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**Adiabatic Control of a Pair of Elliptical Vortex Patches** DMITRI VAINCHTEIN, IGOR MEZIC, University of California Santa Barbara, LUCA CORTELEZZI, McGill University — We discuss an adiabatic method of controlling the interaction of a pair of elliptical vortex patches, including forcing or preventing merging. The idealized actuator is a point vortex of time-varying strength positioned at the joint center of vorticity. It represents a rotating rod. The sensors are realistic and measure the fluid velocity at two given locations. An observer is derived in order to reconstruct the internal state of the system, which is used by the controller to predict the strength of the actuator. The adiabatic controller, through the actuator, applies small perturbations to the system in order to modify the interaction of the vortex pair. We show that the controller can be made more efficient by leveraging the internal dynamics of the system, in particular, by keeping the perturbations is phase with the fast variable of the nominal system. The Hamiltonian structure of the control field is crucial to prove the controllability and the Hamiltonian structure of the nominal system leads to significant extension of the reachable domain. We perform a set of numerical simulations to confirm the analytical results.

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