

Abstract Submitted
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A Overset Grid Method for Fourth Order Evolution Equations of Human Tear Film¹ K.L. MAKI, R.J. BRAUN, T.A. DRISCOLL, A. HERYUDONO, University of Delaware, P.E. KING-SMITH, The Ohio State University, P. FAST, Lawrence Livermore National Laboratory — We developed an overset grid method to simulate the formation and relaxation of the human tear film over multiple blink cycles. We studied limiting cases of the absence and presence of insoluble surfactants on the film's free surface. The evolution is described by a single fourth order nonlinear partial differential equation that arises from lubrication theory on a domain whose length varies significantly with time. Numerical computations, found by implementing a finite difference based method of lines on a overset grid, explore the dynamics of the tear film including the effects of evaporation, gravity, intermolecular forces and reflex tearing. Comparison with in vivo measurements are made.

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