Abstract Submitted
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Turbulent coherent-structure dynamics in a natural surface storage zone: Mechanisms of mass and momentum transport in rivers[1] CRISTIAN ESCAURIAZA, JORGE SANDOVAL, Pontif Univ Catolica de Chile, EMMANUEL MIGNOT, Laboratoire de mecanique des fluides et d'acoustique, INSA de Lyon, France, LUCA MAO, Pontif Univ Catolica de Chile — Turbulent flows developed in surface storage zones (SSZ) in rivers control many physical and biogeochemical processes of contaminants in the water. These regions are characterized by low velocities and long residence times, which favor particle deposition, nutrient uptake, and flow interactions with reactive sediments. The dynamics of the flow in SSZ is driven by a shear layer that induces multiple vortical structures with a wide range of temporal and spatial scales. In this work we study the flow in a lateral SSZ of the Lluta River, a high-altitude Andean stream (4,000 masl), with a Re=45,800. We describe the large-scale turbulent coherent structures using field measurements and 3D numerical simulations. We measure the bed topography, instantaneous 3D velocities at selected points, the mean 2D free-surface velocity field, and arsenic concentration in the sediment. Numerical simulations of the flow are also performed using a DES turbulence model. We focus on the mass and momentum transport processes, analyzing the statistics of mass exchange and residence times in the SSZ. With this information we provide new insights on the flow and transport processes between the main channel and the recirculating region in natural conditions.

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