



## ORIGINAL ARTICLE

# A study on the relationship between temperature and height in Ardabil province, according to the meteorological data

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### ABSTRACT

*the relationship between temperature and height was investigated Based on the review of one of the most important climatic parameters (temperature) in order to provide scientific solutions to meet the social needs and careful planning in the region in the field of agriculture. There was a significant relationship on the basis of Laps Rate phenomenon, so that the differences between heating and cooling processes of 70 degrees Celsius and the height difference of 1500 meters in the province show this important issue.*

**Keywords:** temperature, according, meteorological data

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### INTRODUCTION

#### Location, range and area

This region with the area of 17,867 square kilometers is located at the north of Iran plateau between the coordinates of '45 and '37 to '42 and '39 North latitude and '55 and 48 to '3 and 47 east longitudes from the Greenwich meridian. Based on the assessment studies of Land resources in this area (Ardabil Province) a total of 7 major types and one type of mixed lands and 32 units of land have been identified. In this province, mountain type with an area of 780,443 hectares equivalent to 43.6 percent, hills type with an area of 318,204 hectares, equivalent to 17.8 percent, plateau and upper terraces type with an area of 435,880 hectares, equivalent to 24.4 percent, domain plains type with an area of 162,533 hectares, equivalent to 9.1 percent, sedimentary plains type with an area of 11,149 hectares, equivalent to 0.6 percent, floodplains type with an area of 18,611 hectares equivalent to 1.1 percent, fan-shaped debris type with an area of 500 hectares equivalent to 0.02 % and other types of mixed land with an area of 1387 hectares, equivalent to 2.4 percent allocated the area. From the total area, an area of 17,348 hectares, equivalent to 1 percent has been allocated to residential areas, airports, lakes and rivers. Accordingly, 61.4% of the area is devoted to the type of mountains and hills located in the western part of the region (Sabalan Mountain and highlands) and in (the northern plains region called Moghan). Lowest point of the area is its north less than 100 meters above sea level and Sabalan Mountain is considered as the highest point of the area with 4811 meters. 24.4% of the area consists of the upper terraces located in the vicinity of mountains and hills. Other areas of the province, about 10.7% are reallocated to flood and alluvial plains and lowlands. These plains are mainly located in three areas of Moghan, Ardabil and Meshkinshahr. 28.3% of the surface area is located at height floors Less than 1,000 meters, 22.4% in height floors of 1000 to 1400 meters and 24.9% of the surface area in height floors of 1400-1800. 24.4 percent of the province is located at height floors higher than 1800 m to 3400 meters.

**Table (1-1): Area of height floors (height above sea level in meters) in Ardabil Province**

height floors	Extent (km)	percent
1000less than	5047.73	28.3
1000-1400	3980.17	22.4
1400-1800	4433.98	24.9
1800-2200	2538.76	14.3
2200-2600	1099.11	6.2
2600-3000	435.64	2.4

3000-3400	145.51	0.8
3400 more than	119.2	0.7
Total area	17800.00	100

### Climatic characteristics

The purpose of studying climatic characteristics is to identify the environmental characteristics affected by the climate prevailing in the region. Qualitative and quantitative characteristics and climatic characteristic create various spatial and environmental structures and affect the Qualitative and quantitative changes of environmental conditions. The importance of frequency in choosing a resident by a population affects the shape of settlements and agriculture of an area. Temperature is one of the main climatic parameters affecting the temperature of an area.

### Temperature

The results of studying temperature in the area show that the months of Dey and Bahman (December and January) are the coldest months of the year with a mean of 0.6 and 0.8 degrees Celsius. The minimum annual temperatures in northern areas (Moghan plain) have temperatures higher than 9 degrees Celsius in the year. South of the province and the southern highlands (Khalkhal city) have a minimum annual temperature of 0 to 3 degrees Celsius. The coldest region of the province leads to the south highlands of Sabalan where the annual minimum temperature exceeds from - 4 ° C. In Ardabil and central parts of the province the minimum temperature mean of 2/5 ° C per year. The months of Tir and Mordad (July and August) are the hottest months of the year with a mean of 23.2 and 22.3 ° C and the minimum temperatures of Mordad and Tir in the central parts of the province are 11.2 and 11.9 degrees Celsius which show the influence of the Sabalan Mountain. Maximum annual temperature mean in the northern areas of the region have a temperature between 18 and 21°C. In the southwest of the province and flat areas, maximum annual temperature is 14 to 17 degrees Celsius. In total, the warmest areas of the province are northern regions according to results presented at the weather report with a temperature between 13 to 15°C. In the South West of the province and flat areas the average annual temperature is 8 to 11°C. Coldest areas in the provinces are the southern areas and Sabalan Mountain with an average annual temperature of 1°C and lower. In the East of the region, temperature rises with decreasing altitude and proximity to the sea. In general, in this province the cold weather is a very important factor shaping the activities and settlement. Therefore, based on the ice period in which the number of days in the year are different at different locations, Province can be divided into different areas each of these areas demonstrates the feasibility and ease of living and working in the province. Coldest regions of the province in the areas leading to Sabalan mountain with an average annual temperature of 1 ° C and sometimes lower and the number of ice days is about 210 days per year. In the central areas of the ice period is about 130 days in the year. Northern regions have the lowest number of ice days per year. In the Southern Highlands, there are 150 ice days. Ice in central and southern parts of the province begins from the late Mehr (October) to the early Farvardin (April).

Table 2: The average temperature of meteorological stations in Ardabil Province

Month / year	Farvardin	Ordibehesht	Khordad	Tir	Mordad	Shahrivar	Mehr	Aban	Azar	Dey	Bahman	Esfand	SUM
Ardabil	8.1	12.0	15.6	17.9	18.7	16.7	12.7	7.9	2.1	-1.1	-1.4	2.2	9.3
Pars Abad	12.1	17.4	23.2	26.2	27.4	23.9	18.3	11.9	6.1	4.0	4.0	6.9	15.1
Khalkhal	6.3	10.8	15.3	18.8	19.8	16.8	11.4	5.6	0.4	-3.1	-3.4	0.6	8.3
Meshkinshahr	8.5	12.6	17.7	20.5	21.6	18.4	14.7	8.1	3.3	0.8	0.4	3.4	10.8
Sareyn	7.2	11.7	16.2	18.9	19.6	17.2	13.8	7.1	1.5	-1.2	-0.4	2.7	9.5
Bilehsavar	11.4	16.8	23.5	26.6	27.7	24.1	19.0	12.7	6.5	3.8	4.1	7.0	15.3
Garmi	11.0	15.4	21.9	24.5	25.5	21.5	16.7	10.9	5.8	2.9	2.9	6.1	13.8
Firuz Abad	10.7	15.3	21.1	24.9	25.4	22.2	16.4	9.1	2.3	-1.4	0.3	5.0	12.6
Province	9.4	14.0	19.3	22.3	23.2	20.1	15.4	9.2	3.5	0.6	0.8	4.2	11.8

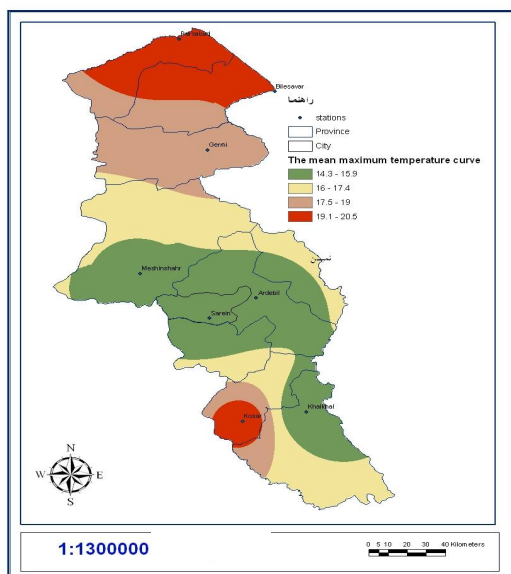
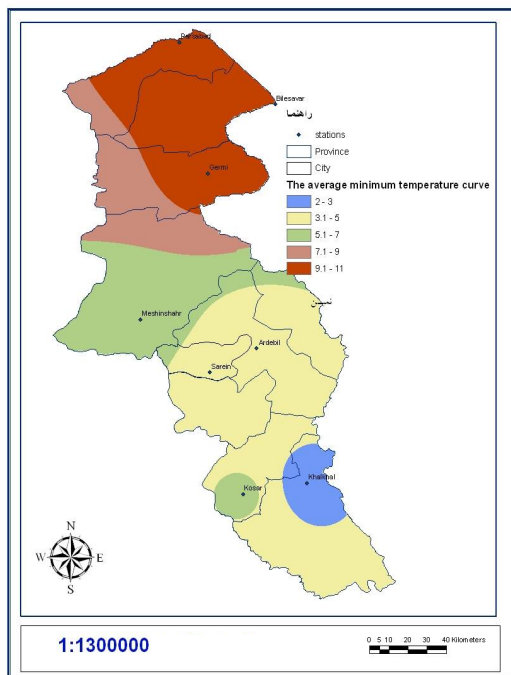
Table 3: The average minimum temperature of meteorological stations in Ardabil Province

Month / year	Farvardin	Ordibehesht	Khordad	Tir	Mordad	Shahrivar	Mehr	Aban	Azar	Dey	Bahman	Esfand	SUM
Ardabil	1.3	5.3	8.5	11.2	11.9	10.0	6.1	2.3	-3.0	-6.1	-6.6	-3.2	3.2
Pars Abad	6.5	11.6	16.5	20.0	21.1	18.2	13.2	7.5	2.1	-0.2	-0.5	2.1	9.8
Khalkhal	0.2	4.3	7.8	13.2	13.5	9.2	3.6	-0.3	-4.4	-8.0	-8.2	-4.4	2.2
Meshkinshahr	3.9	7.6	12.1	15.6	16.0	13.4	9.8	4.1	-0.4	-2.7	-3.2	-0.7	6.3
Sareyn	1.8	6.2	10.3	13.8	13.9	11.7	8.1	2.4	-2.7	-5.3	-4.5	-1.6	4.5
Bilehsavar	6.6	11.6	17.0	21.0	21.5	18.8	14.3	9.1	2.8	0.3	0.7	3.0	10.6
Garmi	7.0	11.2	17.0	20.3	20.7	17.7	13.0	7.7	2.6	-0.2	-0.4	2.5	9.9
Firuz Abad	3.2	7.9	12.0	17.9	16.9	13.4	7.3	2.3	-3.8	-6.6	-4.5	-0.6	5.5
Province	3.8	8.2	12.6	16.6	16.9	14.1	9.4	4.4	-0.8	-3.6	-3.4	-0.4	6.5

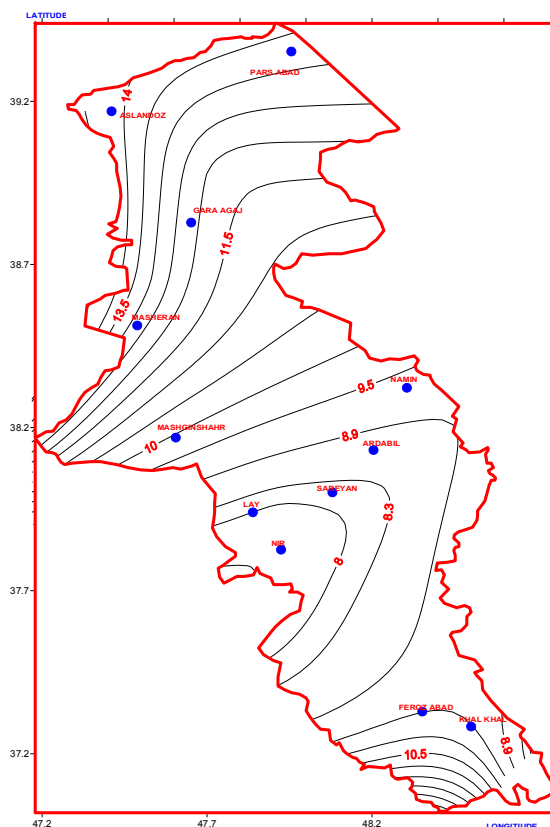
### Bahman Bahari Bighdilu

Table 4: The average Maximum temperature of meteorological stations in Ardabil Province

Month / year	Farvardin	Ordibehesht	Khordad	Tir	Mordad	Shahrivar	Mehr	Aban	Azar	Dey	Bahman	Esfand	SUM
Ardabil	14.8	18.7	22.7	24.5	25.4	23.4	19.4	13.4	7.2	3.8	3.8	7.6	15.4
Pars Abad	17.8	23.2	30.0	32.5	33.7	29.6	23.5	16.2	10.0	8.3	8.5	11.7	20.4
Khalkhal	12.3	17.3	22.8	24.3	26.2	24.5	19.1	11.6	5.2	1.8	1.4	5.6	14.3
Meshkinshahr	13.1	17.5	23.3	25.3	27.1	23.5	19.6	12.1	6.9	4.3	4.1	7.5	15.4
Sareyn	12.5	17.2	22.1	24.0	25.2	22.8	19.5	11.8	5.8	2.8	3.6	7.0	14.5
Bilehsavar	16.2	22.0	30.0	32.3	33.9	29.4	23.6	16.3	10.3	7.3	7.5	11.0	20.0
Garmi	14.9	19.5	26.8	28.8	30.2	25.4	20.4	14.2	9.0	6.0	6.1	9.8	17.6
Firuz Abad	18.1	22.7	30.1	32.0	33.9	31.1	25.5	15.9	8.3	3.9	5.0	10.7	19.8
Province	15.0	19.8	26.0	28.0	29.5	26.2	21.3	13.9	7.8	4.8	5.0	8.9	17.2



The annual temperature curve of the studied stations



## CONCLUSION

Statistical analysis indicates that the minimum temperature was in the south part of the province including Khalkhal and Ardebil and maximum temperature was in the north or Moghan plain and the minimum warm temperature of the province was in the central area of Ardebil affected by Sabalan highlands. However, the altitude was in the northernmost station of 50 meters and the southernmost station was in the 1700 meters above the sea level indicating the direct relationship between temperature and altitude and describes the Laps Rate phenomenon. The occurrence of high temperatures in the warm months of the year in the province and the difference between maximum and minimum temperatures of around 70 degrees Celsius is significant indicating the unique feature of the region. Considering the height of more than 20 percent higher than 2000 m in the province and also the Heating and cooling air mass flows and the impact of differences in climate and other factors, plains and highlands it Can be inferred that large parts of the province, with more than half the year will be on ice.

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