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Feed-forward control of the flow over a backward-facing step FABRIEN JUILLET, Ecole Polytechnique, PETER SCHMID, CNRS - Ecole Polytechnique, BEVERLEY MCKEON, Caltech - GALCIT — In this study, the control of incoming perturbations in convection-dominated flows is analyzed numerically and experimentally. For this purpose, multiple sensors and actuators are used. First, a model is built from input and output data sequences using a least-squares system identification. Then, a feed-forward Model Predictive Controller (MPC) is designed. It appears that feed-forward control is particularly relevant when applied to convection-dominated flows. A very general and flexible formulation of the technique is introduced and validated on the flow over a backward-facing step. Although the objective sensors are localized on the walls, the impact of the control is more global and perturbations are also reduced in the middle of the channel. The coupling of system identification together with feed-forward control was found to be a flexible, efficient and experimentally feasible strategy. In particular, the successful numerical control is further supported by experimental results. Support from Ecole Polytechnique and the Partner University Fund (PUF) is gratefully acknowledged.

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