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Mixing Dynamics Between Water and Biofuels ALINE COTEL, AVERY DEMOND, JIARIU LEI, ERICA GREEN, University of Michigan — Currently, ethanol-based biofuels are considered to be among the best alternatives to gasoline. However, the potential environmental impact of a spill of such fuels on aquatic environments is an area of open discussion and research. Since these fuels are a combination of a miscible fluid (ethanol) and an immiscible fluid (gasoline), models used for traditional gasoline fuels (immiscible in water) are not applicable. Preliminary experiments show that when a solution of ethanol and glycol is mixed with water, a third mixed fluid is formed. Two distinct mixing regimes are observed. A turbulent wake is created between the ethanol/glycol and water layers to cause the ethanol and glycol solution to entrain and mix into with the water phase. In the first regime, due to nonlinear mixing behavior, a dramatic overturning is possible for a certain range of parameters. The second regime begins when the turbulent wake has dissipated and the internal wave created by the plate has begun to settle, typically within the first minute. At this point, Bénard-like cells, similar to those typically seen in Rayleigh-Bénard convection, form at the interface and relatively slow mass transfer is evident. Both regimes are described quantitatively with a set of dimensionless parameters.

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