International Journal of Geobotanical Research, Vol. nº 5. 2015. pp. 61-63

New bioclimatic antarctic data variants and thermotypes

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Abstract:
A new semipolar subantarctic bioclimatic variant which allows us to understand the distribution of the plant communities existing in the euhyperoceanic humid-ultrahyperhumid islands and archipelagoes of the subantarctic isles territories is defined in the current study.

Key Words: Antarctic**,** Bioclimatology, Variant, Thermotypes

Bioclimatic variants

The bioclimatic variants are very informative and interesting typological, that are recognised within the specific bioclimates, and which make it possible to identify climatic peculiarities of an ombric and occasionally thermic nature. According to the proposal of RIVAS-MARTÍNEZ et AL. 2011, eight bioclimatic variants are recognized in the world: steppic, submediterranean, bixeric, antitropical, seropluvial, polar semiboreal, tropical semimediterranean desertic and semipolar antarctic. (Table 1)

Bioclimatic variant found in the mediterranean, temperate, boreal and polar macrobioclimates, at least low semicontinental (Ic > 17), in those apart having higher rainfall in the summer quarter than in the winter quarter [Ps ≥ Pw], the annual ombrothermic index must be between lower hyperarid and upper subhumid: [6.0 ≥ Io > 0.2]; and where at least during one month in the summer (Ps_1) the rainfall in mm is lower than three times the temperature in degrees centigrade [Ps_i: P < 3T].

Bioclimatic variants	*Tr*	*Me*	*Te*	*Bo*	*Po*
Steppic (stp) (*)	—	●	●	●	●
Submediterranean(sbm) (*)	—	—	●	●	●
Bixeric (bix)	●	—	—	—	—
Antitropical (ant)	●	—	—	—	—
Seropluvial (spl) (*)	●	—	—	—	—
Polar semiboreal (posebo)	—	—	—	●	—
Tropical semimediterranean desertic (trsmd) (*)	●	●	—	—	—
Semipolar subantarctic (seposa)	—	—	●	●	—

Table 1. Distribution of the bioclimatic variants in the macrobioclimates of the Earth. *Tr* = Tropical, *Me* = Mediterranean, *Te* = Tempe rate, *Bo* = Boreal, *Po* = Polar.

Steppic (stp).

The steppic nature can be recognize in very different continental or semicontinental plant formations, due to the appearance of xerophytic types of vegetation and the fragility of the forests due to the limited amount of water in periods associated with both solstices. The most characteristic plant formations of the Earth that correspond to this bioclimatic variable are the steppes and steppic forests of Eurasia, the large wooded or unwooded prairies of North America, the steppic deserts of Central Asia, and the Mediterranean steppic xerophytic holarctic forests, shrubland and grasslands. The steppic tundra and taiga formations found in the boreal and polar bioclimates are restricted to areas with low summer and winter rainfall in Asia and North America. In general, it can be said that the steppic bioclimatic variant mainly corresponds to bioclimate a continental or semicontinental type with low summer mediterraneity and with low rainfall also during the winter solstice.

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DOI: 10.5616/ijgr 150004

Submediterranean (sbm).

Common bioclimatic variant in the temperate macrobioclimate, and scarce ocurrence in the boreal and polar macrobioclimates, in which at least one month during the summer, the average of rainfall in millimetres is two point eight times lower than the average temperature in degrees centigrade for this same period [Ios_i: P < 2.8T].

The most characteristic temperate submediterranean plant formations are those representing a transition or ecotone between the temperate bioclimates without summer aridity, and those which are genuinely mediterranean, where the summer drought (P<2T) continues for more than two months. In the Holarctic region, the most representative plant formations are usually those whose mature stage consists of sclerophyllous or deciduous marcescent dry forests, as well as the xerophytic conifer forests.

Bixeric (bix).

Tropical bioclimatic variant, in which there are two annual periods of aridity of at least one month (P = 2T), corresponding to both solstices, separated by another two rainier periods during the equinoctial quarters, in which at least one month is P ≥ 2T. This variable does not occur in the tropical pluvial nec tropical hyperdesertic bioclimates. Bixeric tropical plant formations have structural and occasionally corionomic relationships with those no far mediterranean pluviseasonal, xeric or desertic bioclimates.

Antitropical (ant).

Tropical bioclimatic variant, restricted to the equatorial and low eutropical latitudinal bands (15º N & S), in which rainfall during the winter solstice quarter is higher than that of the summer quarter. This variable does not occur in the pluvial tropical bioclimate or in the hyperdesertic tropical bioclimates.

The antitropical plant formations are not very different in their structure to the tropical formations from the equivalent seropluvial or typical ombrotype (normal monsonic rains), although the floristic element that comprises them has a large number of endemisms, obviously caused by a phenological period that is practically opposite to the normal tropical environment, which has favoured its isolation and therefore its speciation.

Seropluvial (spl.).

Tropical bioclimatic variant in which the rainfall of the first months of the summer solstice is at least 1.3 times less the rainfall corresponding to the two following months. This bioclimatic variant does not occur in the pluvial tropical bioclimate or in the hyperdsertic tropical bioclimate (the prefix sero-, means autumnal or late in the year round).

This bioclimatic variant indicates monsonic bioclimates (pluviseasonal, xeric or desertic) in which the rains coming from the east arrive late in the summer. This regularly occurs towards the west of the continents in tropical and subtropical Africa, Indostan and N & S America increasing the dry season and arid conditions.

Polar semiboreal (posebo).

A subcontinental, oceanic or hyperoceanic oroboreal territory (Tp 380-500, Ic ≤ 28) must be considered as being polar semiboreal if it is not a mountainous territory completely surrounded by forests at lower altitude, when Tmax ≤ 11º (average temperature of the hottest month of the year) and Tps ≤ 320 (positive temperature of the summer quarter in tenths of a degree), and the potential natural vegetation in these bioclimatic territories are treeless tundra instead of forest or microforests, as is the case in North America on the coasts and western reliefs of Beringian Alaska, in the Aleutian Peninsula and Islands, as well as happen in different artoboreal territories of the Earth.

Tropical semimediterranean desertic (trsmd).

In the subtropical latitudinal zone (23º-36º N & S) an arid, hyperarid or ultrahyperarid mediterranean territory (Io: 0.0–1.0) must be considered belong to tropical semimediterranean desertic variant when the precipitation of the warmest six-month consecutive period in the year is at least 0.6 times lower than the precipitation in the coldest six-month period of the year (Pss ≤ 0.6 Psw); this is the case the hottest deserts of California, Atacama deserts of South America, and in the African Saharan and Namibian deserts. Ombrosemestral desertic index Idss = Pss/Psw, where Io≤1.0 Types: Not tropical semimediterranean (Idss 0.1-0.6), moderately semimediterranean (Idss 0.6-0.8), scarcely semimediterranean (Idss 0.8-1.0), tropical (Idss ≥1.0).

Semipolar subantarctic (seposa).

The bioclimatic semipolar antarctic variant has the optimal in the euhyperoceanic humid-ultrahyperhumid isles and archipelagoes of the subantarctic isles territories (Subantarctic Insular Region, Circumantarctic Subkingdom) located no far from the influence of the Antarctic Convergence afected be the West Wind Drift and the Circular Cold Current, within 46º and 51º south latitude. To belong tho the semipolar antarctic biolimate variant, every coastalk island locality (<100 m altitude) must be I accord with the following six bioclimatic values: T 4.5º-7.5º, Tp 500-850, Tps 180-280 (positive summer temperature), Tmax 5º-10º, Ic 3.5-8.0 and Io 10-40. Consecuently with the bioclimatic values the potential natural vegetation physiognomical communities (estructure), at lower altitudes (< 200 m), correspond diverse with a treeless tundral communities like: low thickets (< 2 m), close grass-heaths, dwarf-heaths, wet or peat meadows, etc. in accord with the geomorphology and habitats (Table 2)

Bioclimates, variants	T	Tp	Tps	Ic	Vegetation
Polar euhyperoceanic subantarctic	< 3º	< 380	< 250	4 a 8	Close tundra
Semipolar subantarctic	< 4,5º	380 a 630	180 a 230	3,5 a 6,5	Close tundra
Boreal subantarctic	> 5º	630 a 720	260 a 310	7,5 a 11	Microforest and shruby tundra
Temperate subantarctic	> 6º	720 a 850	240 a 280	4 a 6	Shruby tundra

Table 2. Bioclimates and variants of the Antarctic and the corresponding vegetation

Key for bioclimatic classification of the Antarctic bioclimates, variants and ombrotypes

In addition to Worldwide bioclimatic classification system (RIVAS-MARTÍNEZ ET AL. 2011), for incorporate classify the bioclimatical units of the Antarctic (Circumantarctic Subkingdom) may be useful the next key.

1. Tp > 380 ..... 2 (*)
1. Tp ≤ 380 T < 3º, Tps < 250, Ic 4 to 8 ..... POLAR EUHYPEROCEANIC SUBANTARCTIC

2. Tp > 720, T > 6º, Ic 4 to 6, Tps 240 to 280 ..... TEMPERATE SUBANTARCTIC
2. Tp ≤ 720, T ≤ 6º, ... 3

3. Tp > 630, T> 5º, Tps 260 to 310, Ic 7,5 to 11..... BOREAL SUBANTARTIC (**)
3. Tp ≤ 630, T≤ 5º..... 4

4. T < 4,5º, Tps 180 to 230, Ic 3,5 to 6,5 ..... SEMIPOLAR SUBANTARCTIC
4. Any of this conditions 5

5. Tp 1 to 100 and Tpmax ≥ 30, [Tp 1-50: upper, 50-100: lower], Ic ≤ 19, T < -12ºC] ..... SUPRAPOLAR
5. Tp 0 and Tpmax < 30 [Polar pergelid bioclimate]..... 5

6. Tp 0, Tpmax 0, Tpamax 0, Twmax < -22º, T ≤ -45º..... POLAR ULTRAGELID
6. Tp 0, Tpmax <0, Tpamax <300, Twmax -7º to -22º, T -25º to -45ºC..... POLAR HYPERGELID
6. Tp 0, Tpmax < 30, Tpamax < 500, Twmax < -7º, T -10º to -25ºC..... POLAR HYPOGELID

(*) Only existing in the scrub moorland and *Nothofagus* woodland boreal hyperoceanic vegetation of the Boreal Austromagellanian Province of the Austroamerican Subkingdom in the Extreme South of Chile and Argentina countries.

(**)In Northern hemisphaereon recognizethe Polar Semiborealbioclimatic variant (Global Geobot. 1:15.2011) in the moderate hyperoceanic, balanced oceanic and moderate continental (Ic8-28) oroboreal territories (Tp 380-400), when Tmax ≤ 11ºC (average temperature of the hottest month of the year) and Tps ≤ 300 (positive temperature of the summer quarter in thenths of ºC). Because the Natural Potential Vegetation is a treeless tundra instead of a microforest vegetation as it happens in the Beringian coasts and most of the Aleutian Islands

References

Rivas-Martínez, S., Rivas-Sáenz, S. & Penas, Á., 2011b. Worldwide bioclimatic classification system. *Global Geobotany*, 1, pp. 1-638 + 4 maps.