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Numerical computations of ionic electrodiffusion and osmotic water flow in cells LINGXING YAO, Case Western Reserve University, YOICHIRO MORI, University of Minnesota — We develop a computational method to characterize ionic electrodiffusion and osmotic water flow in cellular systems. In the biological model system we used, cell membranes, which are permeable to both water and ionic flows, divide the domain into intracellular and extracellular regions. The cell membranes move with the flow it is embedded in, while its elastic force and osmotic forces due to ions will in turn affect fluid properties. The whole system is then consists of fluid-structure interactions, coupled with ionic electrodiffusion on domain with moving (internal) interfaces. The numerical computation of advection-diffusion in a 2d rectangle domain with moving boundaries is carried out by using a embedded Cartesian grid method over the entire rectangle domain, which represents the intra- and extracellular regions, while the fluid-structure interactions is handled by the Immersed Boundary Method. We will describe our numerical scheme of solving this PDE system and illustrate the results with some simple applications as the proof of principles.

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