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TURBULENCE STRUCTURE AND IMPLICATIONS IN EXCHANGE PROCESSES IN HIGH-AMPLITUDE VEGETATED MEANDERS: experimental investigation

Donatella Termini , Alice Di Leonardo

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Highlights

- With the aid of a detailed dataset of three-dimensional flow velocity field collected in a large amplitude meandering laboratory flume we investigated the formation of coherent eddies and implications in exchange processes. As a result we verified that the mass and momentum transport, occurring between the vegetation and the flow over it, is controlled by the coherent turbulent motion.
- the contribution of coherent turbulence to exchange mechanisms may be significantly influenced by the relative submergence h/k_v . In particular, a different contribution from turbulence to the exchange mechanism can be observed for $h/k_v > 2$ and for $h/k_v < 2$.
- Close to the outer bank, where $h/k_v > 5$ and the counter-rotating cell develops, the lateral dispersion and the turbulent diffusion are strongly reduced. In the central region, for $2 < h/k_v < 5$, the vertical turbulent transport exchange between the vegetation and the overflow is more significant than the streamwise transport and the lateral dispersion could be important just over the top of vegetation; in the inner-bank region, $h/k_v < 2$, the lateral dispersion becomes important inside vegetation; the turbulent vertical transport becomes less important compared to the streamwise transport.

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