Origin of fluids in the shallow geothermal environment of Savo, Solomon Islands

D.J. SMITH1 G.R.T. JENKIN[1] A.J. BOYCE [2]
J. NADEN [3] AND M.G. PETTERSON [3]

[1] Department of Geology, University of Leicester, UK;
[2] Scottish Universities Environmental Research Centre; [3] British Geological Survey;

Savo is a recently emergent volcano. An active geothermal system has been present for at least 50 years, expressed at the surface by numerous hot springs, fumaroles and steaming ground. Samples of water and steam were collected from geothermal features and non-thermal springs and wells, and representative samples of altered rocks and precipitates were collected from geothermal areas.

Analysis of the waters for anion, cation and stable isotope composition shows that the waters discharging at the surface fall into two groups (see Table).

	Rembokola	Reoka
Temperature	102	100
pH	8.2	2.5
SO_4^{2-} (ppm)	653	516
$\delta^{34}S_{SO4}$ ‰	+5.7 ±1	-2.9 ±1
Cl^- (ppm)	50	4
Al (ppb)	<350	827
Ca (ppm)	129	58
Fe (ppm)	<0.1	24
Na (ppm)	220	45

Reoka Type fluids have the high sulphate, low pH, and enriched $\delta^{18}O$ and δD values typical of steam heated acid sulphate waters, where shallow groundwater is heated by rising steam and gas. Isotopically light H_2S is oxidised in the near surface environment to produce the sulphate content.

Rembokola Type fluids have chemistry distinct from the Reoka Type fluids, despite the two being found within close proximity (<10 m). Rembokola Type fluids produce a carbonate sinter, so are assumed to be saturated with bicarbonate. The aqueous sulphate has heavy $\delta^{34}S$, suggesting that it is not exclusively produced by the oxidation of H_2S in the near surface environment. We suggest that condensation of volcanic gases (including CO_2 and isotopically heavy SO_2) into meteoric-derived groundwater in the upper levels of the volcanic edifice produces these carbonate-sulphate waters. The presence of SO_2 suggests that there is a degassing magma at depth, and potentially a high sulphidation-type epithermal system beneath the steam heated zone.