

## Conceptual Modeling and Tracer Testing at Ribeira Grande, São Miguel, Azores, Portugal

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### **ABSTRACT**

The Ribeira Grande geothermal reservoir on São Miguel Island, Azores, is exploited by two different production/injection areas on the northern side of the Lagoa do Fogo (Agua de Pau) volcano, both developed and operated by Sociedade Geotérmica dos Açores, S.A. (SOGEO). The southern (upslope) area has been in continuous production since 1994 and now has a 13 MW capacity. The northern (downslope) area has been in continuous production since 1981, with an expansion from 3 MW to 10 MW that went on-line in 2006. To support the expansion and plans for continued development in the northern area, the conceptual model of the reservoir has been updated, a tracer test conducted, and a numerical model developed. The reservoir is fed by a 240°C upflow of relatively alkaline, Na-Cl water that appears to occur in the southeastern quarter of the southern area. Outflow is to the north, and the reservoir as a whole is marked by a striking degree of chemical homogeneity and limited cooling along a horizontal distance of more than 3 km. The conceptual model is constrained somewhat by limited drilling (one well) in the gap between the southern and northern production areas. Tracer injected at the northern edge of the southern production field (one well) shows very limited returns to the south (0 ~ 3 ppb), and was not seen to the north (1.75 km and further) after 240 days. Tracer injected at the northern edge of the northern production field (two wells) shows more rapid and substantial returns (10 ~90 ppb) to wells of the northern field, and it is planned to relocate this injection further to the NE. Results of early exploration drilling, and locations of surface manifestations, indicate that an eastward and southeastward expansion of the northern production/injection area should be possible, whereas further expansion of the southern production area is limited by severe surface topography and limited access. SOGEO plans to conduct step-out drilling for production and injection both, in late 2009.

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