PROBLEM OF PRESERVING THE ARAL SEA

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Diametrically opposite, contrasting changes in the natural conditions are constantly noted in the basin of the Aral Sea. Stretches with the predominance of accumulation processes have become stretches of intensification of removal, particularly intensification of desiccation of the surface, and vice versa.

Some movements of surface material occur slowly and quietly, and others rapidly and often catastrophically. Slow movements of material sometimes intensify, sometime abate and change direction. The results can be tremendous over the course of tens and hundreds of years.

The authors of various publications attempted to obtain data on current movements of surface materials depicted on aerial and satellite photographs. World practice has not used such data. They were published for the first time partially in the cited works. It was possible for the first time to reveal zones of minimum relative changes in the interactions of natural components, the dynamic boundaries of various ranks — the limits of action of suppressed opposite flows, areas of intensified removal and accumulation of surface material, directions of intensification of removal and accumulation of surface material, zones of maximum stresses, models and vectors of transit movements of earth material.

The ground surface, just as the entire earth as a whole, developed with an infinite diversity of movements of the material composing it. It is important to know the rank and character of movements of surface material, to know how to determine the changes occurring, and to predict possible interactions of natural components. Until quite recently the detection and "expression of movement" remained one of the most complex problems of research. Aerial and satellite photographs of the ground surface are presently the only sources enabling investigation and solution of these problems. Regions of the Aral Sea basin and eastern Caspian area can be investigated successfully by these methods.

Of all known movements of the material of any stretch of the surface, three types, for example, can be taken into account simultaneously: general movement of all points (masses) of the surface in one particular direction; "vertical" and "horizontal" movements of given points relative to one another in different perpendicular planes as a consequence of their different rates of movement in one particular direction; character of removal and accumulation of material on the earth's surface. All movements occurring on the surface of stretches (flows of material, for example, water) are examined in connection with other movements. Stretches with the predominance of the accumulation process (deposition) or denudation (weathering and removal) are freely, for example, recognized and can be evaluated from aerial and satellite photographs for the Aral Sea basin and interrelations of different ranks between them are detected.

Most recently the characteristics of the movements of surface material in many regions were established by the authors from aerial and satellite photographs, data of ground observations, and with the use of topographic survey data. And everywhere there is a distribution of regions of intensification of removal and intensification of accumulation of material separated by transition regions.

How does a particular territory "live," what occurs on stretches being developed, in what chain of natural changes, for example, do processes of drainage or irrigation develop on them? Having obtained answers to such questions, we can well-foundedly select engineering methods of preventing negative consequences in the interactions of man and nature, and strictly regulate human intervention in the life of stretches with diametrically opposite material movements.

From aerial and satellite photographs we can establish the direction of intensification of removal and intensification of accumulation of material, the directions of small streams, the rate of flow of water, the character of development of ruggedness, vegetation, and water regime of various types of lakes, clay deserts, and playas and on the basis of this to single out regions (bands) of diametrically opposite material movements within the limits of a particular rank of interaction. These regions (bands),
Fig. 1. Orthogonal boundaries of stretches: a) model of transit movements of surface material; b and c) models of the occurrence of drainage and accumulation processes: 1) boundaries of minimum relative changes in the interactions of natural components; a) of the first rank and r) of the second rank; 2) arbitrary numbers of stretches within the same rank; 3) region of maximum accumulation; 4) vector of transit movements; 5) earth material; 6) directions of intensification of removal of material; 7) numbers of models of transit movements.

as a rule, differ in total relative accumulation. Three bands of lower rank are united as one rank of interaction: one with an intensification of removal, another with intensification of accumulation of material, and the third between them — transitional, which is a unique zero region with respect to the first two. Similar dynamic regions (bands) of the same rank tending in another direction function simultaneously in the same plane orthogonally to the first. Nine stretches of the same rank function within the intersection of the same rank of interaction as a result of the superposition of movements of six orthogonal regions (bands) of a different character. Each of them has its own indices of accumulation (minimum, in two orthogonal directions simultaneously), its own principal and subordinate directions of material flows, and its own zones of maximum stresses, to which gravitate contemporary disturbances of the earth’s surface. Stretches on aerial and satellite photographs differ and are distinguished precisely with respect to such indices. Some stretches are characterized by a general intensification of the removal of material in two orthogonal directions, and others by a general intensification of accumulation of material and intensification of the removal and intensification of accumulation simultaneously, and one of the nine by a combination of two transitional regimes of movement. All nine stretches of the same rank develop differently as a result of a combination of the processes of intensification of removal and intensification of accumulation of material and with a transitional dynamic regime (Fig. 1). Until now the func-