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Mixing in Thin Flows over a Curved Substrate[1] JEAN-LUC THIFFEAULT, KHALID KAMHAWI, Imperial College London — We consider steady gravity-driven flow of a thin layer of viscous fluid over a curved substrate. The substrate has topographical variations ('bumps') on a large scale compared to the layer thickness. Using lubrication theory, we find the velocity field in generalized curvilinear coordinates. We correct the velocity field so as to satisfy kinematic constraints, which is essential to avoid particles escaping the fluid when computing their trajectories. We then investigate the particle transport properties of flows over substrates with translational symmetry, where chaotic motion is precluded. The existence of trapped and untrapped trajectories leads to complicated transport properties even for this simple case. For more general substrate shapes, the trajectories chaotically jump between trapped and untrapped motions [1].

[1] J.-L. Thiffeault and K. Kamhawi, http://nlin/0607075

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