

## **Cryosphere-Aerosol Interactions in a High-Resolution Global Climate Model**

*Dr. Sarah Kapnick & Dr. Paul Ginoux, Geophysical Fluid Dynamics Laboratory, National Oceanic and Atmospheric Administration*

High Mountain Asia is also known as the “Third Pole” due to it possessing the highest concentration of ice and snow outside of the Polar Regions. Under climate forcing, the timing and amount of snowfall over the region will be altered, which can change the regional water budget irrespective of changes in glacier and snowmelt runoff caused by warming temperatures. Snow and ice in the region is not pure; dust deposition in High Mountain Asia can alter the surface albedo and influence cryosphere melt dynamics.

We are integrating dust satellite products (TOMS, MODIS and SeaWiFS) ~15-20 years with global climate model simulations to quantify dust deposition events to explore year-to-year climate variability, the role of dust and surface albedo on precipitation/snow, and regional hydroclimate predictability. We are using a high-resolution (0.5 degree horizontal atmospheric resolution) global climate models developed at the National Oceanic and Atmospheric Administration Geophysical Fluid Dynamics Laboratory (NOAA / GFDL). Previous GFDL models at high resolution have been shown to be effective in representing the hydroclimate seasonal cycle of High Mountain Asia ([Kapnick et al. 2014](#)). This project can be broken down into 3 parts:

1. We will utilize satellite data to identify and quantify regional dust sources ([Ginoux et al., 2012](#)) and deposition ([Kaufman et al., 2005](#)) events.
2. We will explore year-to-year hydroclimate variability and quantify biases in snowmelt runoff timing with an emphasis on major dust-on-snow events.
3. We will use the results of stages one and two to implement observations-based idealized model simulations for dust on snow to quantify model improvements to snowmelt predictability, variability, and climate change influence by considering dust on snow.

Our data sets for dust and global climate model output for the HiMAT region will be made publicly available.