Atmospheric aerosol particles range greatly in size and species, and have very important effects on atmospheric and hydrologic cycles. For example, they directly interact with solar radiation and act as cloud condensation nuclei, which are the seeds of clouds. Consequently, aerosols influence the earth’s radiation balance, atmospheric visibility, and the biogeochemical cycling and transport of nutrients and contaminants. Aerosols can also negatively impact public health and welfare. This talk will discuss recent measurements focused on aerosol-water interactions in both maritime and continental atmospheres, with a focus on how aerosol perturbations modify cloud properties and precipitation generation.