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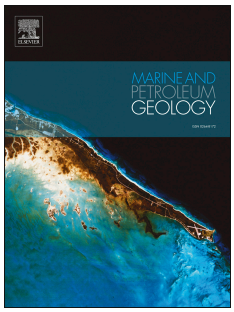

Large salt accumulations as a consequence of hydrothermal processes associated with 'Wilson cycles': A review, Part 2: Application of a new salt-forming model on selected cases

Martin Hovland, Håkon Rueslåtten, Hans Konrad Johnsen

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Large salt accumulations as a consequence of hydrothermal processes associated with 'Wilson cycles': A review

Part 2: Application of a new salt-forming model on selected cases

Martin Hovland[1], Håkon Rueslåtten[2], Hans Konrad Johnsen[2]

[1] Tech Team Solutions, Stavanger, Norway

[2] Independent consultant, Trondheim, Norway

ABSTRACT

The new hydrothermal salt model predicts that salt may accumulate in the sub-surface by hydrothermal circulation of seawater and brines in locations of high heat-flow. Such conditions are primarily found along tectonic plate boundaries, with processes of subduction and rifting, associated with the Wilson cycles.

Modern knowledge of the physicochemical and thermodynamic properties of salt solutions at elevated pressures and temperatures, allows numerical modeling of fluid behavior at relevant conditions in the deep crust. This modeling shows how seawater that migrates down towards hot magma bodies in a rift situation (e.g. in the Red Sea) is subject to phase transitions, where low-saline (distilled) water vapor migrates out of the system, while still saltier brine continues to migrate further down towards the heat source, until solid salt precipitates. Similarly, in a subduction situation, the seawater confined in the subducting oceanic plate is subjected to an ever increasing pressure and temperature during the descent towards the mantle, which leads to similar phase behavior of the brine as in the rifting situation. The salts forming in the deep of a subduction zone are not readily transported up to the surface due to thick overburden of mantle- and crustal rocks. Hence, much of the salt formed during subduction remains hidden from human observation in the roots of the mountains.