

DFD14-2014-002550

Abstract for an Invited Paper  
for the DFD14 Meeting of  
the American Physical Society

**Stanley Corrsin Award Lecture: Lagrangian Measurements in Turbulence: From Fundamentals to Applications**

EBERHARD BODENSCHATZ, Max Planck Institute for Dynamics and Self-Organization

In my talk I shall present results from particle tracking experiments in turbulence. After a short review of the history of the field, I shall summarize the most recent technological advances that range from low and high-density particle tracking to direct measurements of the Lagrangian evolution of vorticity. I shall embark on a journey that describes the discoveries made possible by this new technology in the last 15 years. I present results that challenge our understanding of turbulence and show how Lagrangian particle tracking can help us ask questions on turbulent flows that so far were hidden. I shall show how Lagrangian particle tracking may provide important insights into the reversibility of turbulent flows, on vorticity generation, the energy cascade and turbulent mixing. I shall describe the consequences of inertial particle transport on rain formation and end with an outlook on how Lagrangian particle tracking experiments on non-stationary flows in real-world situations may provide high quality data that can support real world engineering problems. I am very thankful for the support by Cornell University, the National Science Foundation, the Research Corporation, the Alfred P. Sloan Foundation, the Kavli Institute for Theoretical Physics, the German Research Foundation, the European Union and the Max Planck Society. I very gratefully acknowledge the excellent partnership with many colleagues in the field of fluid mechanics and turbulence.