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A Model Problem for Blob-Driven Tear Film Breakup (TBU)[1]
LAN ZHONG, C.F. KETELAAR, R.J. BRAUN, T.A. DRISCOLL, University of Delaware, P.E. KING-SMITH, The Ohio State University, CAROLYN G. BEGLEY, Indiana University — A model problem is developed to simulate tear film break up by assuming the existence of a flexible non-spreading blob with constant surfactant surface concentration. These assumptions model in vivo observations of an excess of tear film lipid that does not spread, with the surfactant concentration approximating the lipid layer. The model includes the effects of evaporation, osmolarity, surface tension, viscosity, the Marangoni effect and insoluble surfactant transport. The evaporative fluxes are input as representative functions based on data from experiments. A strong flow driven by surface tension gradient is observed from the numerical results, which may drive TBU at times compatible with in vivo observations. The TBU dynamics are studied as functions of blob size, surfactant properties and other parameters to establish regimes were TBU may be driven primarily by Marangoni effects.

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