



**ATS/CIRA Colloquium**

**Matthew J. Berg**

**Visiting ATS from Kansas State University**

**Digital Holography of Aerosol Particles**

**Hosted by Sonia Kreidenweis**

**Friday, April 21, 2017**

**ATS room 101**

**Discussion will begin at 11:15 a.m.**

**Refreshments will be served at 10:45 a.m. in the weather lab**

Methods to determine the physical properties of aerosol particles is important in a vast array of scientific and applied contexts. Due in part to the difficulty of collecting such particles, a variety of contact-free techniques have been developed that infer information about the particles in an indirect manner. A popular example is elastic light-scattering where the angular pattern of light scattered from a particle is analyzed to estimate particle properties like shape and size. This approach is often called the inverse problem, as there is generally no way to know if the inferred information is correct. Fundamentally, this is due to the loss of optical phase information in such measurements. An alternative approach is to image the particles using holography. By placing a digital image-sensor in an optical beam containing a particle, the interference pattern produced by the scattered and unscattered light can be easily measured. The pattern constitutes a digital hologram of the particle and useful information can be extracted from it directly since phase information is encoded in the hologram. For example, applying a Fourier-transform operation yields a silhouette-like image of the particle, thus revealing its shape and size without any need for *a priori* information. The extinction cross section can also be obtained from the hologram. Thus, digital holography “solves” the classic inverse problem. This talk will present our recent work in this area and its future applications, including plans for field measurements of coarse-mode atmospheric aerosols.

**Bio:** Matthew Berg is a tenured associate professor of physics in the Department of Physics at Kansas State University (KSU). Professor Berg received a PhD in physics from KSU in 2008 and a BS in Engineering Physics from the Colorado School of Mines in 2003. Following graduate school, he held a National Research Council postdoctoral fellowship at the U.S. Army Research Laboratory from 2009-2010. In 2010 he joined the Department of Physics & Astronomy at Mississippi State University as an assistant professor and then KSU in 2016. Throughout his career, Berg’s research has focused on various applications of electromagnetic scattering. His initial theoretical work in this area led to new discoveries in the asymptotic nature of optical extinction, i.e., the so-called extinction paradox. Later, he developed laboratory techniques with digital holography and demonstrated their potential for aerosol characterization. Berg recently received the NSF CAREER award to further this holography work in the area of coarse-mode atmospheric aerosol sensing and characterization.

Link to colloquium videos and announcement page: <http://www.atmos.colostate.edu/dept/colloquia.php>