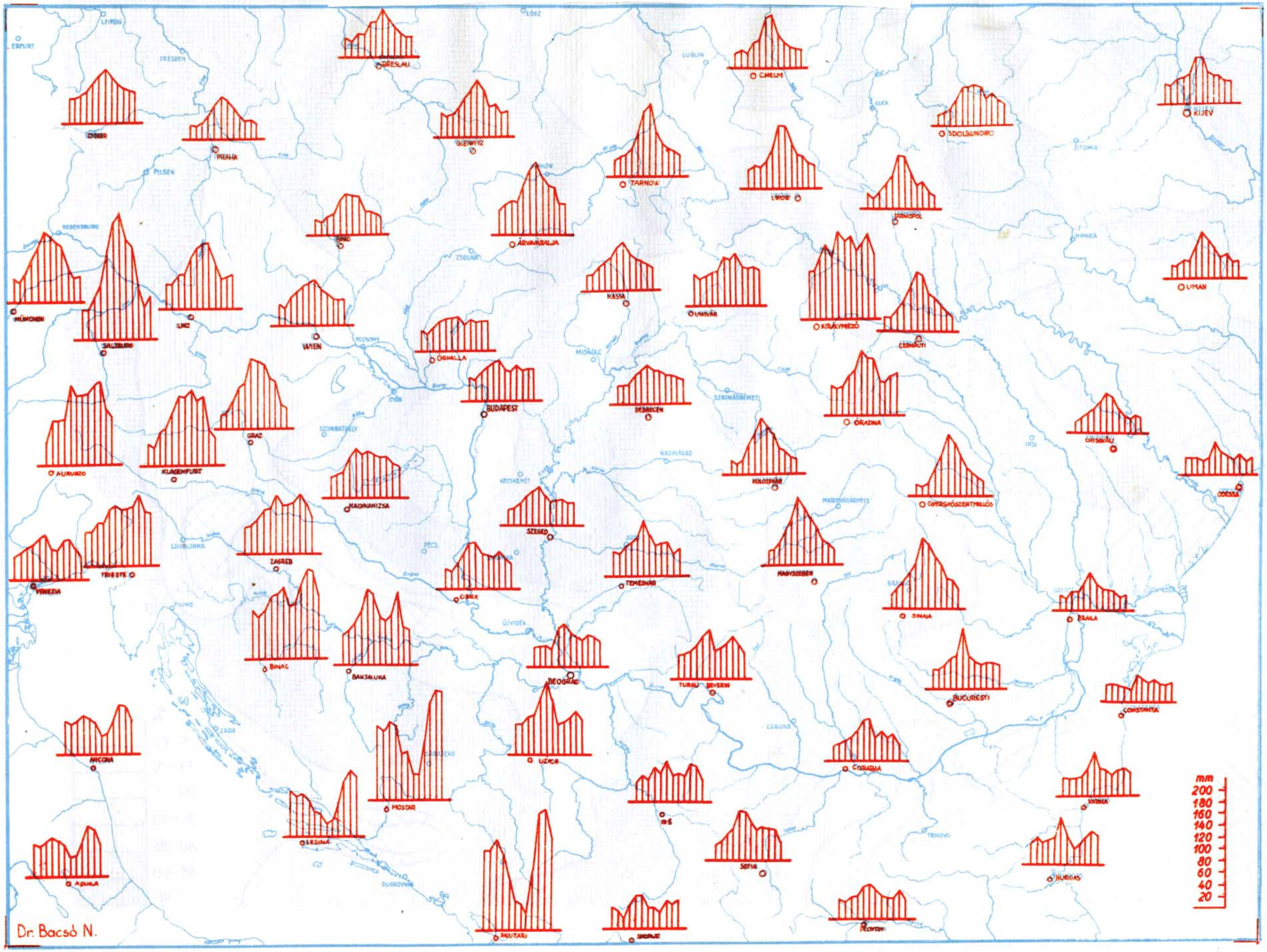
Three principal forms of the annual course may be distinguished in Central Europe: the first one appears in the area of the Atlantic Ocean: winter minimum /January/ and summer maximum /July/. It is clearly represented by Eger /Bohemia/. The second oneis characteristic of the interior of the continent: winter minimum /January or February/, and early summer maximum /June/, such as Nagyszeben. The third one is the Mediterranean form: summer minimum /July-August/, and autumn maximum /October-November/; its most significant representative being Scutari.

The July maximum influenced by the Atlantic appears in the clearest form in the areas lying north of the Alps and the Carpathians. However, to the east of the Vistula River it is mingled with one of a continental type, where June and July compete for the maximum. /Tarnow has a July maximum, whereas Lwów and Tarnopol have a June maximum/ Within the range of the Carpathians only Kassa has a July maximum. The June maximum proves most effectual in Transylvania, outside the Carpathians it is mingled with other influences and forms.

Both the oceanic and continental courses of rainfall are characterised by the summer monsoon-rains which in the interior of the continent, however, come sooner to a close than in the west, where storms and rainfalls occur even in the middle of summer. The dry basins of Central Europe receive at least 30 per cent of the annual amount of rainfall in the summer months /June, July, August/, more than in case of an evenly distributed rainfall would be due to them. The Alps prevent this influence completely from penetrating into the Adriatic which on the contrary, has a summer minimum as it es usually the case on the entire coastal area of the Mediterranean. It is surrounded by the stronger autumn and the weaker spring maximum. In the southern portions of the Alps the two influences are mingled, while all the three ones are mixed in the interior of the Carpathian Basin, in the plains. /Ogyalla and Budapest./ The remote influence of the Mediterranean form may be evidenced in Ruthenia too, where in the Maramaros Mountains spring, summer and autumn maximum are mingled. /Királymező/ On the dry coastal area of the Black Sea beside the June maximum there is a slight increase in autumn as well.

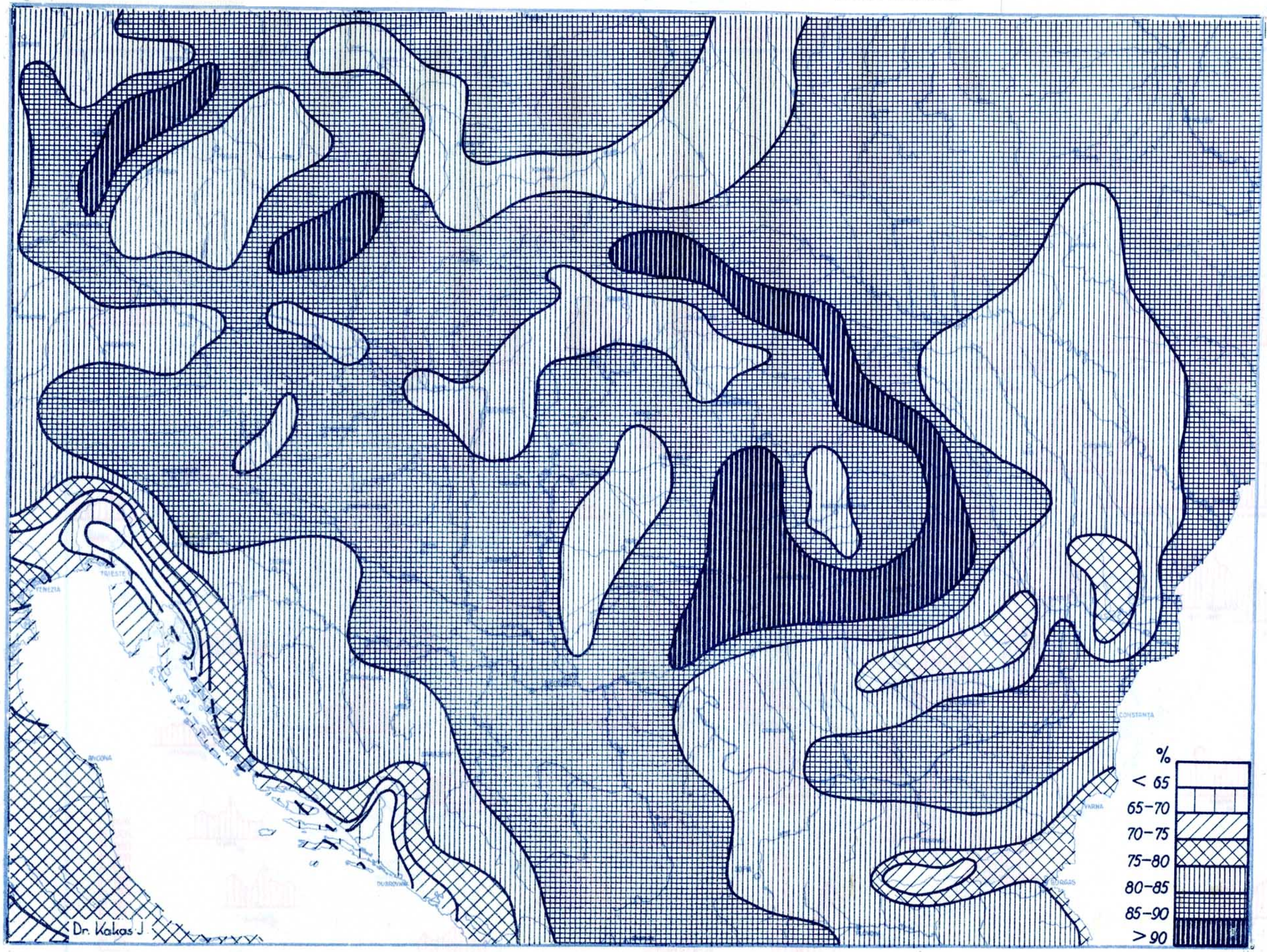
Dr. Ferdinand Bacsó.

THE ANNUAL COURSE OF RAINFALL



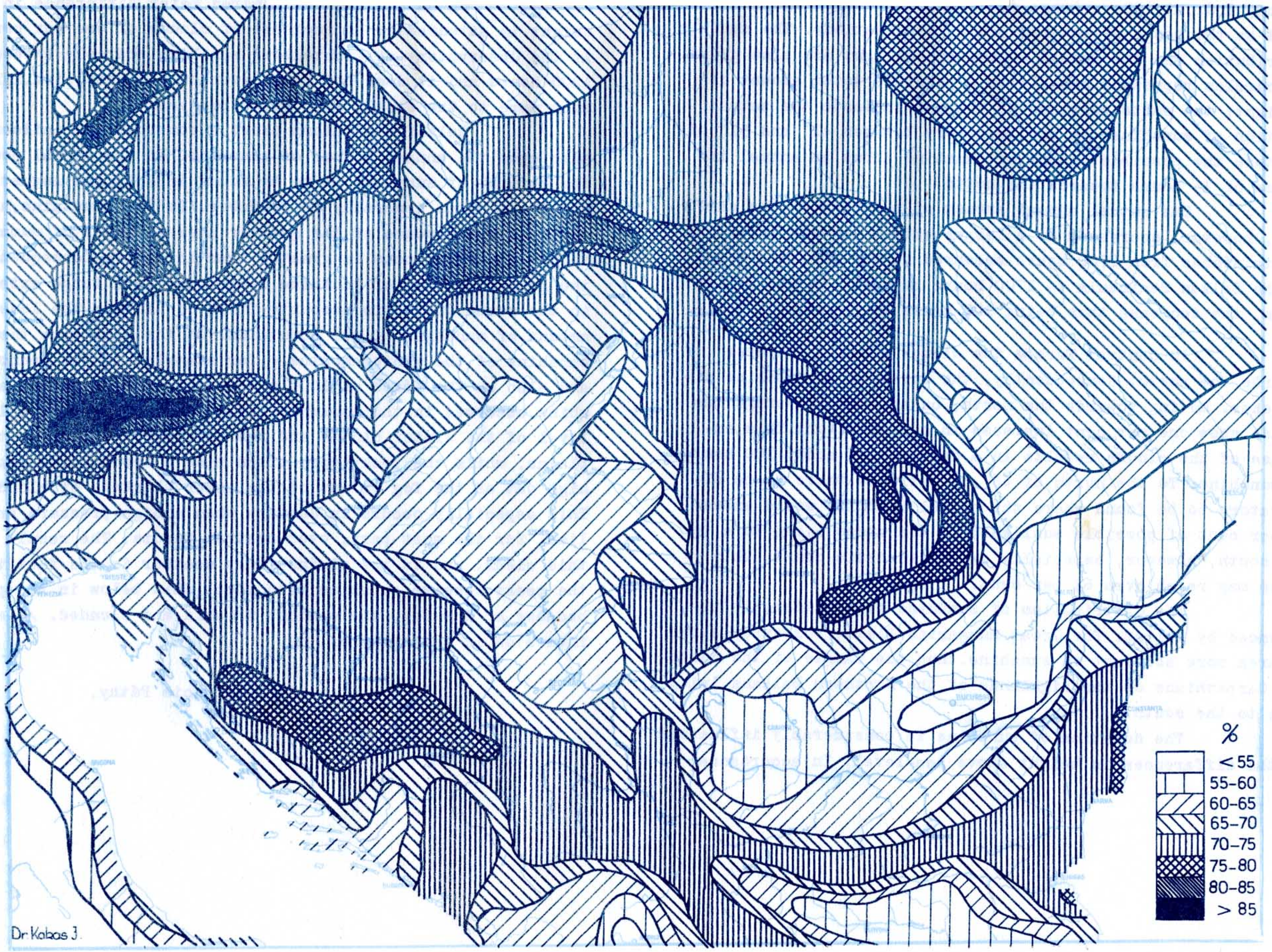
HUMIDITY IN JANUARY

The data give the amount of vapour per cent in relation to the whole capacity



HUMIDITY IN JULY

The data give the amount of vapour per cent in relation to the whole capacity



Sunlight.

In order to characterise the distribution of sunlight the hours of sunshine are given. The figures given in our map indicate the average annual amount of sunlight, calculated on the basis of several years' observations. The monthly distribution and the annual course of sunlight are also given. The circles represent areas with a possible total amount of sunlight; the white portions of the map indicate the actual duration of sunshine. In our territory between 41° and 51° of latitude the possible amount of sunshine shows an annual increase of 15 hours towards the north.

The actual annual amount of sunshine of the same area, however, decreases to a larger extent towards the north it diminishes from 2700 hours measured on the Adriatic coast of the Balkan Peninsula to 1700 hours measured in the Polish Plain, the decrease thus being 100 hours by degrees of latitude.

In Central Europe the clouds greatly increase towards the north. Consequently, the duration of sunshine diminishes. Moving towards the north, on an annual average, the clouds show one per cent increase in our territory. This increase of the clouds results in a decrease of about 100 hours in sunshine. To the north of 46° of latitude there is no observatory to be found where the actual sunshine would exceed 50 per cent of possible sunlight; in the areas lying more to the south, however, especially on the Adriatic coast, this value may reach even 62 per cent.

The distribution of sunshine is considerably influenced by relief. The Great Hungarian Plain, for example, is an area more abundant in sunshine, than the ranges of the Southern Carpathians or the highlands of the Northern Balkans lying more to the south.

The duration of sunshine is considerably influenced by the differences in height above sea-level. In accordance with the increase of clouds and with height the duration of sunshine decreases.

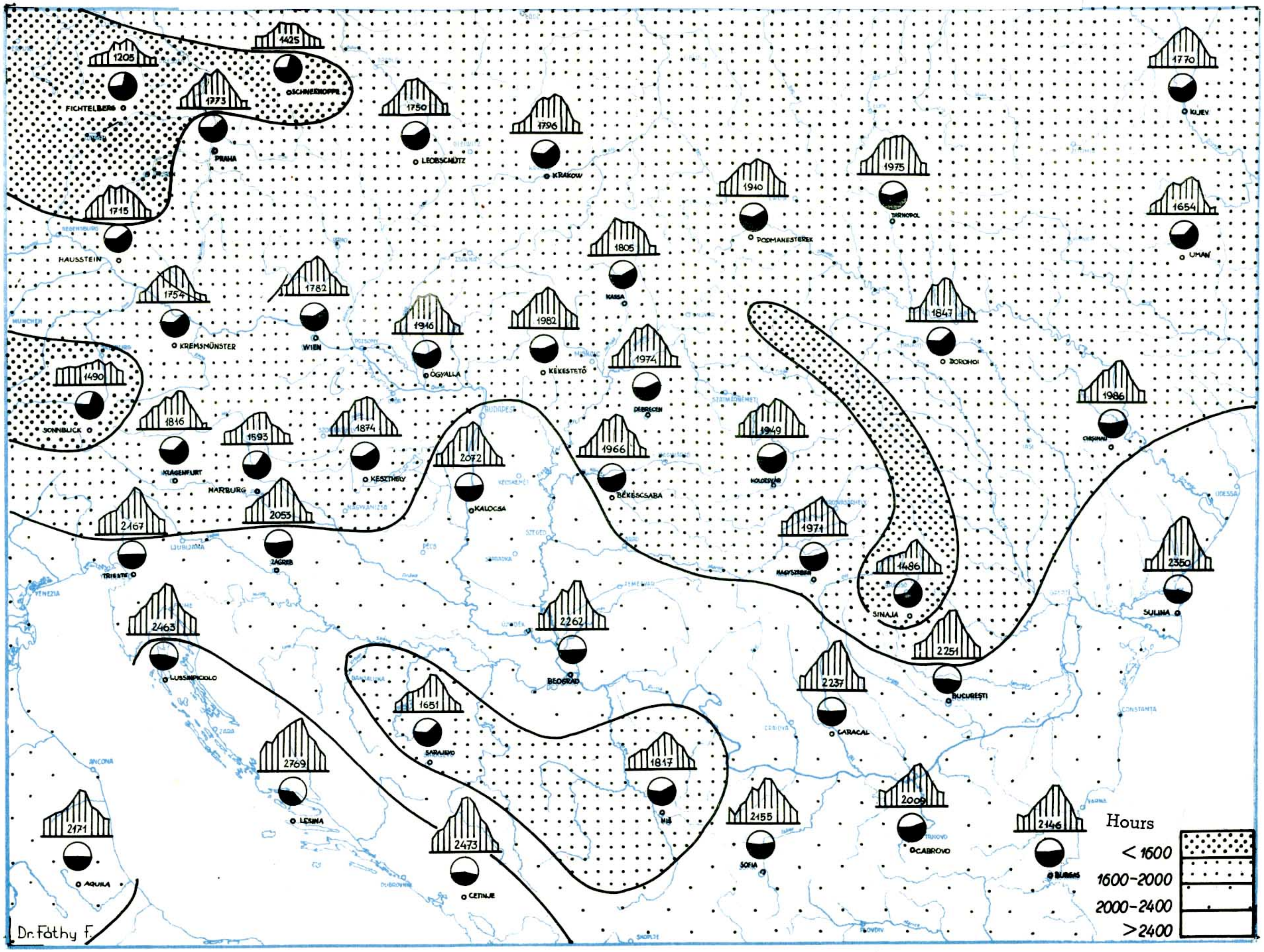
On an average one hundred meter difference in height is attended by an increase of clouds of one per cent. At the Observatory of Fichtelberg sunshine scarcely exceeds 1200 hours and it does not reach even on the Sonnblick, lying much more to the south, 1500 hours per year

Relief conditions exert a considerable influence also upon the annual course of sunshine. In the annual course the maximum of sunshine is to be found in July and August, and the minimum generally in December. In the mountains, however, in consequence of the greater average level of summer clouds the cloudiness is greater than in winter. Consequently, the summer maximum of sunshine diminishes to a large extent in the mountains; this accounts first of all for the less amount of sunshine of the mountains. At the same time the sunshine of the winter months - for example, on the Sonnblick and also on the Kékes of 1000 m - exceeds the amount of sunshine observed in the lowlands. It is due partly to the lower level of the winter clouds and the frequency of fogs in the plains, while the peaks very often rise a few hundred meters high out of the fog or out of the lower blankets of clouds. This especially occurs in January when a high-pressure area lies, for the most part, over Central Europe. The result of this clear, and in the plains foggy weather is the fact that the peaks receive sunshine even then, when below in the plains because of the fog, the weather is cold and clouded. /i.e. inversion in temperature/

Dr. Francis Fáthy.

ANNUAL AMOUNT OF SUNSHINE

Data indicate the hours of sunshine. Whole area of circles denotes the hours of possible sunshine, their white section the hours of actual sunshine

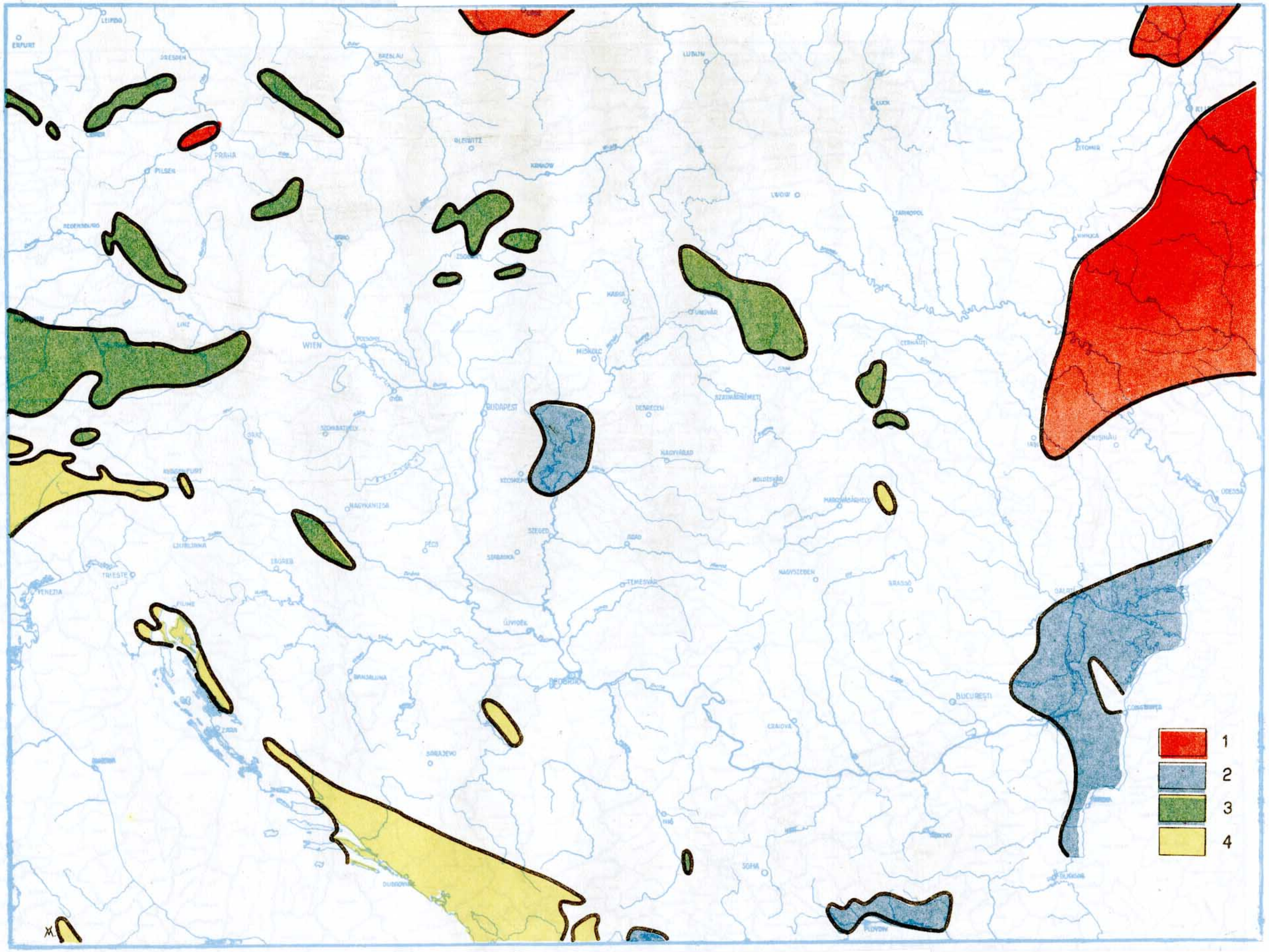


The annual amount of rainfall has but relative values. Its importance is modified by temperature. In case of a higher temperature, for example, the same amount of rainfall contains a humidity of less value from the point of view of vegetation. It is important, therefore, to observe to what an extent the period of culmination of rainfall does coincide with that of the highest temperature. The relation between precipitation and temperature may be also measured by the vapour contents of the air. The data of vapour contents illustrate the fact that the basins and lowlands of Central Europe - with the exception of the Mediterranean coastal area - are much drier in the summer than in winter, in spite of the fact that they receive the major part of their rainfall in summer.

Beside the relationships between precipitation and temperature, from the point of view of agriculture the relationships between clouds and precipitation, or which is the same, between sunshine and rainfall is not indifferent either. The great amount of clouds in the course of the year does not mean necessarily a large amount of rainfall and the latter little sunshine. In the Mediterranean the slopes facing vertically the direction of the winds receive even in a comparatively less cloudy weather a large amount of rainfall, while in the northern lowlands having plenty of cloudy weather there is little precipitation. From the point of view of the relationship between precipitation and clouds there is a contrasted situation to be found in the highland areas being under western climatic influence, as well as in the flat lands around the Black Sea. The former ones have plenty of cloudy weather and much rainfall, the latter ones few clouds and a small amount of rainfall. The great amount of sunshine is especially favourable to the fruits and flowers. This accounts for the large amount of fruit of the Mediterranean. This also accounts for the abundance and the fine quality of fruit in the middle portions of the Great Hungarian Plain, for the large quantity of fruit found in the region lying at the outer feet of the vast southeastern curve of the Carpathians, as well as for the rose-oil region lying at the southern feet of the Balkan Mountains.

The map representing the connection between precipitation and clouds gives a clear idea of the different types of climate meeting in the Carpathian Basin and around it. The four types illustrated in the map embrace the large basin. The different types are mingled the most in the basin itself. The map also illustrates the difference between the climates of those dry basins of Central Europe which show the same or similar values of temperature and precipitation in many points. The center of the Bohemian Basin receives precisely the same amount of rainfall as the body of the Great Hungarian Plain and the middle portion of the Roumanian Plain. In the first and the latter one, however, there are more clouds and less sunshine than in the Great Hungarian Plain. The latter one is an especially favourable island in Central Europe from the point of view of sunshine, the economical importance of which is evidenced by the quantity and fame of the Hungarian fruit, and which is going to gain in importance, when the irrigation works of the Hungarian Plain will be finished.

PRECIPITATION AND CLOUDS



1. SOK FELHŐ, I
2. KEVÉS FELH(

1. Many clouds, little rainfall
2. Few clouds, little rainfall
3. Many clouds, much rainfall
4. Few clouds, much rainfall

First figure: clouds, per cent
Second figure: Rainfall mm

SAPADÉK (60 <, 1000 <)
CSAPADÉK (50 >, 1000 <)