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SYNCHRONIZED STATIONARY CLOUDS IN A STATIC FLUID

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The existence of stationary bound states for the hydrodynamic velocity field between two concentric cylinders is established. We argue that rotational motion, together with a trapping mechanism for the associated field, is sufficient to mitigate energy dissipation between the cylinders, thus allowing the existence of infinitely long lived modes, which we dub stationary clouds. We demonstrate the existence of such stationary clouds for sound and surface waves when the fluid is static and the internal cylinder rotates with constant angular velocity. These setups provide a unique opportunity for the first experimental observation of synchronized stationary clouds. As in the case of bosonic fields around rotating black holes and black hole analogues, the existence of these clouds relies on a synchronization condition between the angular velocity of the internal cylinder and the angular phase velocity of the cloud.