1. Interannual variability of orographic rainfall
The current configuration of the PMM hydrometeorological network in the Appalachians including 32 raingauge stations and a flux tower was completed in 2009 (Fig. 1.1). Annual amounts in 09-10 (strong El Niño) compared against annual amounts in 08-09 (moderate to weak La Niña) show an increase in annual rainfall of about 50%. Significant increases took place in the months of May, September (Figs 1.2a and b) and December.

2. Evaluation of Satellite Products
2.1 QPE Adjustment
A database of optimal QPE is being derived from NSSL's Q2 product by applying an orographic adjustment based on the PMM raingauge network at high elevations as well as valley stations from the HADS and ECOnest networks at low elevations (method 2), and without any separation by elevation threshold (method 1). Though differences in RMSE are small between the methods, there is marked improvement in low elevation QPE using method 2 (Fig. 2.1).

3. Orographic effects on spatial structure
To understand the mechanisms associated with the spatial and temporal rainfall distribution over the Southern Appalachians high resolution down to 1 km resolution is shown in Fig. 3.1. The segments and * mark raingauge locations.

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To understand the mechanisms associated with the spatial and temporal rainfall distribution over the Southern Appalachians high resolution down to 1 km resolution is shown in Fig. 3.1. The segments and * mark raingauge locations.

3.2 Dynamical downscaling and related uncertainties
To understand the mechanisms associated with the spatial and temporal rainfall distribution over the Southern Appalachians high resolution down to 1 km resolution dynamical downscaling of Hurricane Ivan, 2004 was conducted using WRF3.1.

3.3 Downscaled rainfall in the inner mountain region
Table 3.1: Simulation configurations and physics options.

3.4 Sensitivity to model configuration
Fig. 3.6: Differences of horizontally averaged RH between NARR_YSU and a) NARR_withoutTopo, b) NARR_MYJ, c) NARR_Cumulus. The small rectangle in (b) is the region used for horizontal average in Fig. 3.7, and the large rectangle is for Fig. 3.6.

Fig. 3.7: Time evolution of horizontally averaged vertical wind velocity (m/s), cloud water plus ice (g/kg), rain water (g/kg), and orographic precipitation (g/kg) for NARR_YSU (a to d) and NARR_MYJ (e to h) in the southeast corner of domain 1. The segments and * mark raingauge locations.

Fig. 3.8: A database of optimal QPE is being derived from NSSL's Q2 product by applying an orographic adjustment based on the PMM raingauge network at high elevations as well as valley stations from the HADS and ECOnest networks at low elevations (method 2), and without any separation by elevation threshold (method 1). Though differences in RMSE are small between the methods, there is marked improvement in low elevation QPE using method 2 (Fig. 2.1).