An immersed boundary method for mass transfer across permeable moving interfaces

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In this talk, we present an immersed boundary method for mass transfer across permeable deformable moving interfaces interacting with the surrounding fluids. One of the key features of our method is the introduction of the mass flux as an independent variable, governed by a non-standard vector transport equation. The flux equation, coupled with the mass transport and the fluid flow equations, allows for a natural implementation of an immersed boundary algorithm when the flux across the interfaces is proportional to the jump in concentration. As an example, the oxygen transfer from red blood cells in a capillary vessel is used to illustrate the applicability of the proposed method. We show that our method is capable of handling multi-physics problems involving fluid-structure interaction with multiple deformable moving interfaces and (interfacial) mass transfer simultaneously. This is joint work with Xiaobo Gong and Zhaoxin Gong, Shanghai Jiaotong University.