ANALISIS FENOMENA TRANSPORT GAS ^{222}Rn PADA LAPISAN BUMI DI KAWASAN SUMUR PANTAU PREKURSOR GEMPA DAERAH PIYUNGAN, BANTUL

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INTISARI

Beberapa dekade terakhir telah berkembang upaya untuk mempelajari kaitan gas radon dengan proses geodinamika. Radon dianggap yang paling cocok untuk mempelajari gejala-gejala awal (prekursor) gempa dibanding gas-gas lainnya karena mudah terdeteksi. Upaya-upaya untuk memperbaiki pemantauan dan analisis data radon terus dilakukan, demikian juga dengan metodologi serta pemodelan matematis terus berkembang untuk memperkuat kaitan anomali gas radon dengan proses geodinamika.

Pada penelitian ini diperlukan data kondisi tanah, serta formulasi untuk menghitung transport gas radon (emanasi, difusi, dan ekshalasi) di daerah sumur pantau. Geometri sumur radon di Piyungan dimodelkan dengan syarat dan kondisi batas tertentu lalu disimulasikan menggunakan perangkat lunak GNU *Octave*. Simulasi dilakukan pada saat kondisi normal dan pada saat kondisi aktivitas seismik berupa variasi ketinggian air, kelembaban tanah, dan difusivitas tanah.

Dari hasil simulasi didapat konsentrasi gas radon terukur pada saat keadaan normal di sumur pemantauan daerah Piyungan sebesar 2,2420 Bq/L saat kedalaman air sumur sebesar 14,2308 m dengan galat sebesar 9,4251% terhadap data yang didapat oleh BMKG yaitu sebesar 2,4753 Bq/L dengan kedalaman air sumur sekitar 14,0725 m. Terjadi pula anomali gas radon ketika divariasikan ketinggian dimana semakin sedikit air sumur, semakin besar konsentrasi radon terukur. Ketika variasi kelembaban tanah dilakukan didapat semakin besar kelembaban tanah, semakin besar pula konsentrasi radon terukur. Variasi difusivitas menghasilkan korelasi semakin tinggi difusivitas maka semakin rendah konsentrasi radon yang terukur di detektor radon tersebut.

Kata kunci: ^{222}Rn, difusi, gempa bumi, anomali

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ANALYSIS OF ^{222}Rn GAS TRANSPORT PHENOMENONS ON EARTH LAYERS AT THE EARTHQUAKE PRECURSOR MONITORING WELL AREA IN PIYUNGAN, BANTUL

by
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ABSTRACT

On the last few decades the study of relationship between radon gas and geodynamic processes have developed. Radon is considered the most suitable for studying earthquake precursors compared to other gases because it is easily detected. To improve monitoring and analysis of radon data continue to be made, as well as methodologies and mathematical modeling continue to develop to strengthen the linkage of radon gas anomalies with geodynamic processes.

In this study the data of soil conditions are needed, as well as the formulations to calculate the transport of radon gas (emanation, diffusion, and exhalation) in the monitoring well area. The radon well geometry in Piyungan was modeled with certain boundary conditions and then simulated using GNU Octave software. Simulations are carried out during normal conditions and during seismic activity conditions in the form of variations in water level, soil moisture, and soil diffusivity.

The results of the simulation is radon gas concentration during normal conditions in the monitoring wells of the Piyungan area was 2.2420 Bq / L when the water depth of the well was 14.2308 m with an error of 9.4251% of the data obtained by BMKG which was 2, 4753 Bq / L with a well water depth of about 14.0725 m. There is also a radon gas anomaly when the height is varied where the less water the well is, the greater the measured radon concentration. When the variation in moisture content is conducted, the greater the soil moisture, the greater the measured radon concentration. Diffusivity variation results in a correlation, the higher the diffusivity, the lower the radon concentration measured at the radon detector.

Keywords: ^{222}Rn, diffusion, earthquake, anomaly

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