

## **Parallel Salt and Methane Generation – Possible Paradigm Shifts for Salt Generation in Deep Sea Processes**

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### **ABSTRACT**

Until today, salt generation has been attributed to residual seawater evaporation. The newly discovered processes of parallel salt and methane generation suggests that this may not be the only possible hypothesis. This second hypothesis becomes interesting considering that many salt basins to overlap with some of the gas provinces, suggesting that salt structures, stratigraphy and diapir generation will create a framework for HC systems. Existing deep marine hypersaline anoxic basins (DHAB) in the Mediterranean Sea are well-documented. This region provides an analogy between the current and ancient DHABs, which allows us to hypothesize that salt basin methane deposits have been generated by euryhaline bacteria. This redefines the relationship between salt and methane deposits. Our hypothesis presumes that a secondary mechanism of salt generation takes place on a geological scale. Beginning with the idea that sea water is a neglected colloid system, we intend to show that intensive hypersaline brine generation has been taking place today and in the past. The mechanism of brine formation consists of well-known, common processes that proceed in a well-defined order; and these can be presumed to be accountable for the parallel generation of salt and methane. We hypothesize that the flocculation of argillaceous particles in a deep marine environment creates a semi-permeable membrane whose polarization initiates the process of DHAB formation. The reverse osmosis process concentrates the common ions (NaCl) under this surface where an intense bacterial mat generates methane. We further postulate that the non-crystallized, over-pressured, salty brine is the appropriate material to trap and host methane. This viscous, gas-saturated brine supporting the covering sediments can be deeply buried and thus become an engine for diapir formation. When the overburden is breached, the upward movement of hypersaline brine simultaneously crystallizes salt and releases methane and water. This concept will require further research and consideration as an alternative for parallel salt and methane generation, coupled with salt diapir formation in particular salt basins. As a possible example, we plan to research whether the 250 m thick salt layers in the Transylvanian Basin (Romania) arose from millions of years of inundation and evaporation or could have been generated by buried, over-pressured salt brine crystallizing during diapir generation along the extensional structural elements.