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Identification of hydrogeometric characteristics of river courses using near infrared satellite imagery and its use for estimating streamflow

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The use of satellite remote sensing information is becoming more critical for acquiring hydrological information in ungauged area, complementing missing values, and for measuring synchronized hydrological components in large-scale area. The reconstruction of hydraulic measurement using satellite remote sensing have recently received much attention especially for the purpose of identifying spatial and temporal hydrologic connectivity. Despite the relatively low accuracy at the individual measuring point, the satellite imagery covers large area simultaneously which offsets the disadvantages compared to ground measurements. In this study streamflow along the river course was reconstructed using Sentinel Satellite imagery. The Sentinel satellite is being operated by ESA(European Space Agency) and provide the imagery with 18 multispectral bands. The near infrared imagery with 10m resolution captured on Feb. 8, 2016 which can identify water body from ground surface was utilized for this study. The experiments were implemented at the 26.7km section from Yangpyeong Bridge to Yeoju Bridge along the South Han River. The streamflows at the reference surveying points with river cross sections ready were estimated using the river width observed from satellite imagery, the pre-calibrated relationships of the stage vs width and stage vs cross-section and the water surface slopes replaced for the energy slopes. For minimizing uncertainties caused from the energy slope the water surface slopes were measured from the water elevation gauged from the ground at 3 river bridges located in the middle of the experimental section. The discharge coefficient was calibrated and validated at the downstream and upstream section of the Ipo Bridge in the center. The relative error of the estimated streamflow at the validation section was -1.5%. The additional experiment under the various flow regime and with different band will supplement the practicality of the methodology.