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Composite Stochastic Solution of a 3-D Geothermal Model in Nea Kessani (Greece)

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We use the BME approach to study the Nea Kessani (Greece) geophysical system that is formed by a thermal reservoir consisting of arcosic sandstones. The BME generates temperature solutions that are: (a) composite, in the sense that apart from being consistent with the physical model, they also account for the multi-sourced uncertainty of the model parameters and the site-specific information obtained from measurements in a set of vertical drill holes indicating that hot fluids rising from depth enter the reservoir in a restricted area and flow towards local thermal springs; and (b) complete, in the sense that the whole temperature pdf is generated at each spatial location. From these pdf, different temperature maps can be derived (most probable, error minimizing etc. maps), depending on the objectives of the study. The proposed composite solution is distinguished from the standard (direct) solution of the physical model in a formal mathematical sense. By means of comparative analysis, it is shown that the numerical composite solution is more informative than the direct temperature solution as well as the analytical solution obtained using simplified boundary conditions (the composite solution offers a more realistic representation of the real-world phenomenon and, unlike the previous methods, it is in agreement with empirical quartz geothermometry analyses).