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Solutal Marangoni flow induced by a solute source. ISLAM BE-NOUAGUEF, Department of Mathematical Sciences, New Jersey Institute of Technology, Newark, New Jersey, NAGA MUNSUNURI, Department of Mechanical and Industrial Engineering, New Jersey Institute of Technology, Newark,New Jersey, DENIS BLACKMORE, Department of Mathematical Sciences, New Jersey Institute of Technology, Newark, New Jerey, IAN S. FISCHER, PUSHPENDRA SINGH, Department of Mechanical and Industrial Engineering, New Jersey Institute of Technology, Newark,New Jersey — The study of the solutocapillary flow induced in a waterbody due to the presence of a solute source or sink on its surface is reported. The surface tension of water increases with increasing salt concentration, and so, for example, when a freshwater source is present on the surface the local salt concentration is reduced which in turn makes the interfacial tension near the source smaller than that away from the source where the salt concentration is larger. This gives rise to an interfacial gradient away from the source which drives the flow. We have analytically studied the axially symmetric analytic solution to this problem and have made a comparison with the experimental data obtained by the PIV (Particle Image Velocimetry) and PLIF (planer laser-induced fluorescence) techniques. It is shown that a freshwater source gives rise to a doublet flow such that the flow comes towards the source within a conical region with its vertex at the source and outside the conical region the flow moves away from the source. The half cone angle increases with increasing source strength and for a typical solutocapillary flow it is ~70-80 degrees.

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