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Secondary Flow Structures in Natural Channels Under Open and Ice-coverage Conditions[1] BERKAY KOYUNCU, TRUNG LE, None — Secondary flow structure (SFS) under ice-coverage has not been examined so far despite its important role in dynamics of meandering streams and rivers. In this work, three-dimensional flow structures are investigated in natural channels from a relatively small streams to large-scale rivers using both field measurement (Acoustic Doppler Current Profiler) and Large Eddy Simulation. Three channels are considered in this work: (a) Buffalo River, Minnesota, United States; (b) Red River of the North, Fargo, North Dakota, United States; and (c) Hong River, Hanoi, Vietnam. Two methods of measurements have been carried out: (a) continuous monitoring; and (b) traverse crossings for these rivers. The measurements show evidence for the existence of SFS across measured cross-sections. To understand the impact of ice-coverage, three-dimensional model of the Red River of the North is setup for Large Eddy Simulation at bank-full condition under both open and covered conditions. Our field data show that ice-coverage condition induces a drastically different 3D structures in comparison to the open-surface condition. Under ice-coverage, a double log-law velocity profile distribution is formed. Due to the presence of SFS, turbulent statistics are also altered across the measured cross-sections.

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