

CAN ONE DEFINE POLJES?

ALI JE MOGOČE DEFINIRATI POLJE?

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Izvleček

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Emil Silvestru: Ali je mogoče definirati polje?

Krasoslovje je znanost, ki je nastala z združitvijo številnih znanstvenih vej. Zato je veliko število današnjih posebnih terminov privzetih iz "starejših" znanosti. Često krasoslovci take termine napačno uporabljajo ali so celo sprejeti v krasoslovje. Verjamem, da je nastopil čas, ko je k tem vprašanjem treba pristopiti drugače, na trdnih temeljih. Ko obravnavamo kraško ozemlje ali kraški relief, morajo geologija, hidrogeologija in geomorfologija predstavljati osnovo raziskavam. Potemtakem morajo biti kriteriji za vpeljavo termina ali za klasifikacije: geološka osnova, funkcionalnost (preoblikovalni dejavnik in hidrogeološka funkcija) in morfologija. Kot najbolj razvita kraška oblika je polje idealni primer težav z definicijo. Po pregledu dosedanjih definicij predlagamo novo, na zgoraj omenjenih osnovah.

Ključne besede: krasoslovje, morfologija krasa, kraško polje, terminologija

Abstract

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Karstology was built as a science by joining together a large number of research fields. This is why an important number of specific terms are actually adopted from "older" sciences. Pretty often such terms are misused by karstologists or have even been accepted in karstology. We believe that time has come for a different approach, on firm grounds. We consider that, when approaching karst terrains and their relief, the very basics of research must deal with geology, hydrogeology, and geomorphology. Therefore the main criteria to be used when introducing a term or making classifications, are: substratum, functionality (i.e. modelling agent and hydrogeological function) and morphology. As the most evolved karst pattern, poljes are an ideal example for the difficulties in definition. After reviewing previous definitions we suggest yet another one, on the above-mentioned basis.

Key words: karstology, karst morphology, karst polje, terminology

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Karstology was built as a science by joining together a large number of research fields. Prevailing however are, geomorphology, hydrogeology and geology. There is one more, extremely important characteristic which makes karstology almost unique: long before being a self-standing science, geography was already coining terms that subsequently became standard karstological terms, without being actually re-defined according to new criteria. More specifically: J. CVIJIC (1895) was describing the very archetype of karst - the Kras region - using simple descriptive criteria and quite often, regional terms.

Polje is such a term, which originally means field. Of course, in the middle of a rather rugged landscape, the presence of surprisingly flat, large and fairly wet areas, ideal for farming, is a very special pattern and the inhabitants had no need to define it with more than one word - polje (field). Yet, there is for example another field in eastern Serbia - Kosovo Polje (The Blackbird's Field) - which has entirely different connotations. A simple date (1389) added to this toponym, would suffice for specialists to define it. For the rest of the world however, many more specifications are needed in order to clearly define this information. Similarly, the particle karstic has been added to the term polje in the Kras area. However, this simply means a large, flat area in karstic landscapes.

CVIJIC (1960) did not actually define a polje. He simply stated that "a polje is a flat-bottomed karstic depression, always displaying a long axis". He also added several specifications:

- a polje differs from a blind valley by being much larger, having festooned borders and its long axis paralleling important structural features,
- some flat-bottomed, elongated uvalas may be considered a transition form between dolines and poljes; 1 km in diameter seems to be the threshold value between the two,
- the presence of a surface stream inside the depression is not a necessary feature for poljes.

Practically, all further definitions dealt more or less with these issues. This shows CVIJIC's keen sense of observation on one hand, and the general trend to stress morphological rather than genetical and functional features, on the other hand.

A short review of some of the most important definitions advocates for such a statement:

B. GEZE (1973): large, closed karstic depression, characterised by a flat bottom which joins the usually barren slopes in an angle. Its drainage is subterranean. It may be dry, crossed by a stream of permanently or temporarily flooded.

M. SWEETING (1973): a depression in karst limestone, whose long axis is developed parallel to major structural trends and can reach tens of kilometres in length. On the floor accumulates superficial deposits, and it is drained either by surface water-courses (when the polje is said to be open) or by swallow holes (a closed polje). Their development is encouraged by any impedance in the karst drainage.

G. T. WARWICK (1976, in FORD & CULLINGFORD): the larger dolines grade into large flat-floored depressions known as polja (singular, polje), the base being covered with alluvium of non-limestone origin. The sides are usually steeply sloping, but rarely cliffed, and may be breached by inflowing streams which sink into the polje floor. Most of them are elongated but there is a wide variety in plan.

I. GAMS (1977): a polje is an extensive (closed) basin with a flat bottom, karstic drainage and steep slope, at least on one side. If the slopes are mostly steep, with a break at the transition to the bottom, and a sinking river, the flat bottom is 400 m wide at least.

J. CHOPPY (1985): vast, closed and elongated depression, ranging up to several hundred square kilometres, with a clear break between the flat bottom and the slopes, which are mostly barren; its drainage is subterranean.

GAMS (1977) did however much more than propose a new definition. He separated 5 basic types of polje: border polje, peripheral polje, overflow polje, polje in the piezometric level, piedmont polje. The criteria used for this separation clearly included hydrogeological functioning (and conditioning) of poljes. Geology is also taken into consideration. We consider this an extremely important step towards a karstological understanding and defining of poljes. Another important step was taken by RUSU (1973, 1975, 1988) by introducing a new category: the karstic catchment depression (kcd) defined as:

open depression-type karstic form, developed along a valley track, upstream a subterranean catchment (sinking) point, marked by an antithetic step².

This category was the result of RUSU's work in the Pădurea Craiului Mountains karstic areas, where polje-like depressions are quite frequent. However, when compared to true poljes, these depressions revealed several differences:

- the kcds are always open upstream (CVIJIC's open polje, GAMS's border polje)

² term coined by BLEAHU (1957) for the more or less vertical step that sometimes marks a sinking point in the very river bed of a sinking stream.

- the most obvious break between the slopes and the flat bottom is always at the downstream end of the kcd,
- the surface water-courses always have their sources outside the limestone terrains.

In the other words, RUSU's karstic catchment depressions are a special type of blind valleys, which have created an alluvial plain upstream and around their sinking area.

The question is: are these forms true poljes? The above-mentioned author answers "no", because of the differences mentioned previously.

We tend to agree with this point of view, since we consider poljes as the most developed and complex karstic forms, specific to large and mature karst landscapes, of which Romania has no share.

Moreover, as far as we could figure it out, poljes (at least the Dinaric type) are present in areas not very far from the sea which, as a regional base level would induce much more dramatic changes (following climate changes), such as SWEETING's "impedance", in the karst drainages, as compared to river-type base levels. Such changes are most likely to account for the genesis of landforms the magnitude of poljes.

DISCUSSION

As we have previously stated, there is a true need for a karstological definition of poljes, a definition that would stress the functional, hydrogeological, geological and finally morphological elements.

If we take a close look at the previously mentioned definitions, we may notice that these elements are all there but need to be summed up. On the other hand, simply merging them into one one-page definition is by all means non-scientific.

FORD (1992) found an original way to avoid this. He first states that poljes are: "large, flat floored enclosed depressions in karst terrains". He then reduced GAMS's categories of poljes to three describing the following:

- border poljes - allogenic input dominated.
- structural poljes - dominated by geological control. "They are inliers of a normal fluvial landscape within an otherwise karstic terrain"
- baselevel poljes - water table dominated. Actual "windows on the water table" and "the purest kind of poljes".

The way FORD describes these categories makes definitions sound obsolete and even . . . degrading. Yet those simple sentences like: "inliers of a normal fluvial landscape . . ." are as a matter of fact, the best definitions. If it were for the karstologists only, these would suffice; however, as parts of karstology (especially the geomorphology of karst terrains) are normally introduced in general treatises, we are still left with the need for general definitions. This brings us back to our main topic: can one really define poljes?

There is one good possibility of simplifying things, if we introduce RUSU's karstic catchment depression (kcd) as a self-standing karst landform category. This would eliminate some of the poljes described before - namely the border or open poljes. Generally speaking, all poljes that are not enclosed depressions should no more be considered as poljes. They should be called karstic catchment depressions. Genetically they are closer to blind valleys, regardless the size and shape.

The (en)closed depressions on the other hand, represent a special case in karst terrains and argue for a complex genesis, unlike the kcds for which the surface streams are the main genetic factor. There is one mention to be made: one should make a difference between dolines and uvalas on one hand - which display a predominantly conical shape, and "depressions" on the other hand. We consider depressions in karst to be defined by more or less flat bottoms (truncated shape). Size is less significant. It is quite possible that the original excavation was of doline type (solutional) and that there subsequently existed a grading from dolines to poljes (as WARWICK puts it). The most important thing is the flat-bottomness which in most of the cases had been achieved by alluviation, up to covering an irregular topography. In the Duvanjsko Polje, the sediment reaches 2 000 m in thickness (FORD, 1992). No known present karst drainage can account for such an input of alluvia into a closed depression in karst and therefore one may assume that, the karstification processes that shaped poljes were somewhat different from the ones we can presently investigate. The climate during the Neogene period (when most of the sediments have accumulated) was considerably wetter and warmer (FRANKS, 1979) and the solutional and alluvial rates must have been very different from the present ones. This is why we consider poljes to be dying remnants of a different (most probably ante-Quaternary) type of karstification. Under such circumstances, it is very difficult to define the main hydrogeological factor to control their genesis. The present hydrogeological function is somewhat secondary - a polje drains a subterranean stream it had cut during its evolution. It is questionable if the same stream is responsible for the genesis of the polje. Yet, such a feature (even if secondary) is in a way intrinsic to a polje . . .

Geology is one important controlling factor, as considered by many authors, by providing "the infrastructure" within a limestone terrain. However, what really seems to be important is the character of "holokarst" (CVIJIĆ, 1924): massive and pure limestones with predominantly vertical fracturing which results in large (surface) streamless karst surfaces. The tectonic features may be of great importance for the final morphology and function of the polje, but not necessarily for the very existence of it.

At this point, what do we have left? A polje should be:

an ante-Quaternary enclosed depression with a predominantly flat, alluviated bottom, in a large massive limestone area.

It may drain a temporary or permanent karst stream (a stream that has at least one karstic character: karst source or/and sink).

Size is irrelevant since the mechanism(s) that generated poljes implied a sort of self-regulating "size-control", probably due to alluvia input.

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Povzetek

Krasoslovje je znanost, ki je nastala z združitvijo številnih znanstvenih vej. Zato je veliko število današnjih posebnih terminov privzetih iz "starejših" znanosti. Često krasoslovci take termine napačno uporabljajo ali so celo sprejeti v krasoslovje. Cvijić je polje le opisal, ni ga pa definiral. Gams pa ni le predlagal nove definicije, ampak tudi klasifikacijo na pet osnovnih tipov polj, kar je Ford skrčil na tri. Stvari je mogoče poenostaviti, če upoštevamo Rusujevo "karstic catchment depression". Nova definicija polja naj bi bila: polje je predkvartarna zaprta depresija s prevladujočim ravnim, aluvijalnim dnom, v večjem apnenčevem masivu. Po njem lahko teče občasni ali stalni kraški tok (mora imeti vsaj eno kraško značilnost: kraški izvir in/ali ponor).