

# Phytosociological Research Center

www.globalbioclimatics.org

## Worldwide Bioclimatic Classification System

Prof.Dr. Salvador Rivas-Martinez

(Adapted to Synoptical Table 30/08/2017)

KAYNAR (KAZAKHSTAN)

Altitude: 610 m.

Latitude: 49°11'N Longitude: 77°25'E

Temperature observation period.: 1981-1994 (14)

Rainfall observation period....: 1984-1994 (11)

| (C/mm) | Ti     | Mi     | mi     | M'i   | m'i    | Pi   | Epi    |
|--------|--------|--------|--------|-------|--------|------|--------|
| Jan.   | -15.56 | -10.00 | -21.11 | 6.11  | -51.11 | 8.9  | 0.00   |
| Feb.   | -15.00 | -9.44  | -20.56 | 6.11  | -40.00 | 12.2 | 0.00   |
| Mar.   | -8.89  | -2.78  | -15.00 | 18.89 | -37.22 | 7.1  | 0.00   |
| Apr.   | 2.50   | 8.33   | -3.33  | 28.89 | -23.89 | 33.8 | 18.88  |
| May.   | 10.00  | 17.22  | 2.78   | 32.22 | -13.89 | 26.2 | 74.62  |
| Jun.   | 15.27  | 22.22  | 8.33   | 36.11 | -5.00  | 36.1 | 110.49 |
| Jul.   | 17.50  | 24.44  | 10.56  | 37.22 | 1.11   | 54.6 | 125.70 |
| Aug.   | 15.83  | 23.33  | 8.33   | 36.11 | -2.78  | 31.0 | 105.58 |
| Sep.   | 10.00  | 17.78  | 2.22   | 30.00 | -10.00 | 4.8  | 59.36  |
| Oct.   | 2.78   | 8.89   | -3.33  | 25.00 | -26.11 | 14.5 | 16.61  |
| Nov.   | -7.78  | -2.78  | -12.78 | 16.11 | -37.22 | 11.4 | 0.00   |
| Dec.   | -13.89 | -8.89  | -18.89 | 10.00 | -45.00 | 19.8 | 0.00   |
| Year   | 1.06   | 7.36   | -5.23  | 23.56 | -24.26 | 260  | 511.23 |

### BIOCLIMATIC INDICES AND DIAGNOSIS

|   |      |
|---|------|
| Thermicity index.....(It):                          | -300 |
| Compensated thermicity index.....(Itc):             | -54  |
| Simple continentality index.....(Ic):               | 33.1 |
| Diurnality index.....(Id):                          | 15.6 |
| Annual ombrothermic index.....(Io):                 | 2.72 |
| Monthly estival ombrothermic index.....(Ios1):      | 3.12 |
| Bimonthly estival ombrothermic index.....(Ios2):    | 2.57 |
| Threemonthly estival ombrothermic index.....(Ios3): | 2.50 |
| Fourmonthly estival ombrothermic index.....(Ios4):  | 2.52 |
| Annual ombro-evaporation index.....(Ioe):           | 1.79 |
| Annual positive temperature.....(Tp):               | 739  |
| Annual negative temperature.....(Tn):               | 611  |
| Estival temperature.....(Ts):                       | 486  |
| Positive precipitation.....(Pp):                    | 201  |

| N. of  | P>4T | P:2T-4T | PT-2T | P<T | T<0 |
|--------|------|---------|-------|-----|-----|
| Months | 2    | 3       | 1     | 1   | 5   |

Latitudinal Belt...: High eutemperate

Continentality.....: Continental - Low Eucontinental

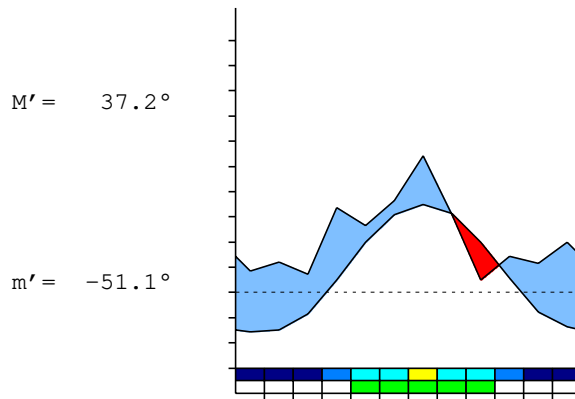
Bioclimate(Variant): BOREAL XERIC (STEPIC)

Bioclimatic Belt...: LOW THERMOBOREAL LOW DRY

KAYNAR (KAZAKHSTAN)

610 m

P= 260      49° 11'N      77° 25'E      14/11 y.  
 T= 1.1°      Ic= 33.1      Tp= 739      Tn= 611  
 m= -21.1°      M= -10.0°      Itc= -54      Io= 2.7



BOREAL XERIC (STEPPIC)  
 LOW THERMOBOREAL LOW DRY

WATER INDEX CARD

KAYNAR (KAZAKHSTAN)

Altitude: 610 m.

Latitude: 49° 11'N

| (C/mm) | T     | PE  | P   | VR  | R  | RE  | DF  | SP | DR | HC   |
|--------|-------|-----|-----|-----|----|-----|-----|----|----|------|
| Jan.   | -15.6 | 0   | 9   | 9   | 40 | 0   | 0   | 0  | 0  | *    |
| Feb.   | -15.0 | 0   | 12  | 12  | 52 | 0   | 0   | 0  | 0  | *    |
| Mar.   | -8.9  | 0   | 7   | 7   | 59 | 0   | 0   | 0  | 0  | *    |
| Apr.   | 2.5   | 19  | 34  | 15  | 74 | 19  | 0   | 0  | 0  | 0.7  |
| May.   | 10.0  | 75  | 26  | -48 | 26 | 75  | 0   | 0  | 0  | -0.6 |
| Jun.   | 15.3  | 110 | 36  | -26 | 0  | 62  | 48  | 0  | 0  | -0.6 |
| Jul.   | 17.5  | 126 | 55  | 0   | 0  | 55  | 71  | 0  | 0  | -0.5 |
| Aug.   | 15.8  | 106 | 31  | 0   | 0  | 31  | 75  | 0  | 0  | -0.7 |
| Sep.   | 10.0  | 59  | 5   | 0   | 0  | 5   | 55  | 0  | 0  | -0.9 |
| Oct.   | 2.8   | 17  | 15  | 0   | 0  | 15  | 2   | 0  | 0  | -0.1 |
| Nov.   | -7.8  | 0   | 11  | 11  | 11 | 0   | 0   | 0  | 0  | *    |
| Dec.   | -13.9 | 0   | 20  | 20  | 31 | 0   | 0   | 0  | 0  | *    |
| Year   | 1.1   | 511 | 260 | *   | *  | 260 | 251 | 0  | 0  | *    |

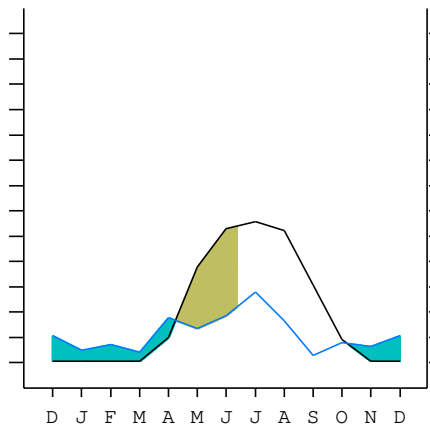
R = Reserve    VR = Variation of the reserve    RE = Real evapotranspiration  
 DR = Drainage    HC = Humidity coefficient    DF = Deficit    SP = Superavit

KAYNAR (KAZAKHSTAN)

49°11'N    77°25'E    610 m 14/11 y.

T= 1.1      Ic= 33.1      BOREAL XERIC (STEPPIC)  
 m= -21.1      Tp= 739      LOW THERMOBOREAL  
 M= -10.0      Tn= 611      LOW DRY  
 M' = 37.2      Itc= -54  
 m' = -51.1      Io= 2.7  
 P= 260      mm      ———  
 PE= 511      mm      ———

|             |         |
|-------------|---------|
| Imbibing    | 5 Oct.  |
| Saturation  | 8 Apr.  |
| Reserve Use | 11 Jun. |
| Deficit     |         |



KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

SUMMARY OF RIVAS-MARTINEZ CLASSIFICATION

Continental Index [C3a]  
 + Type .....: C. Continental  
 + Subtype .....: 3. Eucontinental  
 + Variant .....: a. Low  
 Thermic types [B1.C7]  
 + Latitudinal zone .....: B. Temperate  
 + Latitudinal belt .....: 1. High eutemperate  
 + Thermic type .....: C. Cold  
 + Thermic subtype .....: 7. Cold  
 Bioclimatic types [D1a.2b.5b]  
 + Macrobioclimate .....: D. BOREAL  
 + Bioclimate .....: 1. XERIC  
 + Bioclimatic variant .: a. STEPPIC  
 + Thermic type.....: 2. THERMOBOREAL  
 + Thermic subtype.....: b. LOW  
 + Ombrothermic type ...: 5. DRY  
 + Ombrothermic subtype : b. LOW  
 Bioclimatic Classification .....: Boho (Stp).Mbo.Dry

KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

PRECIPITATION PARAMETERS

Warmest semester of the year.....(Pss): 167  
 Coldest semester of the year.....(Psw): 93  
 Warmest four months period of the year.....(Pcm1): 148  
 Following warmest four months period.....(Pcm2): 51  
 Positive precipitation dryest 3 months.....(Ppd): 0  
 Positive precipitation dryest 2 months.....(Ppd2): 0  
 Positive precipitation dryest 1 month.....(Ppd1): 5  
 Positive precipitation warmest 3 months.....(Pps): 122  
 Positive precipitation warmest 2 months.....(Pps2): 86  
 Positive precipitation warmest 1 month.....(Pps1): 55  
 Positive precipitation coldest 3 months.....(Ppw): 0  
 Positive precipitation coldest 2 months.....(Ppw2): 0  
 Positive precipitation coldest 1 month.....(Ppw1): 0

| Seasons  | Winter<br>Tr1-W | Spring<br>Tr2-P | Summer<br>Tr3-S | Automn<br>Tr4-F |
|----------|-----------------|-----------------|-----------------|-----------------|
| Rainfall | 40              | 67              | 121             | 30              |

Seasonal rainfall rhythms: S > P > W > F

KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

TEMPERATURE PARAMETERS

Average warmest month [T].....(Tmax): 17.5  
 Average coldest month [T].....(Tmin): -15.6  
 Maximum temp. warmest month [M].....(Tmmax): 24.4  
 Minimum temp. coldest month [m].....(Tmmin): -21.1  
 Absolute Max.temp. warmest month [M'].....(Tamax): 37.2  
 Absolute Min.temp. coldest month [m'].....(Tamin): -51.1  
 First warmest contrasted month [M].....(Tcmax): 17.8 (9)  
 First coldest contrasted month [m].....(Tcmin): 2.2 (9)  
 Estival temperature.....(Ts): 486  
 Positive temperature dryest 3 months.....(Tpd): 0  
 Positive temperature dryest 2 months.....(Tpd2): 0  
 Positive temperature dryest 1 month.....(Tpd1): 100  
 Positive temperature warmest 3 months.....(Tps): 486  
 Positive temperature warmest 2 months.....(Tps2): 333  
 Positive temperature warmest 1 month.....(Tps1): 175  
 Positive temperature coldest 3 months.....(Tpw): 0  
 Positive temperature coldest 2 months.....(Tpw2): 0  
 Positive temperature coldest 1 month.....(Tpw1): 0

KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

SEASONAL PARAMETERS

|                            | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Warmest semester...(Sms)   |     |     |     |     | o   | o   | o   | o   | o   | o   |     |     |
| Dryest semester....(Smd)   | o   | o   |     |     |     |     |     |     | o   | o   | o   | o   |
| Warmest 4 months...(Cm1)   |     |     |     |     | o   | o   | o   | o   |     |     |     |     |
| Dryest 4 months....(Cmd)   | o   | o   | o   |     |     |     |     |     |     |     |     | o   |
| Vegetation Activity(Pav)   |     |     |     |     | o   | o   | o   | o   | o   |     |     |     |
| Ultragelid...[M' <=0] (Pf) |     |     |     |     |     |     |     |     |     |     |     |     |
| Hypergelid...[M <=0] (Pf)  | o   | o   | o   |     |     |     |     |     |     |     | o   | o   |
| Gelid.....[T <=0] (Pf)     | o   | o   | o   |     |     |     |     |     |     |     | o   | o   |
| Subgelid.....[m <=0] (Pf)  | o   | o   | o   | o   |     |     |     |     |     | o   | o   | o   |
| Pregelid.....[m' <=0] (Pf) | o   | o   | o   | o   | o   | o   |     | o   | o   | o   | o   | o   |
| Agelid.....[m' > 0] (Pf)   |     |     |     |     |     |     | o   |     |     |     |     |     |
| HiperAgelid..[all>0] (Pf)  |     |     |     |     |     |     | o   |     |     |     |     |     |

KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

OMBROTHERMIC PARAMETERS

Annual aridity index.[PE/P].....(Iar): 1.96  
 Mediterranean index of July.[PE/P].....(Im1): 2.30  
 Mediterranean index of July & August.....(Im2): 2.70  
 Mediterranean index of June, July & August....(Im3): 2.81

| Months     | Dec.         | Jan. | Feb. | Mar.   | Apr. | May. | Jun.          | Jul. | Aug. | Sep.   | Oct. | Nov. |
|------------|--------------|------|------|--------|------|------|---------------|------|------|--------|------|------|
| Pp(x10)    | *            | *    | *    | *      | 338  | 262  | 361           | 546  | 310  | 48     | 145  | *    |
| Tp         | *            | *    | *    | *      | 25   | 100  | 153           | 175  | 158  | 100    | 28   | *    |
| Io (Iom)   | *            | *    | *    | *      | 13.5 | 2.62 | 2.36          | 3.12 | 1.96 | 0.48   | 5.22 | *    |
| Seasons    | Winter       |      |      | Spring |      |      | Summer        |      |      | Autumn |      |      |
| Pp(x10)/Tp | */*          |      |      | */*    |      |      | 1217 / 486    |      |      | */*    |      |      |
| Io (Iot)   | *            |      |      | *      |      |      | 2.504         |      |      | *      |      |      |
| Semesters  | December-May |      |      |        |      |      | June-November |      |      |        |      |      |
| Pp(x10)/Tp | */*          |      |      |        |      |      | */*           |      |      |        |      |      |
| Io (Iosm)  | *            |      |      |        |      |      | *             |      |      |        |      |      |

KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

Aridity Value Index (AVI)

[10xPP/TP=IO]: 2010/739=2.72 **There is No Yearly Aridity**

| Months                | Dec.   | Jan. | Feb. | Mar.   | Apr. | May. | Jun.                    | Jul. | Aug. | Sep.   | Oct. | Nov. |
|-----------------------|--------|------|------|--------|------|------|-------------------------|------|------|--------|------|------|
| Pp [P*10]             | *      | *    | *    | *      | 338  | 262  | 361                     | 546  | 310  | 48     | 145  | *    |
| Tp [T*10]             | *      | *    | *    | *      | 25   | 100  | 153                     | 175  | 158  | 100    | 28   | *    |
| Iom [Pp/Tp]           | !!     | !!   | !!   | !!     | \$\$ | 262  | 236                     | 312  | 196  | 48     | 522  | !!   |
| Avm [200-Iom]         | ***    | ***  | ***  | ***    | ***  | ***  | ***                     | ***  | 4    | 152    | ***  | ***  |
| Seasons               | Winter |      |      | Spring |      |      | Summer                  |      |      | Autumn |      |      |
| Pp / Tp               | * / *  |      |      | * / *  |      |      | 1217 / 486              |      |      | * / *  |      |      |
| Iot [Pp/Tp]           | **     |      |      | **     |      |      | 250                     |      |      | **     |      |      |
| Avs E[Avm<200]        | ***    |      |      | ***    |      |      | ***                     |      |      | ***    |      |      |
| Strong lower arid [1] |        |      |      |        |      |      | Weak upper semiarid [1] |      |      |        |      |      |
|                       |        |      |      |        |      |      |                         |      |      |        |      |      |
|                       |        |      |      |        |      |      |                         |      |      |        |      |      |
|                       |        |      |      |        |      |      |                         |      |      |        |      |      |

KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

BIOCLIMATIC INDICES I

|  |             |
|--|-------------|
| CI of Supan (1884) [Tmax-Tmin] .....   | (Sp): 33.06 |
| CI of Gorezinski (1920) [1.7*Sp/sin(Lat)-20.4] .....                         | 53.86       |
| CI of Conrad (1946) [1.7*Sp/sin(Lat+10)-14] .....                            | 51.44       |
| + Subcontinental (40<CI<60)  |             |
| CI of Currey (1974) [CI=Sp/(1+Lat/3)] .....                                  | 1.90        |
| + Continental (1.7<CI<2.3)   |             |
| Rainfall Index of Lang (1925) [R=P/T] .....                                  | 244.89      |
| + Humid (R>160)  |             |
| Aridity Index of Martonne (1926) [Ia=P/(T+10)] .....                         | 23.54       |
| + Subhumid (30>Ia>20)  |             |
| I of Emberger (1930) [Q=100*P/(Tmax <sup>2</sup> -Tmin <sup>2</sup> )] ..... | 171.68      |
| + Humid (Q>90)   |             |
| I of Dantin & Revenga (1940) [DR=100*T/P] .....                              | 0.41        |
| + Humid (2>DR>0)   |             |
| Aridity Index of UNEP [I=P/PE] .....   | 0.51        |
| + Subhumid - dry (0.65>I>0.5)  |             |
| Potential Erosion I of Fournier (1960) [K=Pi <sup>2</sup> /P] .....          | 11.45       |
| + Very low (K<60)  |             |

KAYNAR (KAZAKHSTAN)

Latitude: 49°11'N Longitude: 77°25'E Altitude: 610 m

BIOCLIMATIC INDICES II

Bioclimatic classification of Gaussen & Bagnouls (1957)  
 + Climate .....

- + Climate .....
- + Region .....
- + Thermic type: 7. Hipermicrothermic

| Thornthwaite (1948)                     |      |      |      |      |      |                              |      |      |      |      |      |        |
|---|------|------|------|------|------|------------------------------|------|------|------|------|------|--------|
|   | Jan. | Feb. | Mar. | Apr. | May. | Jun.                         | Jul. | Aug. | Sep. | Oct. | Nov. | Dec.   |
| P-E ratio                               | 0.06 | 0.09 | 0.05 | 0.22 | 0.13 | 0.15                         | 0.23 | 0.13 | 0.02 | 0.09 | 0.08 | 0.15   |
| T-E ratio                               | 0.00 | 0.00 | 0.00 | 1.13 | 4.50 | 6.87                         | 7.88 | 7.12 | 4.50 | 1.25 | 0.00 | 0.00   |
| Precipitation-effectiveness: 13.91      |      |      |      |      |      | Temperature-efficiency ..... |      |      |      |      |      | 33.25  |
| Moisture Index [MI=100*(P-PE)/PE] ..... |      |      |      |      |      |                              |      |      |      |      |      | -49.06 |
| + D.Semiarid (-66.7<MI<-33.3)           |      |      |      |      |      |                              |      |      |      |      |      |        |
| Index of dryness [DI=100*d/PE] .....    |      |      |      |      |      |                              |      |      |      |      |      | 49.06  |
| + Strong deficit (33.3<DI)              |      |      |      |      |      |                              |      |      |      |      |      |        |
| Index of humidity [HI=100*s/PE] .....   |      |      |      |      |      |                              |      |      |      |      |      | 0.00   |
| + No surplus (0<HI<10)                  |      |      |      |      |      |                              |      |      |      |      |      |        |
| Potential Evapotranspiration PE .....   |      |      |      |      |      |                              |      |      |      |      |      | 511.23 |
| + Second microthermic (427<PE<570)      |      |      |      |      |      |                              |      |      |      |      |      |        |

