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R J Braun* (rjbraun@udel.edu), Dept of Mathematical Sciences, University of Delaware, Newark, DE 19716, and **T A Driscoll, J Dorsch, D Sinopoli, A Phatak, R A Luke and C G Begley**. *Automated Tear Film Breakup Detection and Mechanism Determination*.

The tear film is a thin fluid multilayer left on the eye surface after a blink. A good tear film is essential for health and proper function of the eye, yet millions have a condition called dry eye disease (DED) that inhibits vision and may lead to inflammation and ocular surface damage. There is little quantitative data about tear film failure, often called tear break up (TBU). Currently, it is not possible to directly measure important variables such as tear osmolarity with TBU. We discuss automatic methods that we have developed to extract data from video of healthy eyes, and to estimate important variables like osmolarity within regions of TBU. The data extraction is an average value over a small square where TBU has been identified by a convolutional neural network trained to find TBU in fluorescence imaging of the tear film. The parameter estimation is from a nonlinear least squares fit to that data of an ordinary differential equation model that contains parameters representing evaporation rate of water and the flow along the eye surface. Not only is new data obtained, but far more data, enabling statistical methods to be applied. So far, the methods provide baseline data for TBU in healthy subjects; future work will produce data from DED subjects. (Received January 13, 2022)