INTRODUCTION

We study two-layer flow (lower neutral /upper stable layer), separated by a sharp density discontinuity. This type of layered flow over mountains is known to generate different responses: from hydraulic jumps to lee waves and highly turbulent rotors, i.e., vortices with horizontal axis parallel to the mountain (1). Direct observations of rotors are scarce. We run experiments in a large stratified water tank to extend the exploration of rotor formation to a broad range of flow regimes. We concentrate on flow over double obstacles (e.g., representative of valleys oriented across the flow) and explore the occurrence of wave interference phenomena (1).

Using high-resolution reconstructions of the time-dependent 2D velocity field, we aim at reconstructing the flow field and, possibly, the distribution of turbulence within rotors (2).

EXPERIMENTAL DESIGN

The water tank size (12 x 3 x 1 m) and typical flow speeds (U = 10 cm s⁻¹) allow to simulate high Reynolds number flows, O(10⁶).

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These figures show the flow response over one and two obstacles of different height ratios. Images are taken from two mobile cameras (mounted side by side on the carriage and moving along with obstacle). Tracking the motion of particles between consecutive frames, the fluid velocity on a two-dimensional plane can be reconstructed (Particle Image Velocimetry, PIV).

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