Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Effect of size and shape on the transport of particles over the free surface of a natural stream[1] HENRI SANNESS SALMON, LUCIA JANE BAKER, JESSICA KOZAREK, University of Minnesota, FILIPPO COLETTI, ETH Zurich — Plastics are the most prevalent type of marine debris found in our oceans and great lakes. They come in many shapes and sizes and degrade into very small pieces (microplastics) that irreversibly pollute the environment. Understanding how these objects are transported in natural streams is critical for capturing them before they reach large bodies of water. Here we investigate experimentally the motion of floating particles on the turbulent free surface of the Outdoor Stream Lab, a field-scale meandering stream at the St. Anthony Falls Laboratory. We consider mm-sized tracers as well as cm-sized disks and rods. Particle tracking velocimetry is used to obtain Eulerian and Lagrangian statistics of the particle motion at different flow rates. In particular, we analyze particle velocity, acceleration, spatial and temporal correlations, single-particle and particle-pair dispersion rates. The tracer analysis allows to define the characteristic spatial and temporal scales of the free-surface turbulence and its dispersion properties. The larger particles are directly compared to the tracers, highlighting the influence of shape and size on their velocity and dispersion.

[1]Legislative-Citizen Commission on Minnesota Resources (LCCMR)

Henri Sanness Salmon
University of Minnesota

Date submitted: 01 Aug 2020 Electronic form version 1.4