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Topological Advection SPENCER SMITH, Mount Holyoke College — Fluid advection problems typically involve either quantifying mixing (e.g. with topological entropy) or finding barriers to mixing (e.g. by identifying Lagrangian coherent sets). Since topological entropy is given by the exponential stretching rate of material curves and coherent sets are defined to have boundaries which do not appreciably stretch, both advection problems have a common formulation: find the future state of material curves under the action of the flow. When our knowledge of the fluid system is through sparse data (finite set of trajectories), which is the natural output of experiments, this constitutes the problem of topological advection. The current best known topological advection algorithm blends a braid theory representation of trajectories with a clever coordinate system on the space of closed material curves. I will present a new algorithm which solves the topological advection problem more efficiently and perhaps more naturally. It uses ideas from computational geometry to maintain a triangulation of the points as they move, while encoding curves as edge weights that enumerate transverse intersections. These results also naturally extend to higher dimensional versions of this problem.

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