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Multiscale modeling of thrombus formation and its application in simulating the development of thrombus in retinal microaneurysms HE LI, XIAONING ZHENG, ALIREZA YAZDANI, Division of Applied Mathematics, Brown University, SAMPANI KONSTANTINA, JENNIFER SUN, Beetham Eye Institute, Joslin Diabetes Center, Boston, MA, United States, GEORGE KARNIADAKIS, Division of Applied Mathematics, Brown University — I will present methods for atomistc-continuum coupling that enable multi-fidelity modeling of the multiscale processes taking place in thrombus formation and in the early stages. We use dissipative particle dynamics, force coupling methods and phase field methods to bridge different time and spatial scales involved in the thrombus formation process. Specifically, we simulate the aggregation of platelets by coupling a spectral/hp element method with a force coupling method. Once platelets aggregate, we convert the platelet distribution into a three-dimensional continuum field to estimate the clot volume fraction, which serves as an input for the phase-field simulation. Then, we use the phase-field method to simulate the interaction between the formed thrombus and flowing blood. At last, I will show some preliminary results from implementation of this framework to model the formation of thrombus in retinal microaneurysm, a sign of initial stage diabetic retinopathy.

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