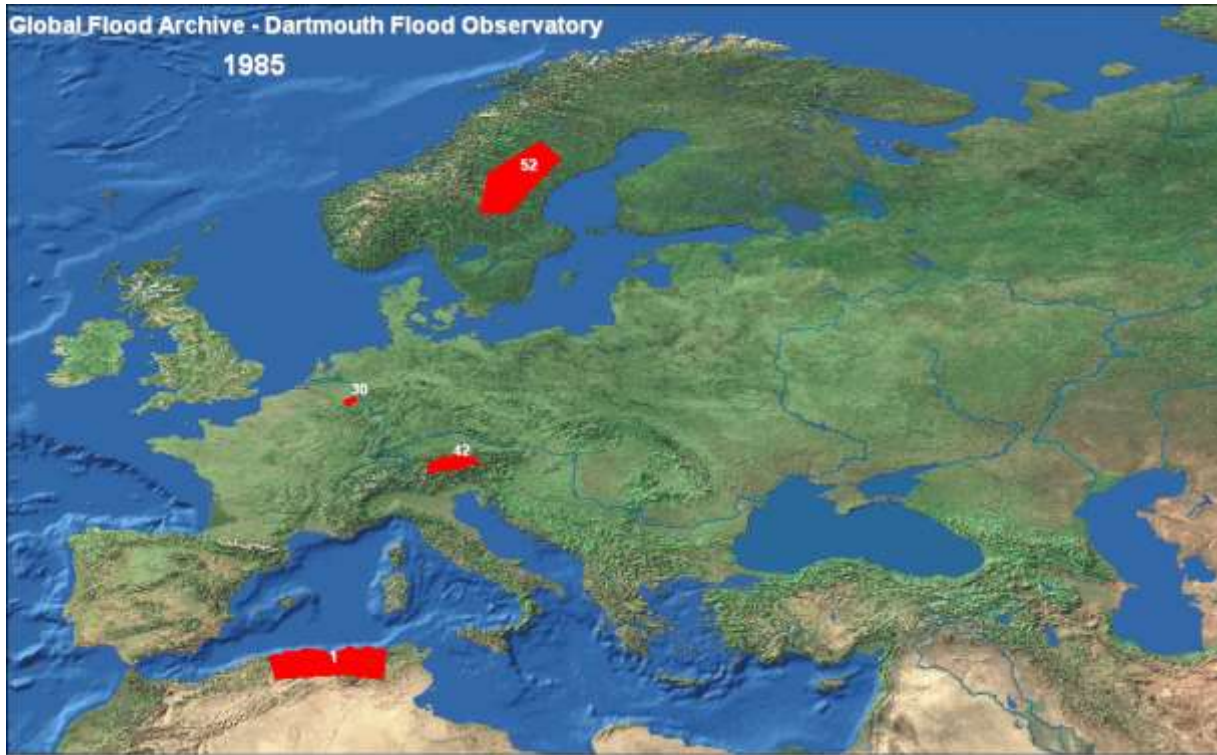# Principal Statistic Analysis of Rivers flow During Baseline and Impact Period

Saman Armal

PhD Candidate, Civil Engineering , The City College of New York

Professor Reza Khanbilvardi

Director of NOAA Crest, Professor in Dept. of Civil Engineering, The City College of New York

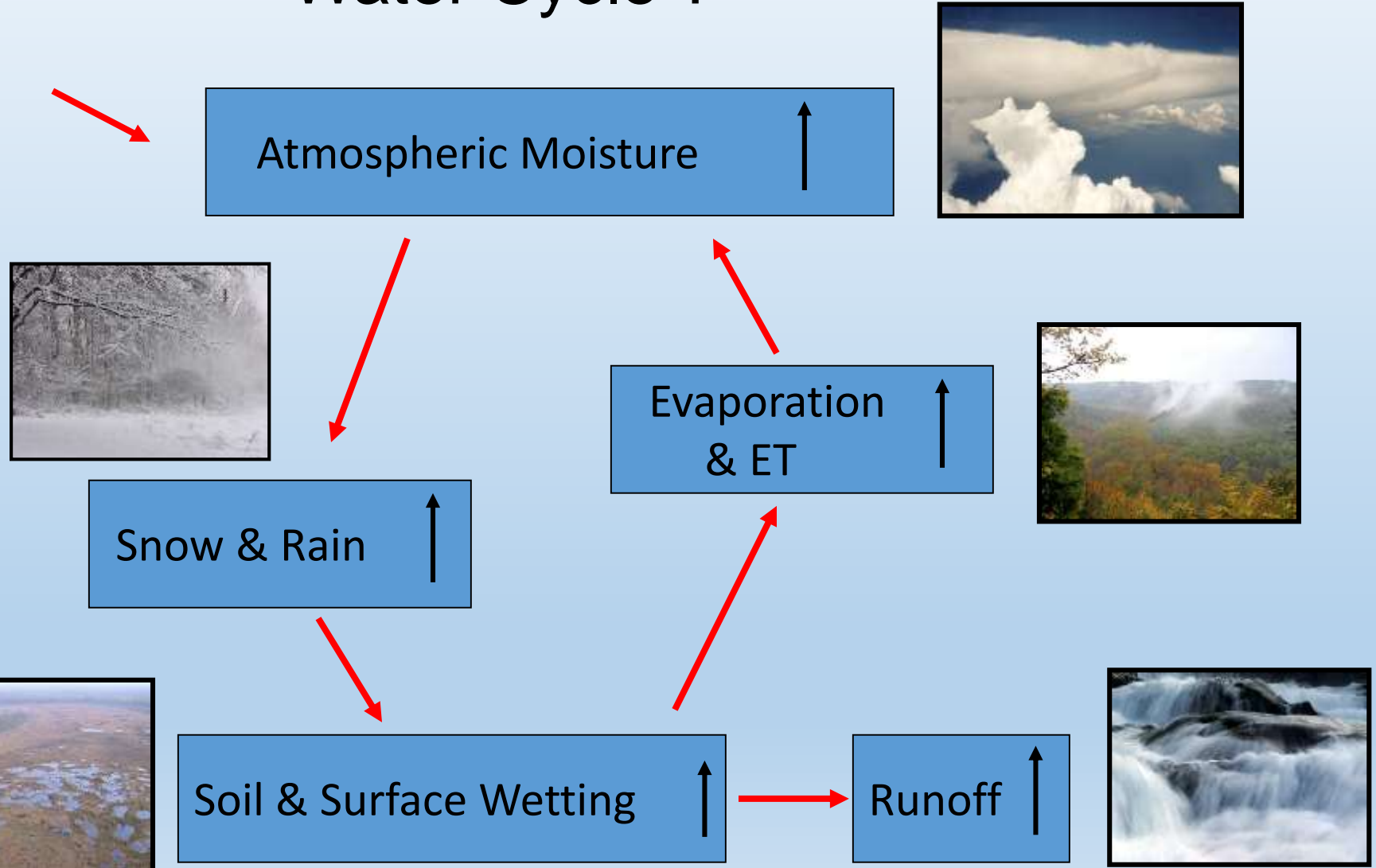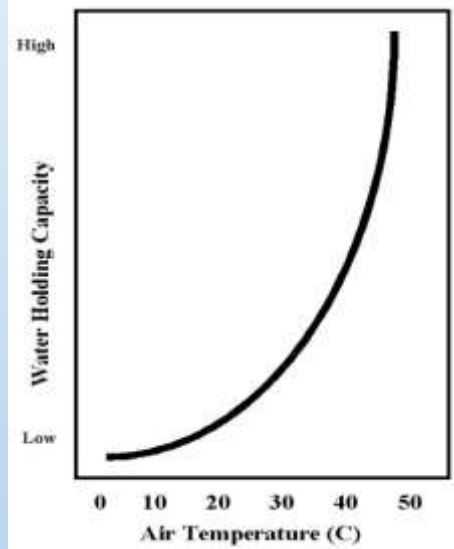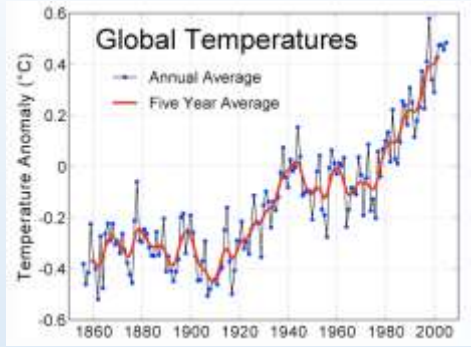Global Flood Archive - Dartmouth Flood Observatory
1985

- *80% of natural disasters' economic losses : hydro-meteorological events.*

- *Flooding damage in central Europe : 11.4-13.5 billion Euro.*

- *NYC, the estimated flood damage to buildings : $59 -129 million/year.*
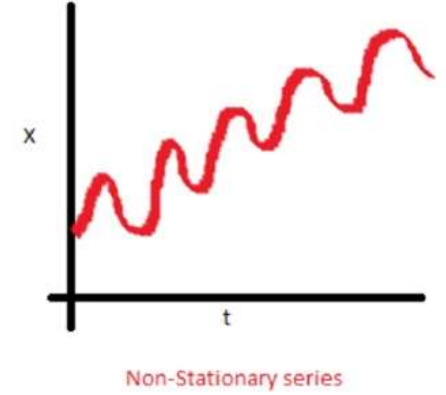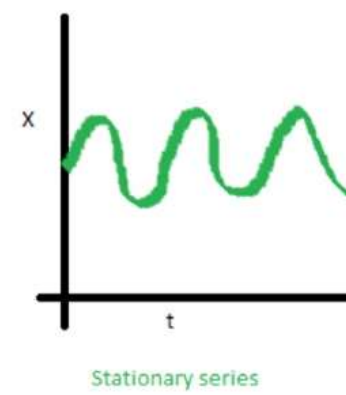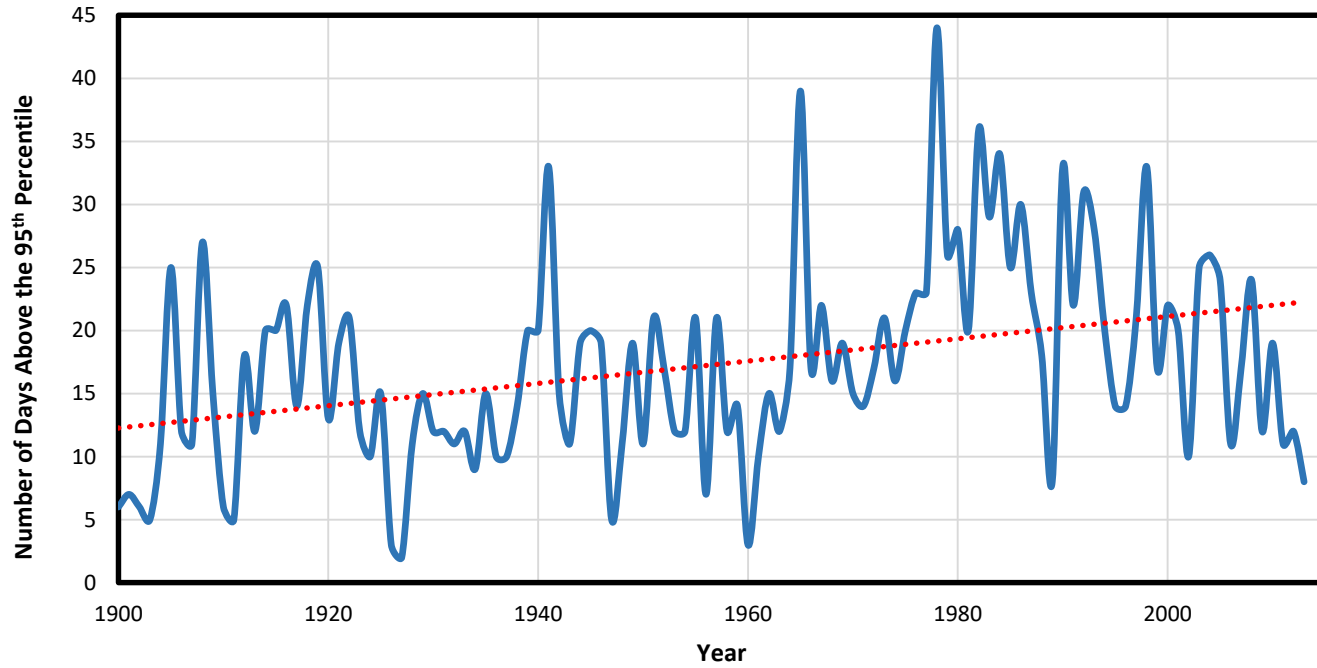
- *Super storm Sandy in NYC and NJ : USD $60 billion.*

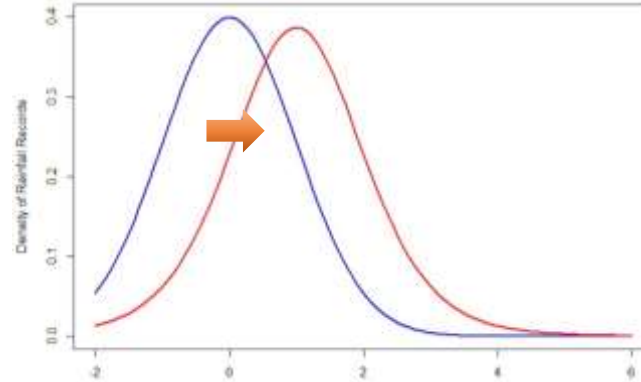FLOOD WARNING
FLOODING IS EXPECTED. IMMEDIATE ACTION REQUIRED.

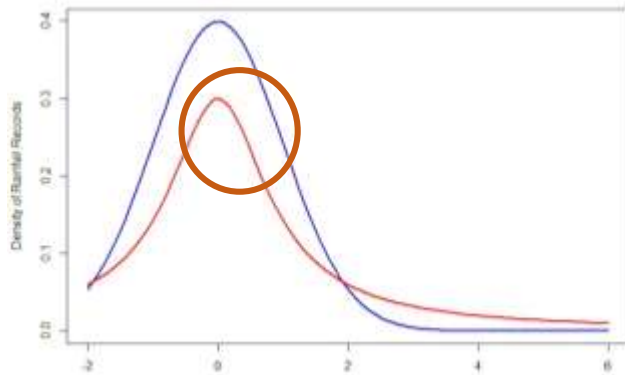# Climate Change
"Accelerated" or "Intensified" Water Cycle ?

Atmospheric Moisture ↑
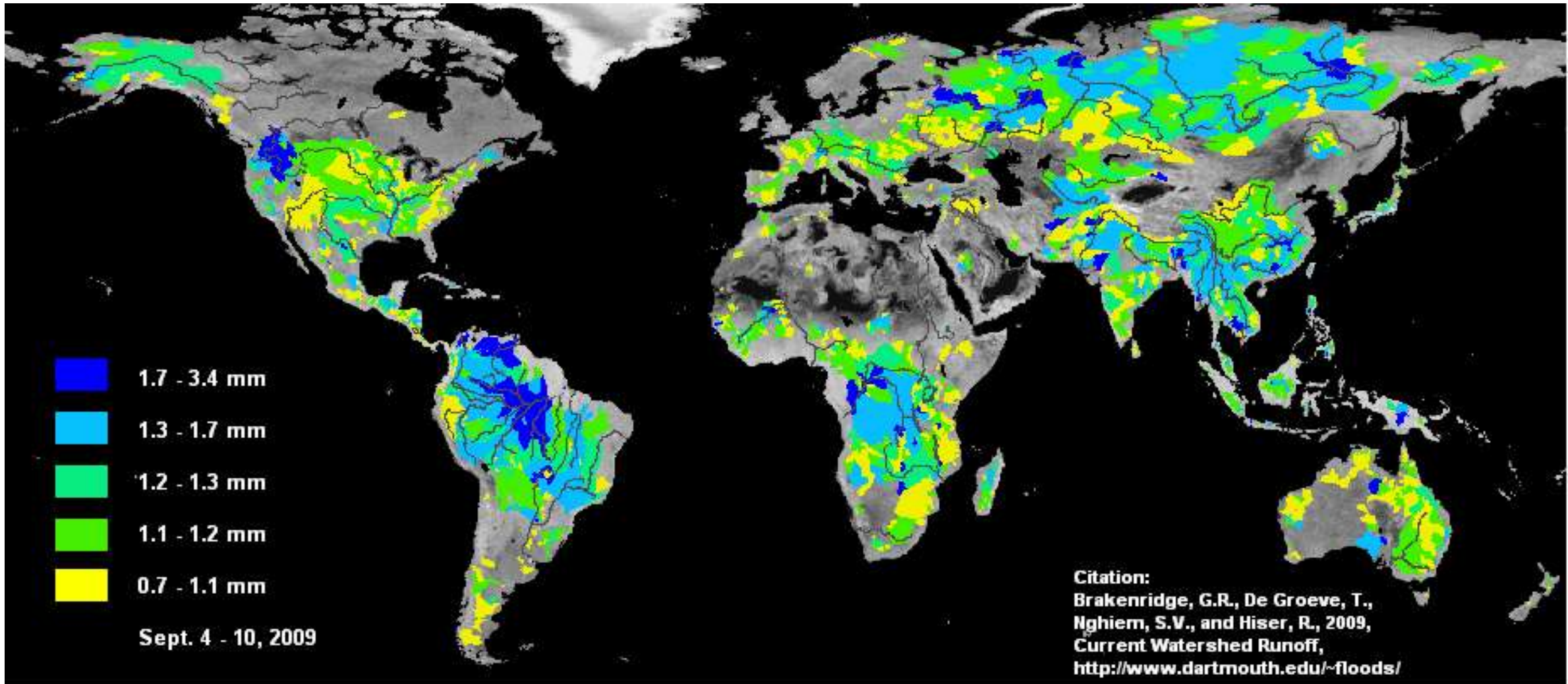
Snow & Rain ↑

Evaporation & ET ↑

Soil & Surface Wetting ↑ → Runoff ↑

Adopted from Charles J. Vörösmarty et al.

Stationary series

Non-Stationary series

Belle Mina Station, Rainfall

Legend:
- 1.7 - 3.4 mm
- 1.3 - 1.7 mm
- 1.2 - 1.3 mm
- 1.1 - 1.2 mm
- 0.7 - 1.1 mm

Sept. 4 - 10, 2009

Citation:
Brakenridge, G.R., De Groeve, T.,
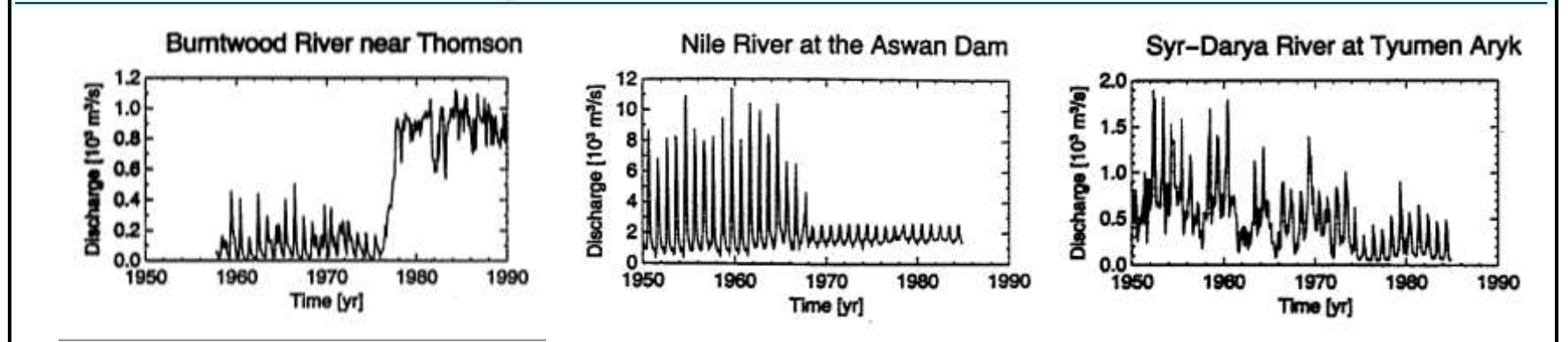Nghiem, S.V., and Hiser, R., 2009,
Current Watershed Runoff,
http://www.dartmouth.edu/~floods/

Change in the Global Runoff

HUMAN IMPCAT

CLIMATE

Source : https://earthzine.org/2011/04/29/floods-and-droughts-in-a-changing-climate-now-and-the-future/

Dams and Flow Variation

HUMAN IMPCAT ENGINEERING

Land Cover Change

Framing Committee/GWSP 2004, Eos AGU Transactions
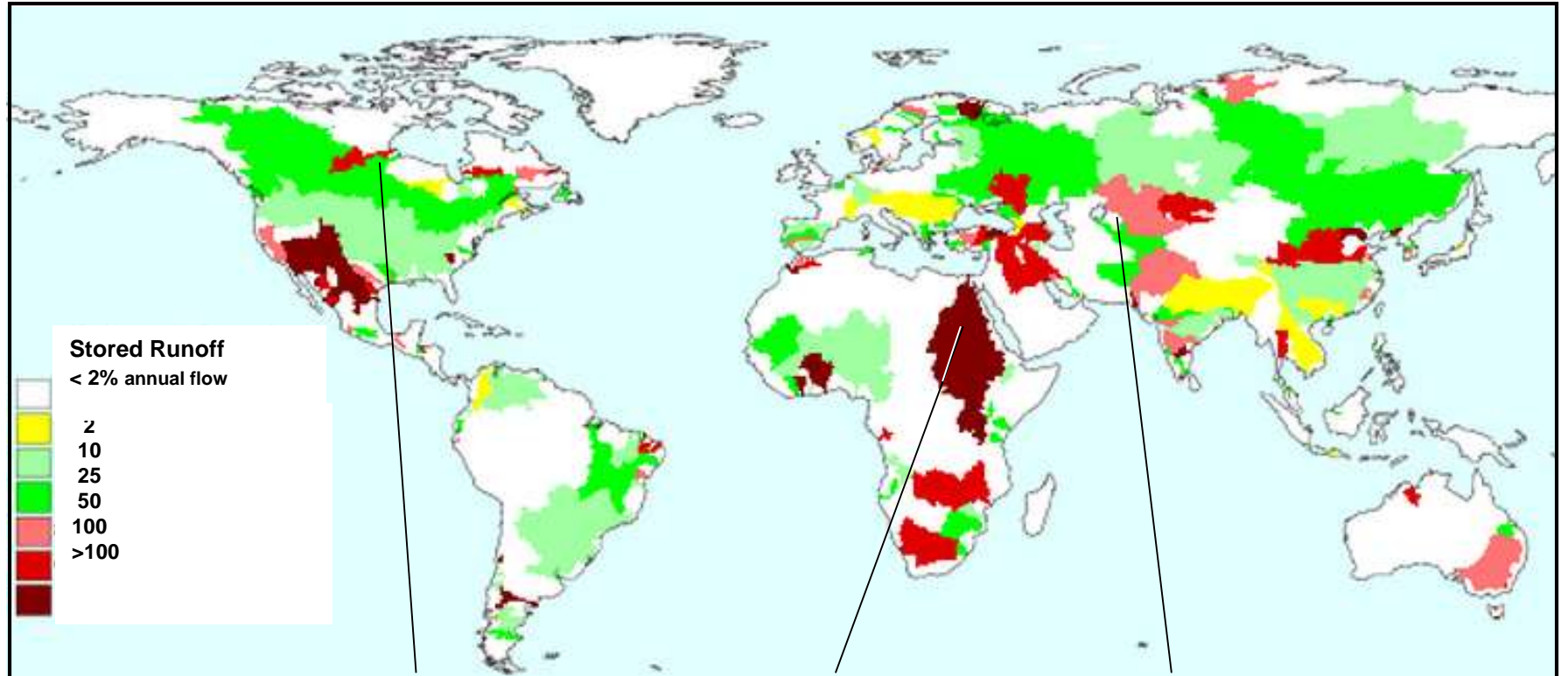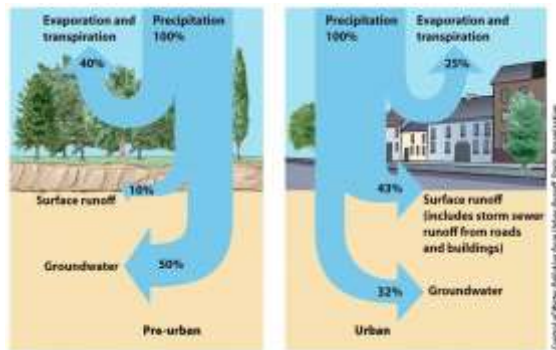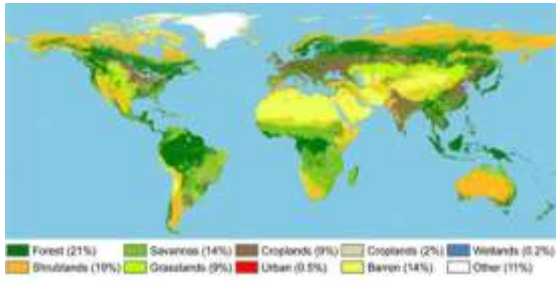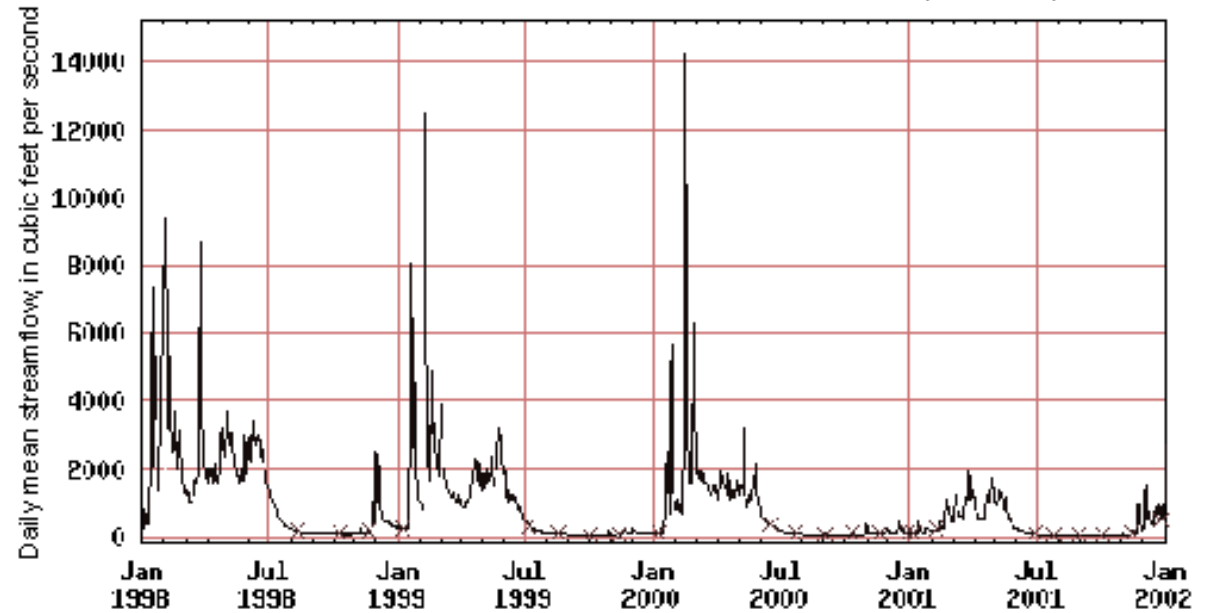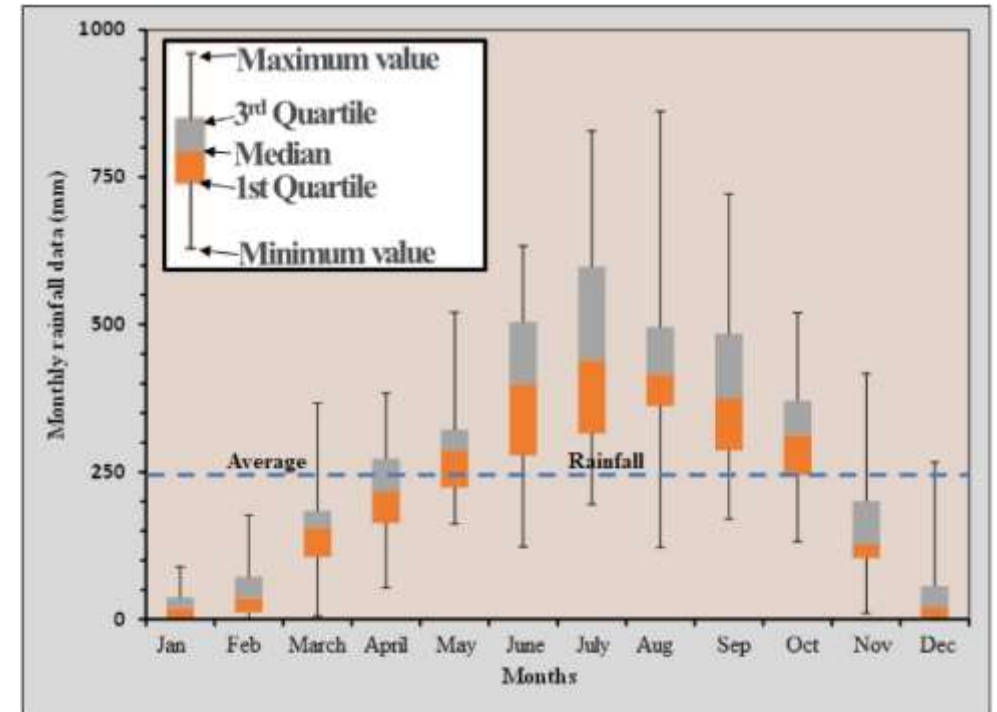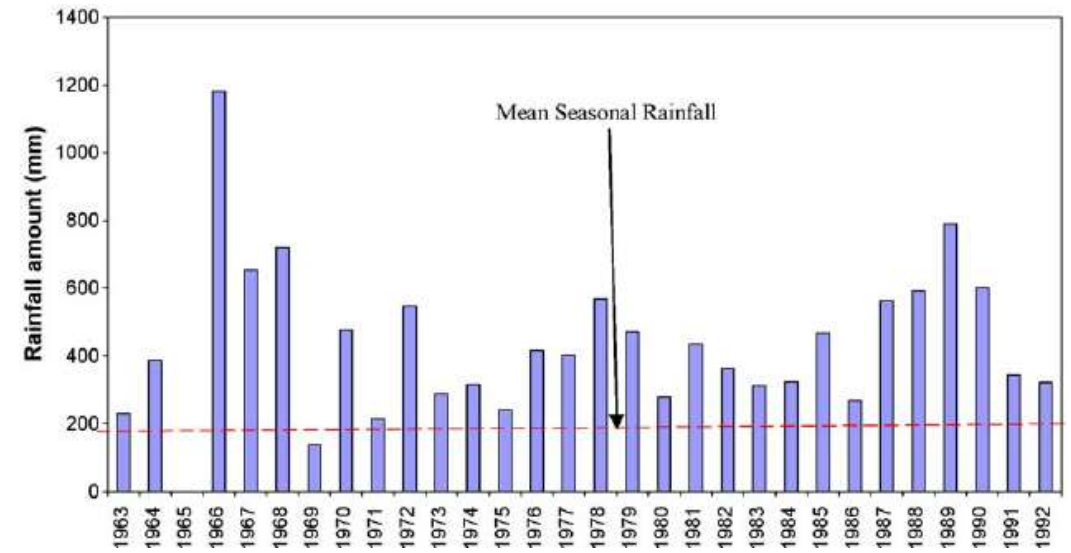
USGS 10109000 LOGAN RIVER ABOVE STATE DAM, NEAR LOGAN, UT
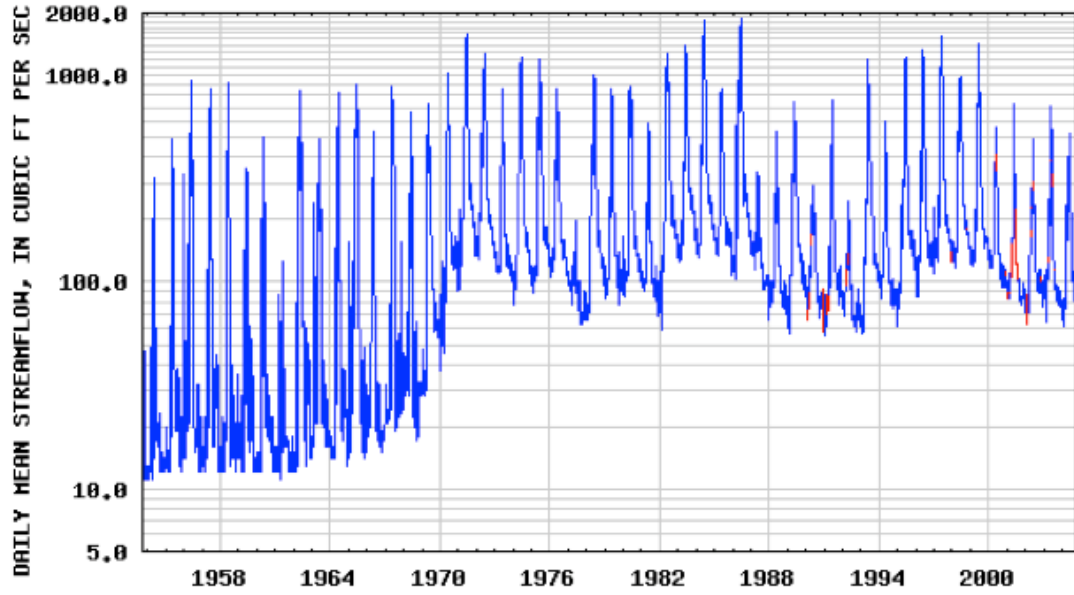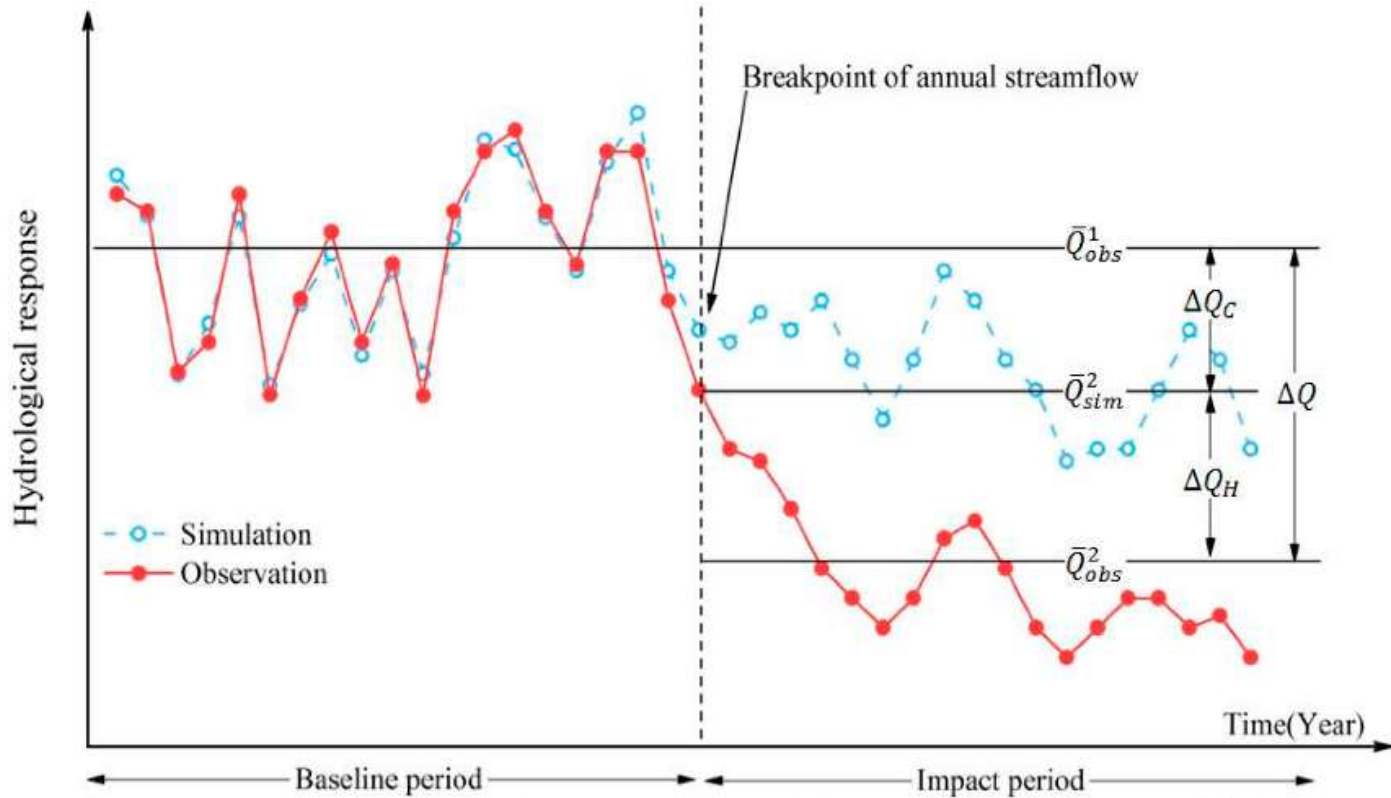
Logan River Streamflow

North Fork River Streamflow

USGS 11427000 - North Fork American River at North Fork Dam, California, USA

Comparing before and after impact in stream flow :

- Evaluation of Statistics properties of hydrological variables

- Understating the evolution of weather variables over time

- **Objective**

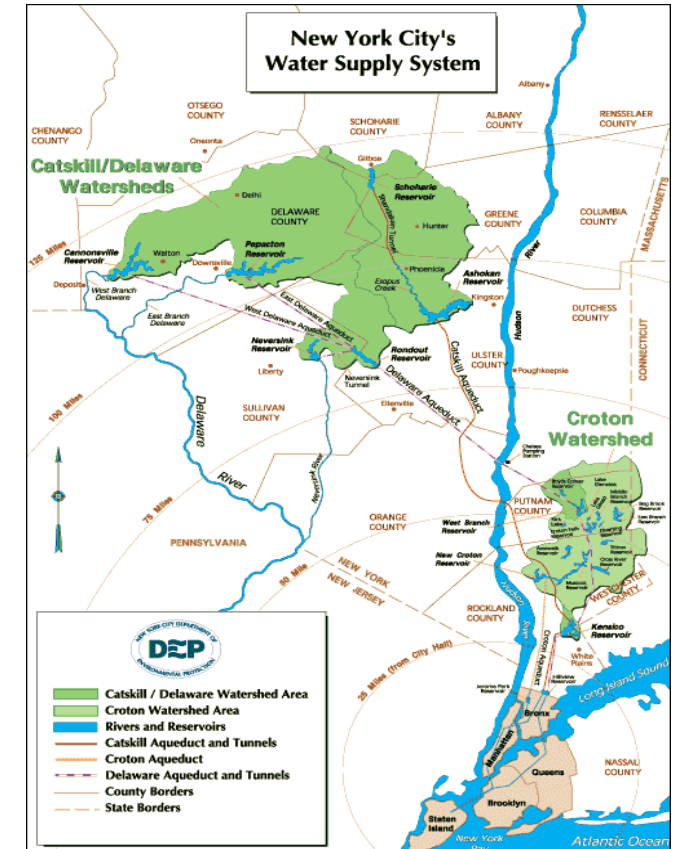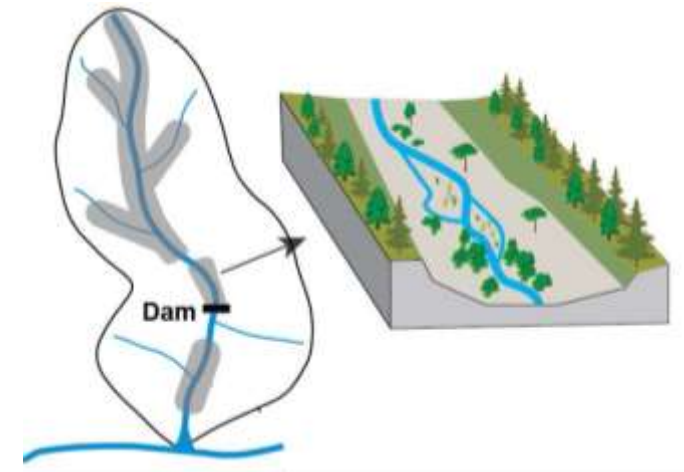The changing hydrology in a dammed area and reliability of infrastructure

- **Tasks**

Summarizing information about the dams (e.g. the year of construction, size and area) / The region selection

Evaluation of statistical parameters (e.g. Median, Mean, StD, IQR) in streamflow
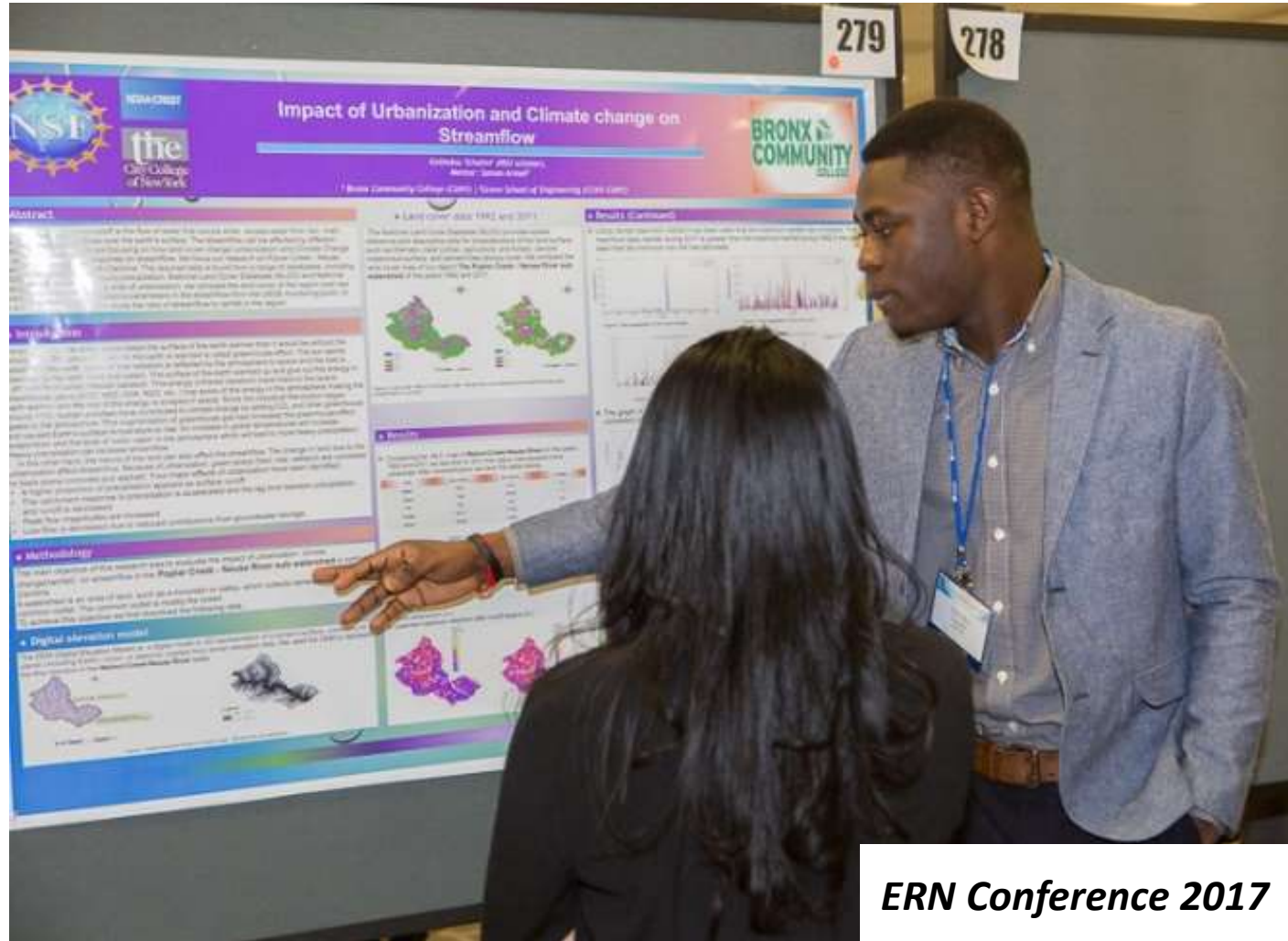
Correlation of rainfall and streamflow, for different parameters over Annual and Seasonal time-scale

Run the analysis for before/after dam construction and full period of data.

- **Technical Capability**

Thank You

ERN Conference 2017