CLIMATE

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Genetic factors

Considering the most striking physiographic features, the region presents a Central Valley which extends to the 41.4° south latitude. Parallel to the coast, this valley limits to the west with the Coastal Cordillera whose heighest elevations are found between the 37° and 38° latitude and between the 40 and 41° south latitude. To the east the Andean Mountains make up the highest mountain range of the country. Towards the south the Central Valley disappears giving way to the sea; separating the continent in islands which generally corespond to outbursts of the Coastal Range. These orographic characteristics determine pluviometric gradients from west to east, while the latitude determines a pluviometric gradient from north to south. The distribution of precipitations or characteristic pluviometric regimes in the zone are determined by the dynamics of the south-west Pacific anticyclone.

The thermal regime possesses oceanic characteristics all along the country; the continentality is revealed only in sectors protected from the oceanic influence as it is windward of a greatly developed mountain range. The altitude effect is another factor present, mainly towards the Andean Mountains whose elevations are higher than those of the Coastal Cordillera.

Latitude and orography, in turn, influence the incidental solar radiation and the insolation. Orography is specially important owing to its exposure effect.

Regime of precipitations

The pluviometric regimes of the zone are graphically showed in the ombrothermic diagrams of the annual precipitation chart and monthly figures are shown in table 1.

In the northern part of the zone up to the 39.5° south latitude through the central valley and 38° through the coast and the Andean Mountains, we found the mediterranean pluviometric regime characterize by winter precipitations and warm and dry summers. The amount of dry months is higher in the valley because it is located under the lee of the coastal relief. Nevertheless, the dry season is reduced towards the south due to the decrease in height of the coastal mountain range and to the lesser influence of the Pacific anticyclone, which, in turn, determines a greater effect of the latitude factor in this region. In the Central Valley the annual precipitations reach up to 1.200 mm and in the highest sectors of the coastal mountain range they come near the 2.000 mm. Eastward, the precipitations exceed the 3.000 mm due to the greater altitude

TABLE N° 1

RAINFALL AND WATER DEFICIT IN SELECTED METEOROLOGICAL STATIONS (in mm)

MET. STA.	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	MEAN	ANNUAL DEFICIT
Temuco	34.9	36.9	66.6	109.6	217.4	206.7	193.7	158.4	98.5	69.4	72.5	57.7	1324.8	340.0
P. Domínguez	43.9	39.9	75.6	104.7	255.0	263.5	257.9	193.6	135.4	79.7	78.5	53.7	1580.7	300.0
Valdivia	66.1	62.3	105.3	198.5	376.1	384.1	352.7	287.1	204.1	107.5	110.2	94.7	2348.7	90.8
Frutillar	63.2	65.8	117.6	169.5	217.3	226.2	204.8	175.6	137.7	82.1	92.8	106.5	1659.6	0.0
Osorno	40.7	67.4	61.3	115.1	215.2	179.4	218.9	196.1	108.0	85.3	68.2	75.4	1431.6	107.5
Puerto Montt	92.5	94.4	142.7	149.8	240.6	240.5	255.0	221.3	169.7	119.8	108.4	106.6	1941.6	0.0
Ancud	104.5	102.6	147.1	206.7	334.7	330.8	323.3	279.3	205.7	160.9	127.4	116.8	2438.8	0.0
Castro	82.4	101.5	128.5	179.8	332.8	332.2	324.0	289.3	224.6	167.9	155.5	105.2	2423.7	0.0

in the Andean Mountains. Southward, the rainfall reaches the 2.000 mm in the limit zone of this pluviometric regime (Chart 1). (INDAP-U. de Chile, 1982.)

The second pluviometric regime corresponds to a rainy one with mediterranean influence extending along the southern region of the zone. It is characterized by rainfall all year long. In spite of this, the influence of the Pacific anticyclone determines a decrease of precipitations during the summer with resulting dry months in this season during drought years. Hence the name of this pluviometric regime. Towards the south, rainfall becomes more homogeneous throughout the year, due to a greater oceanic and latitudinal influence. This can be observed in the ombrothermic diagrams of southern localities. The amount of annual rainfall for the central valley is of 1.500 mm, 2.500 for the coast and of more than 3.000 in the highest parts of the Cordillera of the Andes. Southwards, amounts of rainfall exceed the 2.500 mm (Chart N° 1, Table N° 1).

Thermic regime

The minimum temperatures of the coldest month vary little on account of the oceanic characteristics of the country. There is a thermic constancy that is evident from the most septentrional areas and thus these temperatures present values similar to the ones of the semi-arid zone located in lower latitudes. The values of the isotherms of the coldest months reach 6°C in the coast, decrease to 2°C in the pre-cordillera zone and drop to less than 0°C in the highest points of the Andean Mountains (Chart N° 2, Table N° 2).

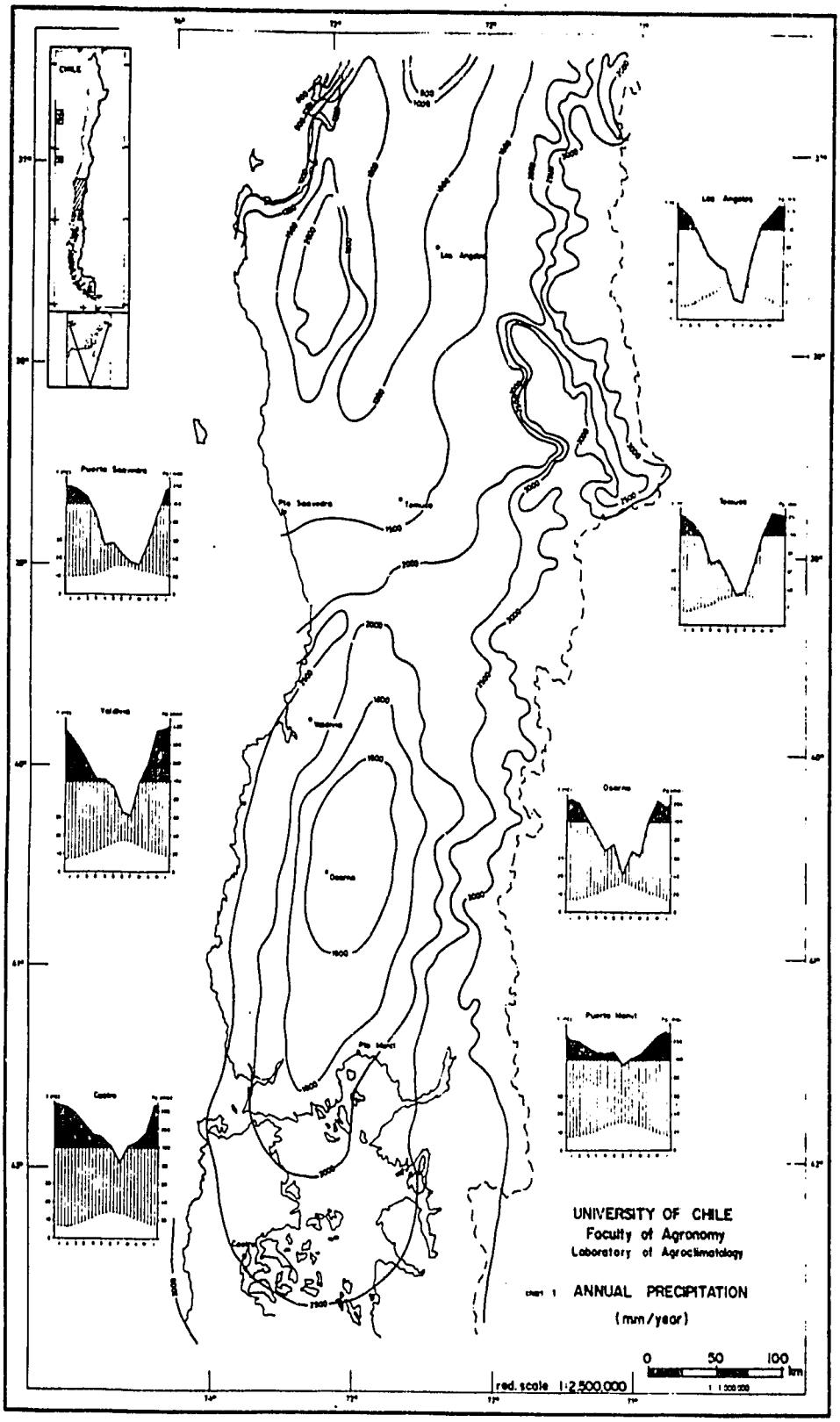
The maximum temperatures vary more due to the insolation and latitude effects, deriving in close isotherms. The continentality is revealed through higher temperatures in the Central Valley that diminish in the coast because of the oceanic effect and in the Andean zone because of altitude (Chart N° 3). In the Central Valley, the temperatures range from 27° to 20°C, and in the coastal and southern montainous zones reach 17° and 18°C respectively (Table N° 3).

Moisture regime

The amount of dry months vary according to the effect of climatic factors. In the areas with a mediterranean pluviometric regime the amount of months with water deficit ranges from 6 to 1. The greatest deficit is between the 37° and 38° latitude where the mountain range presents the highest elevations. The extension of the dry season diminishes gradually towards the south and towards the coast, and along the coastal zone it is limited to one month at 39.5° latitude (Chart N° 4).

In the oceanic pluviometric regime zone, where there are enough precipitations throughout the year, there is a mediterranean nucleus due to the influence of the coastal mountain range present between the 40° and 41° latitude in which a dry month occurs (Table N° 1).

CHART 1.


CHILE
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ANNUAL PRECIPITATION
(mm/year)
red. scale 1:2.500.000
0 50 100 km

TABLE N° 2

MONTHLY MINIMUM MEAN TEMPERATURE IN SELECTED METEOROLOGICAL STATIONS (in °C)

MET. STA.	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	MEAN
Temuco	10.4	10.1	8.8	6.8	5.6	4.6	4.2	4.1	5.1	6.5	7.9	9.4	7.0
P. Dominguez	9.2	9.3	8.5	6.9	5.8	5.5	5.1	4.5	5.5	6.4	7.7	8.8	6.9
Valdivia	10.8	10.4	9.1	7.1	6.9	5.6	4.8	4.6	5.3	6.6	8.4	9.9	7.5
Frutillar	9.0	9.0	7.9	6.1	4.8	3.8	3.0	3.2	3.5	5.1	6.3	7.8	5.8
Osorno	7.5	6.9	5.8	4.6	4.6	3.2	3.4	3.8	3.0	4.4	6.2	7.2	5.0
Puerto Montt	10.9	10.5	9.2	7.6	6.8	5.2	4.6	4.6	5.4	6.8	8.7	10.0	7.5
Ancud	9.5	8.4	8.1	6.3	5.4	4.5	4.6	4.2	4.2	5.4	7.0	8.0	6.3
Castro	9.4	8.2	7.3	5.9	5.0	3.9	3.7	3.2	3.9	5.3	6.5	8.2	5.9

CHART 2.

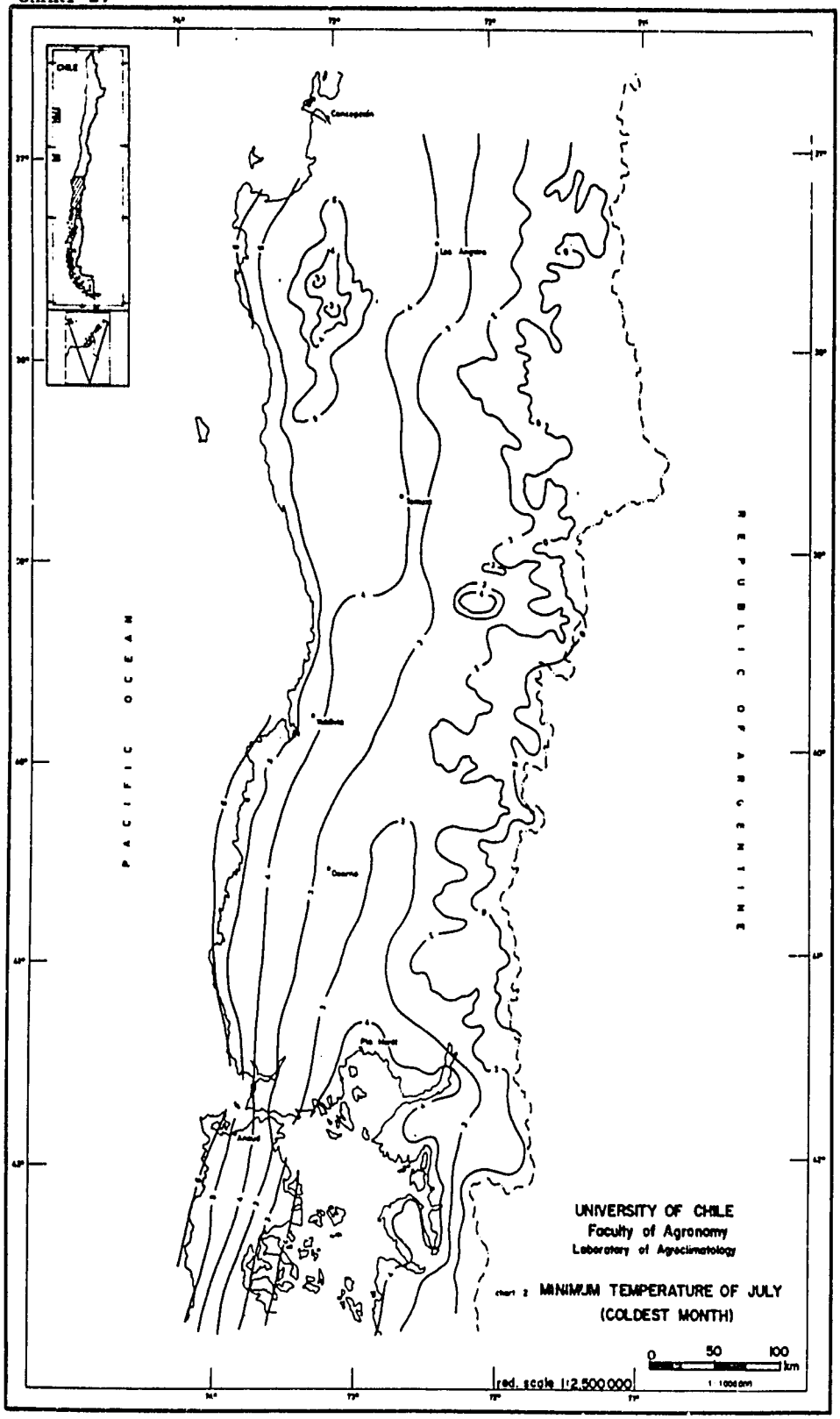
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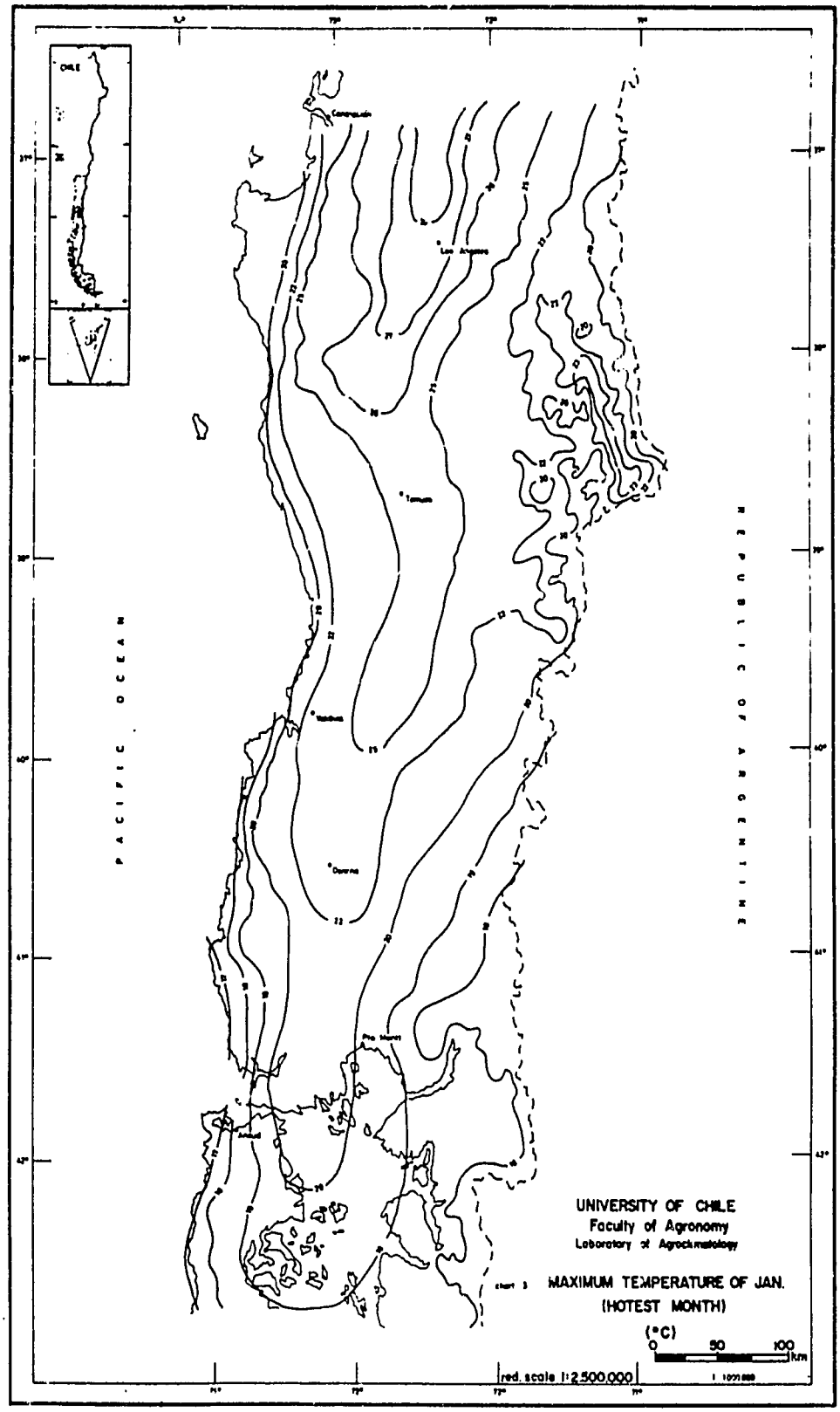
chart 2 MINIMUM TEMPERATURE OF JULY
(COLDEST MONTH)
0 50 100 km
red. scale 1:2.500.000

TABLE N° 3

MONTHLY MAXIMUM MEAN TEMPERATURE IN SELECTED METEOROLOGICAL STATIONS (in °C)

MET. STA.	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	MEAN
Temuco	25.3	25.3	22.7	18.7	14.5	12.1	12.1	13.1	15.5	18.1	20.4	22.8	18.4
P. Domínguez	20.2	20.4	19.0	17.1	14.6	13.1	16.8	13.0	14.2	15.6	16.9	18.7	16.3
Valdivia	24.1	22.5	21.0	17.0	13.1	11.7	11.1	12.3	14.8	17.3	19.9	22.3	17.3
Frutillar	20.0	19.9	17.8	14.7	12.1	10.2	9.8	10.6	12.0	14.5	16.3	18.2	14.7
Osorno	23.2	22.5	20.7	17.0	13.5	10.7	10.9	11.7	14.1	16.9	18.8	21.5	16.8
Puerto Montt	19.5	18.8	17.6	15.2	13.2	11.5	11.0	11.3	12.0	14.5	16.8	18.4	15.0
Ancud	18.6	18.3	16.8	14.4	12.1	10.5	10.5	10.4	11.6	13.5	15.5	17.2	14.1
Castro	19.4	19.2	18.2	15.1	13.2	10.5	10.4	10.5	12.3	14.6	16.7	18.4	14.9

CHART 3.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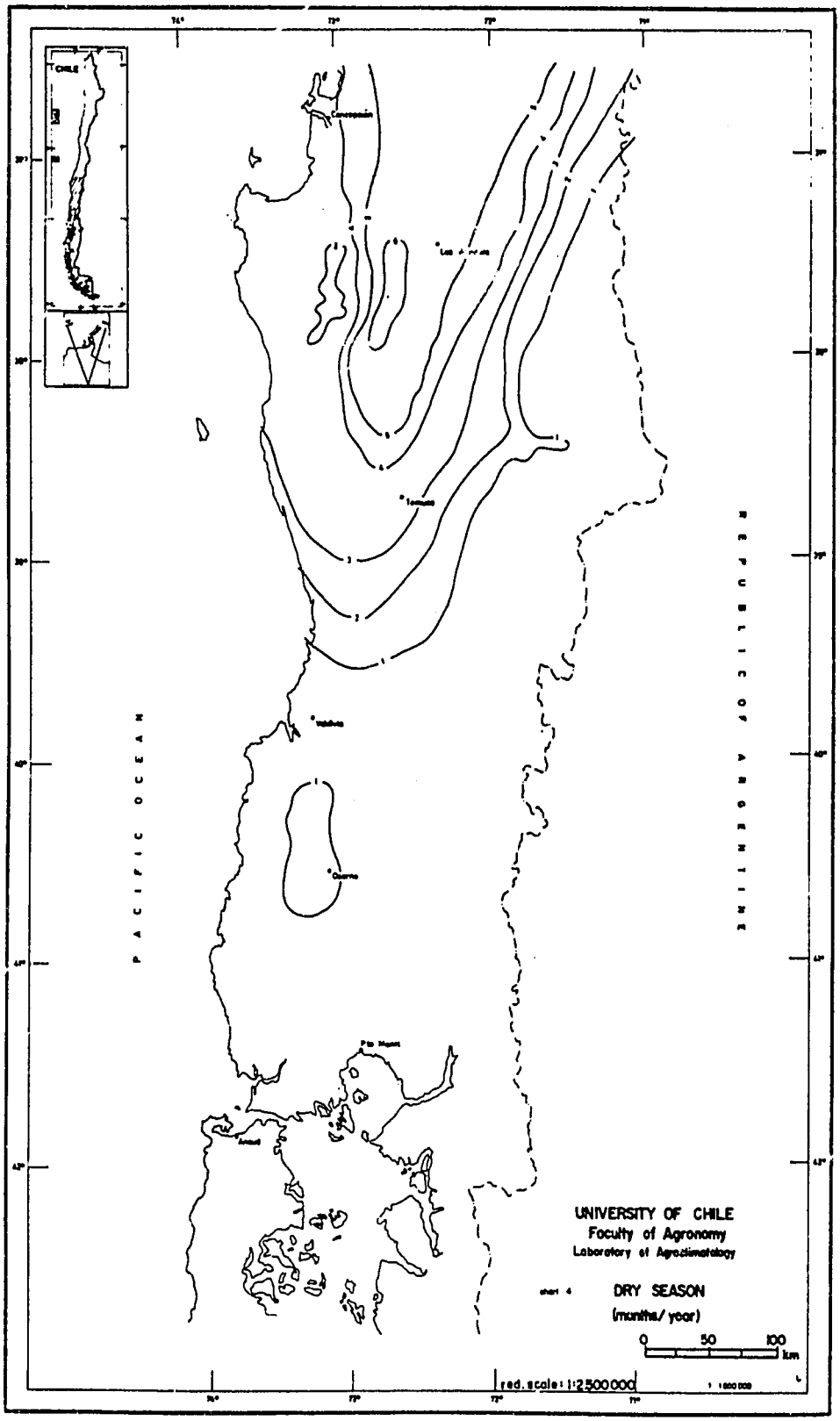
MAXIMUM TEMPERATURE OF JAN.
(HOTEST MONTH)
(°C)
0 50 100 km
red. scale 1:2.500.000

CHART 4.


PACIFIC OCEAN
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DRY SEASON
(months/year)
0 50 100
km
red. scale: 1:2500000

Radiation regime

The amount of incidental radiation depends on: latitude, cloudiness and season of the year. The highest values are obtained in December, varying from North to South between 550 - 450 cal/square cm per day. In June, the month with the highest cloudiness, the values drop clearly from north to south varying between 100 - 60 cal/square cm per day (Table N° 4).

The annual solar radiation varies from north to south between 130 - 90 kcal/square cm a year.

Climatic zones according to Köeppen

According to Köeppen's classification, these are in the zone three climatic types coinciding approximately with the distribution of the pluviometric regimes already described. (Figure 2.)

The first climatic type is the warm temperate climate with a short dry season (Csb 2). It is difficult to precise the southern limit for this climate due to the influence of the coastal mountain range (Cordillera of Nahuelbuta); but it could be determined in the dry months chart as an approximate value since a dry month was determined with the ratio between available humidity (pp) and potential evapotranspiration (ETP), that is pp/ETP.

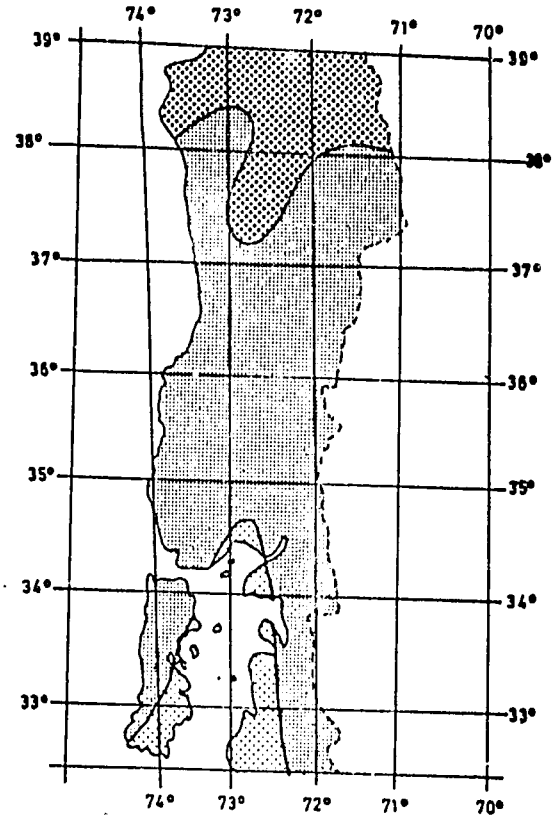
The second climatic type is the rainy temperate climate with mediterranean influence (Cfsb), extending to more southern areas of the described zone. In this type of climate the mediterranean influence is so marked that, for example, in Valdivia January's rainfall is 66.1 mm and June's 384.1 mm (Table N°1).

The third type of climate is the west coast cold temperate climate with a maximum of winter rains (Cfb). See enclosed map.

Agroclimatic districts of the region

Chart N° 5 presents the agroclimatic districts that correspond to the zone of our interest. We have used a system developed in Chile consisting in the integration of a set of variables that define the agricultural potential of a region. The climatic chartography of these variables leads to a chart of agroclimatic districts in which each area is characterized by twelve variables, summarized in a synthetic formula (Chart N° 5).

FIGURE 2.



Climatic characterization according to Koeppen

(adapted by H. Fuenzalida)

TABLE N° 4

RADIATION REGIME IN SELECTED METEOROLOGICAL STATIONS (in cal/cm^2, per day)

MET. STA.	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Temuco	544	449	333	205	115	83	95	157	255	338	435	530
Valdivia	500	420	324	194	103	71	67	146	227	332	432	490
Osorno	489	421	309	194	92	71	76	134	227	332	432	445
Puerto Montt	458	392	277	170	100	61	73	134	233	327	404	445
Castro	431	344	296	156	90	61	73	122	200	284	352	417