This contribution assesses the effects of geomorphologic heterogeneity on grid-based rainfall-runoff model response. Simple model parameterizations representing variability in infiltration and percolation characteristics are based on land surface model formulations, and are coupled to grid-based representations for runoff production and flow accumulation. The latter take explicit account of subgrid variability in topographic slope. A method for regionalization in order to obtain effective parameters for calibration purposes is also presented. Application of the model to three river basins in Peninsular Malaysia, measuring 4000 to 26,000 square kilometres, for daily simulations on a 0.5 kilometre grid scale shows favourable simulation results. However, the analysis also indicates that further investigation is required with respect to the uncertainty inherent in the parameterization and regionalization of geomorphological factors affecting basin runoff.