

Developing a Modified GCUH Based on the Geomorphic Characteristics of Korean Mountain Regions

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Abstract. The geomorphologic or topological characterization of mountain regions has been a big concern to hydrologists and water resources engineers in South Korea. This is because of the significant relationship between geomorphologic factors and their hydrologic response. At first, the geomorphologic analysis has been performed on over 40 mountain watersheds in South Korea. For doing this, the river and basin geomorphic characteristics such as area, length, slope, Horton ratios, etc. were produced for each basin based on the Hydro-GIS techniques. Field investigations have also been performed to measure the stream bank-full width and bed roughness. Based on the collected geomorphologic information, several analyses were imposed to verify the self-similitude and fractal characteristics of Korean mountain basins. The relationships between basin characteristics such as basin area, main stream length, and slope and Horton ratios were also constructed. They suggested well-defined multi-similarity properties between these two factors in Korean mountain regions. Moreover, we adapted the GCUH (geomorpho-climatological unit hydrograph) method for estimating flood discharge to Korean mountains. This Korean-GCUH (KGCUH) has some beneficial aspects to be used in estimating flood properties in ungauged basin. This model can include the effects of non-linear climate dynamics into the unit hydrographs. Furthermore, the parameters in the KGCUH were derived using regionalized geomorphologic properties. For instance, the regionalized Horton ratios and bank-full width, which are very difficult to determine in real ungauged mountain regions have been implied in that model. The proposed model has been applied to a real basin and compared with observed data. The KGCUH has shown acceptable performance in Korean mountain regions on basins up to 180 km².

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