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Targeted particle delivery via reconnecting vortex rings[1] JOSHUA WAWRYK, JOSEPH MOUALLEM, HAMID DARYAN, ZHAO PAN, JEAN-PIERRE HICKEY, University of Waterloo — We propose and characterise a method for targeted delivery of finite-sized particles within a streamwise evolving channel flow. By randomly seeding particles at specific Stokes numbers within the core of vortex rings, the solid-phase is transported in the streamwise direction of the channel flow via self-advection of the vortex ring. The streamwise particle advection can then be halted and transferred into the wall-normal direction through anti-parallel vortex reconnection. To this end, a pair of nearly co-aligned vortex rings are setup to reconnect at a streamwise distance, thus enabling a transfer of the solid particles to the side walls of the channel. This talk will propose a systematic approach towards targeted particle delivery and quantify the mass transport, through high-fidelity direct numerical simulations, to the side walls of a laminar channel flow. This approach can be extended for use in drug delivery, surface treatment of internal flow passages, and food processing industry.

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