

**DOI: <https://doi.org/10.37162/2618-9631-2026-1-102-122>**

**Relationship of the Caspian Sea level and water balance components with large-scale atmospheric circulation indices (1950–2023)** / Ostrovskaya E.V., Pavlova A.V. // Hydrometeorological research and forecasts. 2026, no. 1 (399), pp. 102-122.

Based on observation data of the Volga runoff, the Caspian Sea level, and air temperature, as well as ERA5 reanalysis data (precipitation and evaporation), causes for the Caspian Sea level fluctuations during specific characteristic periods of its rise (1978–1995) and decline (1950–1977 and 1996–2023) are studied. It was found that the long-term average values of the Volga runoff and sea level differ statistically significantly among all three identified periods. Precipitation increased significantly only during the sea level rise phase (1978–1995), whereas an increase in air temperature and evaporation became statistically significant only in the modern period of the sea level decline (1996–2023). Interannual changes in the Caspian Sea level demonstrate a stable and increasing correlation with variations in the Volga runoff over time: the correlation coefficient increases from  $r = 0.39$  in 1950–1977 to  $r = 0.76$  in 1996–2023. However, the modern tendency towards a sea level decline corresponds rather to the positive trends in air temperature and evaporation than to the changes in the Volga runoff. The structure of the relationships between hydrological conditions and atmospheric circulation is variable over time. While the influence of global circulation mechanisms (the North Atlantic (NAO) and Arctic oscillations (AO)) prevailed in the mid-20th century, regional processes described by the EA/WR index (the East Atlantic/West Russia pattern) have begun to play a dominant role in few past decades. This shift is associated with an increased frequency of blocking anticyclonic conditions and a weakening of westerly moisture transport into the region, which ultimately affected the water balance of the Caspian Sea.

*Keywords:* Caspian Sea, sea level variations, Volga runoff, evaporation, precipitation, atmospheric circulation indices

Tab. 6. Fig. 4. Ref. 47.