1. BACKGROUND

Global Climate Models (GCM) precipitation are often characterized by biases and coarse resolution that limit direct application for basin scale hydrological modeling. The biases in GCM are a low number of dry days which are compensated by too much drizzle, a bias in the mean and the inability to reproduce the observed heavy rainfall event. To address the bias of GCM, most of the climate studies couple bias correction and downscaling scheme. This study describes how to select appropriate GCM over the target region and a complete, efficient and comprehensive statistical bias correction method covering extreme rainfall, normal rainfall and frequency of dry days. The method is applied and validated at the Pampanga, Angat and Kaliwa basins in Philippines. Residents of the Manila metropolitan area rely on Angat Dam for 97% of their water resources and detailed analysis of future climate change impacts on these basins are urgently required for irrigation efficiency and future water supply balancing.

2. GCM SELECTION

- 21 in-stations data provided by Philippines Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
- Coupled Model Inter-comparison Project 3 (CMIP3) GCM gridded daily data
- 1981-2000 (the control period)
- 2046-2065 (SRESA1B1)
- Spatial correlation and root mean square error (Reference JRA-25 reanalysis data and GPCP)

3. STATISTICAL BIAS CORRECTION

- Sorting data decreasing order
- Assign equal total rain days as observed station in GCM
- Define zero correction threshold
- Define extreme threshold from top rank
- Extract extremes events
- Check sensitivity in extreme in GCM gridded series
- RGI GCM to GPD by itself
- Make correction by inverse function observed GPD
- Extract monthly normal rainfall between extreme and zero correction threshold
- Gamma CDF mapping for correction
- Same transfer function applied future projection

Extreme Rainfall Bias Correction by AMS

- Define lowest of AMS as threshold of extreme
- Fitting log-normal or Gumbel by plotting position method
- Find the inverse function of in-situ station as corrected extreme
- Corrected value reach in-situ stations' extreme values
- Discaracy in frequencies

4. RESULTS

- Validate extreme value in sorted (1981-2000)
- Validate extreme frequency analysis (1981-2000)
- Validate long term climatology inter-annual variability (1981-2000)
- Validate analyze recurrence level of extreme precipitation (2046-2065)
- Validate total number of dry days and continuous dry spell (2046-2065)

5. SUMMARY

- Six GCMs were selected
- According to their performances over Luzon Island in the Philippines
- Reduce the uncertainty of single GCM use
- Address address components associated with GCM output (extreme rainfall, normal rainfall and total frequency of dry days)
- Biases remove well by fitting the GPD
- Validate extreme rainfall frequency analysis over observation
- Estimate the maximum intensity of different return periods in near future
- Solve frequency of dry days bias by sorting and matching rank
- Two-parameter gamma distribution mapping monthly normal rainfall

An effective, simple and comprehensive bias correction method was developed for climate change impact assessment of basin scale hydrology, and for other impacts. Moreover, the method can be analyzed by discharge flow in further hydrological impact studies. Finally, the bias correction method should be proven by applying to different climate regions.

6. REFERENCES