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Helicity conservation in classical vortex knots and links[1] MARTIN W. SCHEELER, DUSTIN KLECKNER, James Franck Institute, The University of Chicago, GORDON L. KINDLMANN, Computation Institute, The University of Chicago, WILLIAM T.M. IRVINE, James Franck Institute, The University of Chicago — Vortex knots and links in an ideal fluid remain knotted or linked, ensuring that the topology of the vortex field lines is conserved. For a real fluid, however, this conservation is jeopardized by the presence of reconnection events, which allow vortex tubes to reconfigure their global topology; indeed, it has recently been observed that knotted and linked vortex tubes in classical fluids unknot or untie themselves via a series of these reconnection events. Remarkably, we observe that these reconnection processes conserve a measure of the vortex line topology (helicity) and do so through a geometric mechanism that efficiently transfers this topology across scales. The geometric nature of this topology transfer, along with its recent observation in superfluid vortices, suggests that helicity conservation may be a robust and generic feature of non-ideal flows.

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