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Vorticity dipoles and a theoretical model of a finite force at the moving contact line singularity PETER ZHANG, ADAM DEVORIA, KAMRAN MOHSENI, Univ of Florida - Gainesville — In the well known works of Moffatt (1964) and Huh & Scriven (1971), an infinite force was reported at the moving contact line (MCL) and attributed to a non-integrable stress along the fluid-solid boundary. In our recent investigation of the boundary driven wedge, a model of the MCL, we find that the classical solution theoretically predicts a *finite* force at the contact line if the forces applied by the *two* boundaries that make up the corner are taken into consideration. Mathematically, this force can be obtained by the complex contour integral of the holomorphic vorticity-pressure function given by $G = \mu\omega + ip$. Alternatively, this force can also be found using a carefully defined real integral that incorporates the two boundaries. Motivated by this discovery, we have found that the rate of change in circulation, viscous energy dissipation, and viscous energy flux is also finite per unit contact line length. The analysis presented demonstrates that despite a singular stress and a relatively simple geometry, the no-slip semi-infinite wedge is capable of capturing some physical quantities of interest. Furthermore, this result provides a foundation for other challenging topics such as dynamic contact angle.

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