ABSTRAK

Rahman, Budiono, 2021, Pemodelan Risiko Gempa Bumi di Pulau Sulawesi dan Maluku Menggunakan Model *Inhomogeneous Thomas Cluster Process,* Hasil Penelitian, Program Studi Statistika, Universitas Muhammadiyah Semarang, Pembimbing: I. Tiani Wahyu Utami, S.Si, M.Si. II. Fatkhurokhman Fauzi, S.Si, M.Stat.

Pulau Sulawesi dan Maluku merupakan wilayah rawan gempa, sebaran sumber gempa mengelempok di bagian utara Sulawesi dan laut Maluku. Gempa bumi dapat dipengaruhi oleh beberapa faktor geologi, yaitu jarak suatu wilayah terhadap zona subduksi, sesar aktif dan gunung berapi. Penelitian ini memodelkan kejadian gempa bumi di Pulau Sulawesi dan Maluku menggunakan model *Inhomogeneous Thomas Cluster Process* karena proses tejadinya gempa secara umum diawali dengan gempa utama dan diikuti oleh gempa susulan disekitar wilayah tersebut. Hasil eksplorasi data menunjukkan bahwa data kejadian gempa bumi di Pulau Sulawesi dan Maluku tidak homogen. Selain itu, analisis menggunakan *K-function* juga menunjukkan bahwa persebaran gempa di Pulau Sulawesi dan Maluku membentuk *cluster.* Pemodelan risiko kejadian gempa bumi di Pulau Sulawesi dan Malaku dengan *Inhomogeneous Thomas Cluster Process* menunjukkan bahwa faktor jarak gunung berapi, sesar dan zona subduksi secara signifikan mempengaruhi risiko terjadinya gempa di wilayah tersebut, dimana jika jarak suatu lokasi mendekat 100 km ke gunung api, maka risiko terjadinya gempa di sekitar lokasi tersebut meningkat sebesar 1,8 kali. Kemudian, jika jarak suatu lokasi mendekat 100 km ke sesar, maka risiko terjadinya gempa di sekitar lokasi tersebut meningkat sebesar 0,7 kali serta jika jarak suatu lokasi mendekat 100 km ke zona subduksi, maka risiko terjadinya gempa di sekitar lokasi tersebut meningkat sebesar 0,9 kali. Validasi model dengan plot *envelope K-Function* menunjukkan bahwa model *Inhomogeneous Thomas Cluster Process* baik digunakan untuk memodelkan data gempa di Pulau Sulawesi dan Maluku pada rentang tahun 2009-2020 dengan magnitude ≥ 4.5.

Kata Kunci: Gempa Bumi, Suduksi, Sesar, Gunung Berapi, *Spatial Point Process, Inhomogeneous Thomas Cluster Procces.*

ABSTRACT

Rahman, Budiono, 2021, Earthquake Risk Modeling in Sulawesi and Maluku Islands using Inhomogeneous Thomas Cluster Process, Research Results, Statistics Study Program, University of Muhammadiyah Semarang, Under the guidance of Tiani Wahyu Utami, S.Si, M.Si, and Fatkhurokhman Fauzi, S.Si, M.Stat.

Sulawesi and Maluku islands are earthquake-prone areas, where the distribution of earthquake sources is clustered in the northern part of Sulawesi and the Maluku sea. Earthquakes can be influenced by several geological factors, namely the distance of an area from a subduction zone, active faults, and volcanoes. This study modeled the occurrence of earthquakes on the islands of Sulawesi and Maluku using the model Inhomogeneous Thomas Cluster Process because the process of occurrence of earthquakes generally begins with the main earthquake and is followed by aftershocks around the area. The results of data exploration show that the data on the occurrence of earthquakes on the islands of Sulawesi and Maluku is not homogeneous. In addition, the analysis using K-function also shows that the distribution of earthquakes on the islands of Sulawesi and Maluku forms clusters. Modeling the risk of earthquakes in Sulawesi and Malaku Island using Inhomogeneous Thomas Cluster Process shows that the distance factor of volcanoes, faults, and subduction zones significantly affects the risk of an earthquake in the area, where if the distance of a location is closer to 100 km to the volcano, the risk of an earthquake around that location increases by 1.8 times, if the distance of a location is closer to 100 km to the fault, then the risk of an earthquake around that location increases by 0.7 times and if the distance of a location is closer to 100 km to the subduction zone, the risk of an earthquake around that location increases by 0, 9 times. Model validation with K-Function envelope plot shows that the model Inhomogeneous Thomas Cluster Process is good for modeling earthquake data in Sulawesi and Maluku islands in the 2009-2020 range with a magnitude of ≥ 4.5.

Keywords: Earthquake, Subduction, Fault, Volcano, Spatial Point Process, Inhomogeneous Thomas Cluster Process.

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