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0.0.1 Geometry of landform segments and their equilibrium

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Segments of landform characterized by about constant value of morphometric parameters can be a diagnostic of some types of landform equilibrium in various scales. The basis should be a linkage between altitude and gravity field. Absolute homogeneity of altitude field (altitude = z = const.) is a precondition of absolute geomorphic homogeneity of gravity field. Changes of altitude field are connected with changes of gravity field influence on geomorphic processes. Homogeneous change of altitude correspondents with some kind of homogeneity of gravity conditioned geomorphic processes. And it can be connected with specific type of landform equilibrium. We distinguish *static equilibrium* of landform (no perceived change of altitude) *steady state equilibrium* (strict topographic steady state - processes effect the fluctuation of altitude about a mean value but shape and position of form is relatively stable) and *dynamic equilibrium* (relatively stable shape with changing position – parallel retreat/grow of the form).

We have defined the set of scale independent and variously geometrically homogeneous segments of landform – *elementary forms*, which are characterized by constant value of some morphometric parameters (altitude and its derivatives) and delimited by lines of discontinuity of these parameters. Every type of elementary form is described by definition equation and can be interpreted in term of outlined classification of equilibrium. The basis is interpretation of constant value of single parameters:

- *Constant value of altitude* (z = const., horizontal plane) underlies no down slope component of gravity slope, absence of horizontal gravity movement and so maximal gravity stability – creation of local ($z \neq 0$) or main ($z = 0$) base level. In the conditions of tectonic calm it match with static equilibrium, tectonic

movement it change to dynamic equilibrium.

- *Constant value of gradient* (value of change/derivation of altitude in direction of maximal slope – G = const.) underlies uniform ratio of gravity forces on the slope what induce constant unit gravitational energy of geomorphic agents. Elements with constant gradient can be in state of static equilibrium (transport middle slopes) steady state equilibrium (rising fault slope controlled by homogeneous denudation) or dynamic equilibrium (growing depositional slopes which conserve the face under angle of internal).

- *Constant value of normal gradient change* (down slope change of gradient – G_n = const) underlies uniform down slope change of ratio of gravity forces. Uniform rise ($G_n > 0$) or decrease ($G_n < 0$) of ratio of unit energy and transport load of agents is a consequence as well as potential uniform change of altitude by erosion or deposition. Dynamic equilibrium can be a result generally, or steady state equilibrium in the case of compensation effect of tectonic.

- *Constant value of normal change of gradient change* (down slope change of change of gradient – G_{nn} = const) underlines uniform down slope change of change of ratio of gravity forces and consequently equally accelerated ($G_{nn} > 0$) or decelerated ($G_{nn} < 0$) rise/decrease of ratio of unit energy and transport load of agents. Potential uniform change of altitude by erosion or deposition is possible only in the presence of one uniform compensation factor (influence of tectonics or change of agents mass by lateral flux e.g. by influence of horizontal curvature). Dynamic and mainly steady state equilibrium is possible only in the case of specific balance of more factors.

- *Constan value of aspect* (direction of gradient vector – A_N = const, contours are parallel straight lines) underlies parallel straight gravity flow of matter and energy what eliminate lateral concentration/dispersion of the gravity flows and so eliminate non-steady factors resulting from dispersion or concentration of mass of geomorphic agents. It supports all three types of equilibrium in their specific conditions.

- *Constant value of plan (horizontal) curvature* or *radius of curvature of contours* (K_r or R = const) underlines uniform divergence or convergence in horizontal plane, steady decrease or increase of agents mass and so potential uniform change of altitude by erosion (in particular case of transport limited processes) or deposition. Dynamic equilibrium can be a result generally, or steady state equilibrium in the case of compensation effect of tectonic.

- *Constant value of normal change of radius of plan curvature* (R_n = const., contourlines are concentric circles) underlines homogeneous change of divergence or convergence in horizontal plain and so uniform change of altitude by erosion or deposition only in the presence of an compensation factor (e.g. normal change of gradient change, change of mass flux – precipitation, volcanic activity and so on). Dynamic and mainly steady state equilibrium is possible only in case of specific balance of more factors.

- *Constant value of horizontal change of radius of rotor curvature* (radius of curvature of flow lines in the map, R_R = const – contours are right non-parallel lines). It underlines parallel curved flow of matter and energy what eliminate lateral concentration/dispersion of the gravity flows and so eliminate non-steady factors resulting from dispersion or concentration of mass of geomorphic agents. However the side change of ratio of gravity forces is non-steady factor and equilibrium is possible only in the case of existence of compensation factor (e.g. side uniform change of rock resistance). Failing which, the divergence of contours should be a signal of transience.

Majority of elementary forms characterized by some type of equilibrium should be attractors to which development tends towards in specific conditions. Ideal equilibrium is jointed with the ideal shape in homogeneous conditions. Divergence can be influenced by inhomogeneous conditions or interpreted as a signal of transience. Definition equations of individual types of elementary form enable computation for every real segment of landform the set of interpolation models. Difference between models and reality (affinity of real surface to various type of ideal elementary form) express also affinity to equilibrium typical for the type of elementary form. It is documented on the example.