Abstract Submitted
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**Residual streaming flows in buoyancy driven cross-shore exchange**[1] GENO PAWLAK, RICARDO FELEZ, Univ of California - San Diego, KRISTEN DAVIS, University of California - Irvine, ANTONIO SANCHEZ, Univ of California - San Diego — Cross-shore exchange processes are critical for coastal ecosystems such as coral reefs with implications for transport of nutrients, larvae and heat. We present an analytical study of two-dimensional flow in a wedge driven by a time-dependent surface heat flux as a model problem to understand buoyancy-induced cross-shore flow. Besides the turbulent Prandtl number and the relevant Rayleigh number, both assumed to be of order unity, the solution is seen to depend on the geometry through a small parameter $\beta$ measuring the bottom slope. Following previous efforts (e.g., Farrow and Patterson, JFM 1993) an analytic solution is sought in the asymptotic limit $\beta \ll 1$ for a water layer bounded by an adiabatic bottom surface subject to a harmonic heat flux on the upper surface. The analysis reveals that the motion at leading order can be expressed as the sum of a harmonic component and a steady component, the latter driven by the nonlinear advection terms. This steady-streaming motion includes a near-shore vortex with associated counterclockwise recirculating motion that could have a significant effect on the near-short transport dynamics. The analytical solution is compared with numerical integrations of the complete conservation equations for small values of $\beta$.

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