

(Research Article)

Feasibility study of real-time and automated monitoring of Iranian rivers using 50-kHz fluvial acoustic tomography system

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Abstract

Acoustic Tomography (AT) technique is an innovative method for real-time river monitoring. In this study, not only the accuracy of flow velocity measurement using 50 kHz AT system which is appropriate for narrow rivers (most Iranian rivers) is evaluated, but also its performance is compared with 30 kHz one which is used in wide rivers. The comparison results showed that the velocity resolutions of 30 and 50-kHz AT systems for rivers with a width of 40 meters are 4 and 2.5 cm/s, respectively. Correspondingly, applying the systems in a 100-m river width, the resolutions improved up to 2 and 1 cm/s, respectively. Subsequently, the systems have resolutions as much as 1 and 0.7 cm/s in rivers with a width of 200 meters. As a result, the measurement resolution of AT technique enhances with respect to the river width. However, calculations of the maximum sound propagation distance, assuming that there are no suspended particles in the water for frequencies of 30 and 50 kHz, were approximately 2,000 and 1,200 meters, respectively. According to the results of this study, the utilization of the 50-kHz AT system in rivers larger than 40 meters wide is recommended.

Keywords: Real-time river monitoring, Continuous river monitoring, Velocity resolution, Minimum and maximum range measurement, Fluvial acoustic tomography.

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