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Non-linear interaction of boundary layers, internal waves and internal boundary currents in 2D in 2D stratified wakes

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Complete solutions of linearized classical governing equations describing fluid motions past 2D strips moving under arbitrary angle to horizon in continuously stratified fluid are compared with laboratory experimental data. Drag and lift forces on strip are calculated and compared with similar results in the boundary layer approximation. Fine structures of upstream and downstream wakes past different obstacles (strips, cylinders, bluff bodies) are visualized by schlieren instruments. We have distinguished transient and attached (lee) internal waves, downstream wakes with submerged interfaces and vortices, soaring singular interfaces, soaring vortices and vortex systems. Regime of flow with pronounced streaky structures is investigated. Conditions of streaks formation, their coalescence into streak clusters and transformation of clusters into vortex streets are studied past horizontally towing strip in details. New mechanism of isolated interfaces formation inside attached internal waves in continuously stratified fluid is identified. These interfaces are slow velocity analogue of shock waves as normal components of velocity are not equal on different sides of the interface. Formation of vortices on the leading edges of interfaces as product of internal waves and internal boundary current interaction is revealed. These interfaces act as collectors and super jets providing over diffusion and directed propagation of substances. Comparisons of laboratory and numerical data with visualization of environmental phenomena are done.