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Thermally induced seawater intrusion in the coastal aquifers of the Seferihisar-Balçova Geothermal system, Western Anatolia, Turkey - results from thermohaline simulations.

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The Seferihisar-Balçova Geothermal system (SBG), Western Anatolia, Turkey, is characterized by complex temperature and hydrochemical anomalies which causes are not fully understood. Heated groundwater types with low total dissolved solids (TDS) content are found in the Balçova geothermal field whereas the thermal waters in the Ürkmez area, southern SBG, originated from a mixture of seawater and local meteoric groundwater. Previous numerical simulations of coupled groundwater flow and heat transport along a North-South transect showed that the interaction between forced convection from the Seferihisar Highs and free convection in the faults (i.e. mixed convection) is likely the major transport mechanism responsible for the observed temperature anomalies. Furthermore the simulation scenarios allowed to gain a better understanding of the geophysical conditions under which the different fluid-dynamics are likely to develop. At weak recharge conditions, the convective patterns in the faults can extend to surrounding reservoir-units or below seafloor. These fault-induced drag forces can extend from the seafloor to the faults and could cause saltwater to encroach into coastal aquifers. In this presentation, the hypothesis of thermally induced seawater intrusion is addressed by running simulations that couple solute transport to fluid flow and heat transport (i.e. thermohaline flow). Although it is not possible to reproduce basin-scale thermohaline flow in faulted hydrothermal systems, the models provided reasonable representations of the temperature and salinity patterns of the SBG. Additional hydrochemical investigations supply further constraints on the described coupled heat transport processes. The results shed new light on the links between the migration of subsurface energy, solute transport processes and tectonic structures of geothermal systems.