Modeling of the Influence of Saharan Dust and Other Aerosols on Hurricane Nadine (2012) During the NASA Hurricane and Severe Storm Sentinel (HS3) Investigation

*Jainn J Shi[1,2], Scott A Braun[1], Zhining Tao[1], Toshihisa Matsui[1], Christa Peters-Lidard[1]

1. NASA Goddard Space Flight Center, 2. GESTAR/Morgan State University

The Hurricane and Severe Storm Sentinel (HS3) was a multiyear field campaign (2012-14) with the goal of improving understanding of hurricane formation and intensity change and determining the extent to which the Saharan air layer (SAL) impacts storm intensification. This talk will focus on simulations of the early stages of Hurricane Nadine (2012), which interacted with the SAL and never intensified beyond a minimal hurricane. Given the complexity of aerosol effects on cloud microphysics and radiation and their subsequent effects on deep convective clouds, there is a need to assess the combined aerosol effects of microphysics and radiation. We use the Goddard Space Flight Center version of the Weather Research and Forecasting model with interactive aerosol-cloud-radiation physics to study the influence of the SAL and other aerosols (sea salt and black/organic carbon) on Nadine via a series of model sensitivity runs. We also use three 30-member ensemble simulations of Nadine, one ensemble with aerosols of all types (dust, pollution, biomass burning, sea salt), one with dust only, and one without aerosol interactions. The role of the SAL is partly assessed through a correlation analysis relating relevant fields (temperature, humidity, winds) to the intensity of the simulated storms averaged over the final three days of simulation. The impacts of Saharan dust and other aerosols are evaluated by looking at the differences between the control (no aerosol) and either the all-aerosol or dust-only ensemble members.

Keywords: tropical cyclone, aerosol-cloud-radaition interaction, numerical modeling

