

## 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 central object and the angular phase velocity of the cloud.