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Flow Structure through a Fluvial Pool-Riffle Sequence – Case Study

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Abstract

Pools and riffles in gravel-bed rivers have a major effect on the variables of the flow equations. Obtaining measurements of these variables requires comprehensive research conducted in rivers. Detailed measurements were taken from one reach of the Kaj River, Iran. The subsequent results showed a phase shift for: X-component of velocity, near bed velocity in X and Z directions, and bed shear stress versus bed elevation profiles. In the riffle section, vectors of the vertical velocity component were oriented towards the bed. However, in the pool section, vectors were oriented downward close to the bed, and upward at higher levels. Quadrant analysis for the pool illustrated the dominance of ejection and sweep interactions near to the bed and near to the water surface respectively. However, in the riffle, outward interactions were dominant near the bed, and sweep interactions were dominant near the water surface. The spectral analysis revealed that flow over pool-riffle does not follow the scaling regime of Kolmogorov, used to illustrate the slope of -5/3 in inertial sub-range.

Key words: Pool riffle sequence, shear stress, stream velocity, quadrant analysis, spectral analysis.