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Paleodynamics of large closed lakes as a standard for climate modeling data verification

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Observed and reconstructed variations of large lakes can serve as a standard for assessing the quality of the model run off simulated by climate models. It provides the opportunity to assess whether models designed for future scenarios are skillful in 'out-of sample' climate change experiments.
Based on general ideas about the laws of temporal dynamics relating to massive inertial objects, slow changes of the lake level under the semi-steady climate state can be represented as resulting from the accumulation of small anomalies in the water regime; it appears like a kind of "self-developing" system. To test this hypothesis, the water balance model of the Caspian Sea (CS) was used. Time scale for the CS is estimated as $\sim$20 years. Model is interpreted as stochastic, and from this perspective, it is a Langevin equation that incorporates the action of precipitation and evaporation like random white noise, so that the whole can be thought of as an analogue of Brownian motion. Under these conditions, the CS palaeostages during the Holocene is represented by a system undergoing random walk. It should be emphasized that modeling results are interpreted from the probabilistic point of view, despite the fact that the model is deterministically based on the physical law of conservation of water mass.
Despite the CS, another candidate to be as a potential evaluation tool for climate model simulations is the Black Sea (BS) until its merger with the Mediterranean. Therefore, although the image of the CS, BS and other lakes within the climate models is very simplified (or absent), changes in the levels could be used to assess the ability of climate models to reproduce the water budget over the catchment areas. For the CS or the BS, they are the large parts of the East European Plane and can be as indicators of climate model quality.
However, the use of reconstructed data of other closed lakes is problematic. It is due to its water budget components cannot be simulated with needed accuracy because they are either too small (the size of the largest closed Siberian lake (the Chany) is less than the typical grid box of climate model) or they are located in mountain region (like the Issyk-Kul Lake, located in the northern Tian Shan mountains) where the lake variability is determined by badly reproduced glacier melting.