Density Measurements of the Caspian Sea Water at High Temperatures and Pressures

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The Caspian Sea is estimated to be about 30 million years old. The Caspian Sea is the largest lake on Earth with a surface area of 371,000 km^3 and a volume of 78,200 km^3. Depending on the inflow of fresh water from its rivers, the Caspian Sea is a fresh-water lake in its northern portions. It is more saline on the Iranian shore. It has a maximum depth of about 1025 meters (Lenkeran Trench). The largely dried-up Garabogazköl embayment approaches oceanic salinity. The Caspian Sea and its border are rich in oil and gas resources, which have been extracted for many years. As a result of this exploitation, oil and gas residues have flowed and polluted the Caspian Sea. The Caspian Sea has also been polluted by industrial effluents and municipal waste water. The flow of various unnatural components changes the quality and quantity of the Caspian Sea water.

In this presentation, the (p,ρ,T) properties of Caspian Sea water will be discussed. The samples for the experiments were taken from various parts of the Caspian Sea. The experiments were carried out at temperatures T=(278.15 to 353.15) K and pressures up to p=40 MPa. The salinity analysis of samples was carried out using the 8400B "Autosal" Laboratory Salinometer. The DMA 5000 densimeter was used for the density measurements at atmospheric pressure and results were compared with the (p, ρ, T) results extrapolated to p=0.101 MPa. An equation of state for the fitting of (p,ρ,T) properties of Caspian Sea water was developed. The constructed equation of state was used for calculating the isothermal compressibility, thermal expansibility etc., which are necessary for modelling sea water rise, climate change, etc