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Opinion

On Some Ancient Geological Processes That Took Place During the Formation of the Caspian Transgressive Seas

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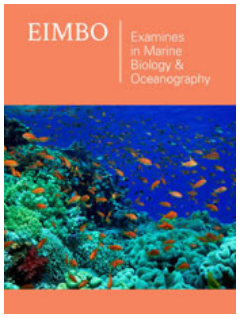

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Opinion

In recent years, research has begun on the hydrology of very unusual objects - the so-called Caspian transgressive seas. They are so named because the level of these seas was significantly higher than the level of the World Ocean. These seas were formed during the melting of glaciers from fresh water and this water, getting through the straits into the Mediterranean Sea, caused a significant freshening of Mediterranean waters. Studies have shown that the formation of transgressive seas is associated with a number of global hydrological and geological processes: climate change, the formation of continental glaciers in the form of ice mountains, the formation of the Bosphorus, Dardanelles, Manych straits, changes in the salinity of water bodies, migration of fish, animals and primitive people, and the other processes on the globe. Thus, the study of the hydrology of seas, which no exist for a long time, showed the need to study processes with a completely different mechanism. For example, it is highly likely that the formation of the deep-sea basin of the Black Sea is associated with the Messinian salinity crisis in the Mediterranean [1-4].

To solve some of the presented problems, it turned out to be necessary to solve the problem of a two-layer water flow in straits and the problem of water outflow from a transgressive sea based on the Navier-Stokes equations [5], and to estimate possible fluctuations in the viscosity coefficient of water under various hydrological conditions [6]. We proposed the equation for calculation the sea level change:

$$\frac{dH}{dt} = \frac{w.10^3}{s} - f.10^3 \longrightarrow (1)$$

where H- is the sea level elevation, t- is the time, W- is the volume of water flowing into the sea, f - is the evaporation coefficient. Dimension H- m, dimension f- m/year [7], S = S(H) is the dependence of the sea area on the sea level elevation. The line S = S (H) was constructed by us according to the modern relief. The S = S (H) curve can be approximated by two straight lines in the interval of level marks from -27 m to +60 m and from mark 60 m to above. The article [2] presents the course of the Akchagylian Sea level, calculated by the numerical method. This article shows an analytical solution to equation (1), in which the equation S = a + bH is used to approximate two straight lines. The solution is presented in a general way since there may be options in choosing a starting point. Equation (1) and the line S = S (H) allow us to calculate the volume of water entering the sea, which is necessary for the sea level to rise to a given stable level H. At this elevation W = f · S (H).

The analytical solution of equation (1) is described by function (2)

$$-\frac{H}{f} - \frac{W.\log(af + bfH - W)}{bf^2} = const + t.10^3 \longrightarrow (2)$$

The solution shows that as the sea level rises, the volume of evaporating water asymptotically approaches the volume of water flowing into the sea. As a result, a sea with stable shores is formed. An analytical solution to equation (1) shows that H (t) is a

transcendental algebraic equation. Its solution is fraught with certain difficulties. But it can be used in a simplified form to analyze the asymptotic approximation H as $t \to \infty$.

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