ABSTRACT

ANALYSIS OF MICRO EARTHQUAKE HYPOCENTER AND *POISSON'S RATIO* AT DESERT PEAK GEOTHERMAL FIELD BEFORE AND AFTER *ENHANCED GEOTHERMAL SYSTEM (EGS) STIMULATION*

By

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A research has been conducted on analysis of hypocenter distribution and poisson's ratio in the Desert Peak Geothermal Field, the State of Nevada, USA. The purpose of this research is to make a hypocenter determination program using Graphical User Interfaces (GUI) in MATLAB, analyze hypocenter and poisson's ratio distribution. Methods of micro earthquake using natural seismic wave measurement sources that have a low frequency. Micro earthquake recording earthquakes (3 SR). The data used in this research are the micro earthquake data catalog of Desert Peak Geothermal Field before EGS (September 2008 to August 2010) and after EGS (March 2013 to February 2015). The data source is from Northern California Earthquake Data Center (NCEDC) and is secondary data covering the arrival time of P and S waves, station position and 1-dimensional speed model. Hypocenter determination using the SED method with preliminary data of the arrival time of P and S waves, 1-dimensional speed model and station location (UTM X, UTM Y and elevation). While the determination of poisson's ratio using wadati diagram with initial data in the form of the difference between the arrival time of wave P and S with origin time. Determination of the hypocenter of micro earthquake successfully done using the GUI program in MATLAB developed by writer. The resulting hypocenter distribution follows the ryholite ridge fault groove which is the main location of Desert Peak Geothermal Field. After the EGS stimulation the micro earthquake distribution increased twice, with the highest increase being in the 500m elevation (EGS stimulation zone). An increase in the value of poisson's ratio after EGS stimulation, especially in the 500m elevation (EGS stimulation zone). This suggests an increase in water saturation in the EGS area after EGS stimulation.

Keywords: MATLAB, Hypocenter, *Poisson's ratio*

ABSTRAK

ANALISIS SEBARAN HIPOSENTER GEMPA MIKRO DAN *POISSON'S RATIO* DI LAPANGAN PANASBUMI DESERT PEAK SEBELUM DAN SESUDAH STIMULASI *ENHANCED GEOTHERMAL SYSTEM (EGS)*

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Telah dilakukan penelitian tentang analisis sebaran hiposenter dan *poisson's ratio* di Lapangan Panasbumi Desert Peak, Negara Bagian Nevada, Amerika Serikat. Tujuan penelitian ini adalah membuat program penentuan hiposenter menggunakan *Graphical User Interfaces* (GUI) di MATLAB, menganalisis sebaran hiposenter dan *poisson's ratio.* Metode gempa mikro menggunakan sumber pengukuran gelombang sesmik natural yang memiliki frekuensi rendah. Gempa mikro merekam gempa-gempa (3 SR). Data yang digunakan dalam penelitian ini adalah data katalog gempa mikro Lapangan Panasbumi Desert Peak sebelum EGS (September 2008 hingga Agustus 2010) dan sesudah EGS (Maret 2013 hingga Februari 2015). Sumber data dari *Northern California Earthquake Data Center* (NCEDC) dan merupakan data sekunder yang meliputi waktu tiba gelombang P dan S, posisi stasiun serta model kecepatan 1 dimensi. Penentuan hiposenter menggunakan metode SED dengan data awal berupa waktu tiba gelombang P dan S, model kecepatan 1 dimensi dan lokasi stasiun (UTM X, UTM Y dan elevasi). Sedangkan penentuan *poisson's ratio* menggunakan diagram wadati dengan data awal berupa selisih antara waktu tiba gelombang P dan S dengan *origin time.* Penentuan hiposenter gempa mikro berhasil dilakukan menggunakan program GUI di MATLAB yang dikembangkan penulis. Sebaran hiposenter yang dihasilkan mengikuti alur sesar *ridge ryholite* yang merupakan lokasi utama Lapangan Panasbumi Desert Peak. Sesudah dilakukannya stimulasi EGS sebaran gempa mikro meningkat dua kali, dengan peningkatan paling tinggi berada di elevasi 500m (zona stimulasi EGS). Terjadi peningkatan nilai *poisson's ratio* sesudah dilakukan stimulasi EGS terutama di elevasi 500m (zona stimulasi EGS). Hal ini menunjukan adanya peningkatan saturasi air di area EGS sesudah stimulasi EGS.

Kata Kunci: MATLAB, Hiposenter, *Poisson's ratio,*