

Rank Models for Assessment Composite Dynamics of Liquid, Chemical and Sediment Influx (Russian Parts of Black and Caspian Sea Basins Case Study)

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Complexity of the climate system makes exact predictions impossible, and needs continual re-assessment of climatic variability on the basis of observations of key variables, and means of communicating this information to policy-makers. This interdisciplinary problem cannot be resolved using traditional “volume-type” models which require enormous volumes of information and hamper using the homogeneity and comparativity estimation principles. In modern Russian economy of transition, the research is complicated significantly due to financial and institutional restrictions to observations development. At the State Hydrological Institute, the models are being created based on structural principles. In the practically realised models, concrete measured or easily calculated indices of natural and man-induced processes in different parts of sea basins (river valleys, deltas, adjoining managed territories) are used. The sets of the indices include meteorological elements, composite climatic characteristics (evaporativity index, duration of activity of certain circulating mechanisms), as well as hydrological characteristics (runoff and sea-level changes, soil moisture content) with emphasis not only on liquid water but on chemical and sediment hydrological components. The atmospheric circulation types are described by elementary circulating mechanisms (ECMs) which are characterized by a definite ratio of cyclones and anticyclones recurrence. “Anthropogenic” indices include dynamics of water storage in main reservoirs, water-feeding to irrigation canals, withdrawal of fresh and circulating water, fertilizers application, cereals yield, and others. The assessments by calculating accelerations of the indices movement are being fulfilled. The main parameters of the models are rank correlation coefficient over deviations (Spearman coefficient), over inversions one (Kendall coefficient), and the composite effectiveness estimation based on them. The models have the advantage of simplicity. They are liquid to those not specialized in water science, and can be easily find a use in indicative planning based on modern electronic computing means. The results obtained for basins of the main confluent to the Black and Caspian Seas from Russian territory (Volga, Terek, Don and Kuban rivers) show that from the beginning of the XX century, the separate periods of several decades long can be identified which are different according to natural and anthropogenic processes superposition patterns, and intensity and frequency of natural and man-induced emergencies. During the period of the last “meridional epoch” of atmospheric circulation (since early 1960th), southwestern cyclones are

abnormally intensive, what may be associated with global warming. During the transition period (since early 1990th), an essential increase of dependence of development stability on fluctuations of climate is fixed. This needs to consider the sustainable development research as a flexible process not leading to a final, unchangeable “truth”, but to insights on the basis of existing knowledge, i.e. within the frame of Planning Development methodology that presupposes permanent participation of governments, decision-makers, and investigators in a planning process