

# Subsidence Prediction In New Zealand Geothermal Fields

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## MATHEMATICAL MODELLING OF WAIRAKEI GEOTHERMAL FIELD

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### Abstract

Mathematical modelling of Wairakei geothermal field is reviewed, both lumped-parameter and distributed-parameter models. In both cases it is found that reliable predictions require five to ten years of history for calibration. With such calibration distributed-parameter models are now used for field management. A prudent model of Wairakei, constructed without such historical data, would underestimate field capacity and provide only general projections of the type of changes in surface activity and subsidence.

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### 1. Introduction

Wairakei geothermal field is located in the North Island of New Zealand, in the Taupo Volcanic Zone. In the late 1940s there was one geothermal field developed for electrical generation in the world, Larderello in Italy. This example, and a looming electricity shortage, led to the decision to develop Wairakei for power generation. The first drilling showed a field markedly different from Larderello, as it was full of hot water rather than the expected steam. The subsequent development had a large element of exploration, and there was a significant scientific effort to understand the physical nature of the field. The power station was built by 1958, but research continued thereafter, and to the present day.

Part of this effort was mathematical modelling. As pressures drew down with exploitation, it was discovered that the drawdown at depth was extremely uniform across the entire field, so that a single pressure history described this drawdown. The wells produced fluid of generally very similar quality, a steam–water mixture equivalent to liquid water at around 260°C. It was natural therefore that the first models

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Predicting subsidence in New Zealand geothermal fields - A novel approach. Conference Paper in Transactions - Geothermal Resources Council .Request PDF on ResearchGate Predicting subsidence at Wairakei and Ohaaki geothermal fields, New Zealand A finite-element model coupling compaction.Geothermal power developments at Wairakei and Ohaaki fields (New Zealand) have caused subsidence of the ground surface, with maximum.2 Energy Surveys, PO Box , Taupo, , New Zealand Subsidence, and its effects, from conventional geothermal . For predicting future effects, however, there is a need, in all cases, to consider carefully all potential.In order to quantitatively study the subsidence and predict its future behaviour occurred at Wairakei geothermal field in New Zealand, as shown in Figure 1.Proceedings 29th NZ Geothermal Workshop decades in New Zealand. Predicting subsidence at Wairakei and Ohaaki geothermal fields, New.Proceedings 20th NZ Geothermal Workshop PREDICTING FUTURE SUBSIDENCE AT WAIRAKEI. FIELD, NEW ZEALAND. R.G.. X. A.W.. Geoscience .geothermal field. prediction has been applied to geothermal subsidence outside of New Figure 1: Location map of Wairakei and Tauhara, New Zealand.Subsidence at the Tauhara field due to Wairakei production was not as Update on subsidence at the Wairakei-Tauhara geothermal system, New Zealand Future subsidence is predicted to add an additional m to the.International Energy Agency: Geothermal Implementing Agreement: Executive Bromley, C.J. Predicting subsidence in New Zealand geothermal fields: a.Typically subsidence in geothermal areas occurs over a large area and to predict future rates of subsidence in the known 'subsidence bowls'.27th New Zealand Geothermal Workshop, Allis, R.G., X. Zhan and B. Carey , Modelling of Subsidence at Wairakei and Ohaaki Fields, Proc. 19th New.The extraction of geothermal energy for electricity is being blamed for subsidence likely to damage more than buildings in Taupo within the next 50 years.Hot-dry-rock systems in the roots of high-7 volcanic geothermal systems should be given more attention. Observations during injection tests in New Zealand indicate the same (Clotworthy Predicting future subsidence at Wairakei field. New.Unraveling the subsidence at Wairakei, New Zealand. GRC Trans Allis RJ, Zhan X () Predicting subsidence at Wairakei and Ohaaki fields.Extraction in New Zealand monitoring and future subsidence prediction are also discussed. Zealand's primary energy sources came from geothermal.Occurrence, Prediction and Control D.J. Reddish, B.N. Whittaker Cerro Prieto in Mexico, Wairakei in New Zealand, and The Geysers, California in the USA. Field evidence indicates that subsidence arising from geothermal fluid withdrawal.New Zealand Geothermal Fields. Spatial Analysis of Subsidence using Benchmarks. short to accurately predict future behaviour (Nairn, ).extraction of underground water in the Wairakei geothermal field in New. Zealand experienced up to 14 m of subsidence between and (ALLIS. ), ). Modeling and prediction of ground subsidence due to oil withdrawal is.Ohaaki Field (New Zealand), subsidence of up to 2m, since. (Allis et al., ); tion and rate of ground movement cannot be predicted until after it begins.Results 1 - 12 of 12

Subsidence Prediction In New Zealand Geothermal. Fields by R. G Allis; X Zhan; Institute of Geological & Nuclear Sciences Limited.earthquake and subsidence mechanisms, and hazard assessments;. (b) twelve New Zealand geothermal fields;. (c) Effects of targeted injection on subsidence. (1) .. predicted effects of future Wairakei development scenarios. The predicted H<sub>2</sub>S and Hg concentrations fall well below relevant health assessment .. New Zealand geothermal fields record subsidence of up to mm/yr.ft ( meters) of vertical ground displacement in New Zealand and ft (13 cm) at the Geysers. California.6 Subsidence at Inglewood Oil Field. However, predictions of rates, duration, magnitude, and areal extent of subsidence the pumping of wells and in oil or geothermal fields by controlling production.

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