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**Fluids, gauge fields, and gravity: connections by way of the classical double copy** TUCKER MANTON, CINDY KEELER, NIKHIL MONGA, Arizona State University — Gravity has been shown to be connected to fluid mechanics through the fluid/gravity correspondence, which asserts that  $d + 1$ -dimensional Einstein equations in general relativity (GR) capture the  $d$ -dimensional Navier-Stokes (NS) equations. More recently, it's been discovered that exact solutions in GR are connected to exact solutions in gauge theories through the classical double copy. In this presentation, we build the third connection between gauge theory and NS solutions using the double copy picture. The particular gauge  $\leftrightarrow$  gravity mapping we employ, referred to as the Weyl double copy, is used to analyze two classes of spacetimes which correspond to two separate restrictions on the fluid velocity fields. We discuss the two types of fluid solutions stemming from the two classes of spacetimes, and their corresponding gauge field solutions. Our findings include incompressible vortex solutions on the fluid side being mapped to (Abelian) gauge theory solutions corresponding to constant electromagnetic fields. Within this class of solutions, we further find that the flux of the Poynting vector is equivalent to the flow of kinetic energy of the fluid (enstrophy), suggesting a natural correspondence between gauge theory and fluid mechanics.

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