

## HUBUNGAN KARAKTERISTIK ALIRAN DENGAN HIDROGEOKIMIA MATAAIR GUNTUR DI KAWASAN KARST GUNUNGSEWU

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### INTISARI

Lokasi penelitian berada di Mataair Guntur yang tergolong pada sistem hidrogeologi Blok Panggang. Tujuan penelitian ini adalah: (1) mengkaji karakteristik aliran Mataair Guntur; (2) mengkaji variasi temporal hidrogeokimia akuifer karst Mataair Guntur; dan (3) mengkaji hubungan antara karakteristik aliran dengan hidrogeokimia Mataair Guntur. Hubungan antara karakteristik aliran dengan hidrogeokimia tersebut dianalisis untuk karakterisasi akuifer karst.

Hidrograf aliran diidentifikasi melalui perekaman data tinggi muka air (TMA) selama 1 tahun (Mei 2018-Mei 2019) dan pengukuran debit dengan 2 metode yakni *sudden injection* saat kemarau serta *velocity area* saat musim hujan. Nilai konstanta resesi diantaranya aliran *diffuse* ( $K_b$ ), aliran *fissure* ( $K_i$ ), dan aliran *conduit* ( $K_c$ ) dihitung melalui kejadian banjir terpilih. Pemisahan aliran dasar juga dianalisis untuk mengetahui persentase aliran dasar. Sementara itu, analisis hidrogeokimia dilakukan melalui 73 sampel yang diambil saat musim kemarau, musim penghujan, dan 5 kejadian banjir selama 24 jam. Hasil analisis karakteristik aliran dan hidrogeokimia tersebut kemudian dihubungkan melalui *scatter plot* untuk menghitung nilai koefisien korelasi ( $R$ ).

Hasil perhitungan konstanta resesi diantaranya yakni  $K_b = 0,998$ ;  $K_i = 0,933$ ; dan  $K_c = 0,5$ , artinya bahwa Mataair Guntur telah memiliki 3 komponen aliran meliputi *diffuse*, *fissure*, dan *conduit*. Analisis pemisahan aliran dasar menunjukkan bahwa aliran *diffuse* cenderung lebih dominan dengan total persentase 93,07 %, namun juga telah terdapat pengaruh aliran *conduit* maupun *fissure* terutama saat musim hujan. Analisis hidrogeokimia diperoleh bahwa Mataair Guntur didominasi oleh *diffuse* maupun *fissure* dengan proses *water-rock interaction* terutama saat kemarau, namun juga telah terdapat perkembangan *conduit* dengan proses pengenceran saat musim hujan. Hubungan persentase aliran dasar dengan parameter hidrogeokimia yaitu unsur terlarut dominan ( $\text{Ca}^{2+}$  dan  $\text{HCO}_3^-$ ); Daya Hantar Listrik (DHL); *Saturation Index* (SI) kalsit; dan pH saat resesi banjir diperoleh nilai koefisien korelasi ( $R$ ) yang tergolong kuat atau hubungan positif. Hal tersebut menunjukkan bahwa aliran *conduit* dengan proses pengenceran (*dilution*) secara perlahan tergantikan oleh *diffuse* saat periode resesi banjir, sehingga proses *water-rock interaction* kembali mulai dominan. Hubungan debit dengan persentase aliran dasar diperoleh nilai  $R > 0,9$ , artinya yakni Mataair Guntur cenderung dikontrol oleh *diffuse*, meskipun telah terdapat perkembangan *conduit*. Keberadaan perkembangan rekahan *conduit* Mataair Guntur dibuktikan melalui tingginya suplai  $\text{CO}_2$  dalam air saat musim hujan.

Kata Kunci: Akuifer Karst, Hidrogeokimia, Karakteristik Aliran

## ***THE RELATION BETWEEN FLOW CHARACTERISTIC AND HYDROGEOCHEMISTRY IN GUNTUR SPRING, GUNUNGSEWU KARST***

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### **ABSTRACT**

*This study was conducted on the Guntur Spring which is classified as Panggang hydrogeological system. The main purpose of this study are: (1) to assess the flow characteristic of Guntur Spring; (2) to assess temporal variation of Guntur Spring karst aquifer hydrogeochemistry condition; and (3) to study the relationship between the flow characteristic and hydrogeochemistry of the Guntur Spring. The relation between flow characteristics and hydrogeochemistry was identified to provide a better aquifer characterization.*

*Hydrograph was identified by recording water level data for one year (May 2018-May 2019) and measurement of discharge with sudden injection method during dry season when velocity area method during wet season. The calculation of recession constant value, including the diffuse flow ( $K_b$ ), fissure flow ( $K_i$ ), and conduit flow ( $K_c$ ) was done by selected flood events. Baseflow separation analysis was conducted to determine the diffuse flow proportion. Meanwhile, hydrogeochemical analysis was conducted through 73 samples taken during the dry season, wet season, and five selected flood events for 24 hours. A scatter plot analysis between the flow characteristic and hydrogeochemical was made in order to calculate the coefficient of correlation ( $R$ ).*

*The results of recession constant calculation by the high  $K_b = 0.998$ ;  $K_i = 0.933$ ; and  $K_c = 0.5$ , showed that the Guntur Spring has three types of flow characteristic including diffuse, fissure, and conduit. Baseflow-separation analysis showed that the diffuse flow significantly dominates with a total proportion to 93.07%, although there have conduit and fissure flow during the wet season. Hydrogeochemical analysis showed that the Guntur Spring is dominated by diffuse and fissure, which underwent the water-rock interaction process especially during the dry season, but also there had been a development of conduits with dilution process during the wet season. The relationship between the diffuse proportion and hydrogeochemical parameters including the major dissolved constituents ( $\text{Ca}^{2+}$  and  $\text{HCO}_3^-$ ); conductivity; SI calcite; and pH when a flood recession period is obtained the coefficient of correlation ( $R$ ) which is classified as strong or a positive relationship. This shows that the conduit flow with the dilution process is slowly replaced by diffuse during the recession flood period, with the result that the water-rock interaction process again begins to dominate. The relationship of discharge with the diffuse proportion obtained by the value  $R > 0.9$  means that the Guntur Spring is controlled by the diffuse system, although it has a conduit development. The existence of conduit fracture in Guntur Spring is proven through the high supply of  $\text{CO}_2$  during the wet season.*

**Keywords:** Karst Aquifer, Hydrogeochemistry, Flow Characteristic