

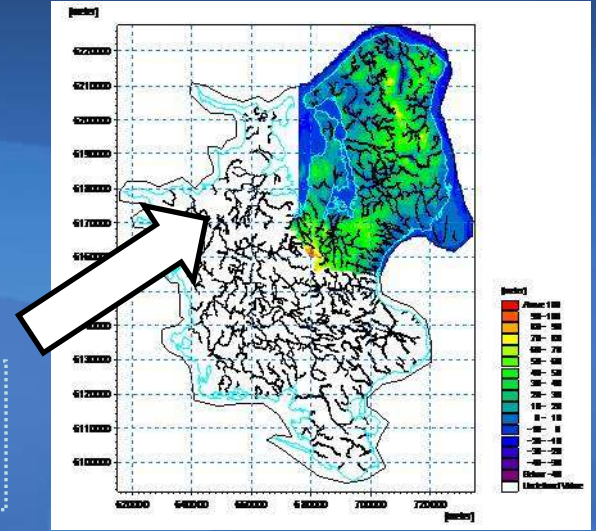
USE OF STATISTICAL DOWNSCALING

Maria Sunyer (mpi@dhigroup.com)



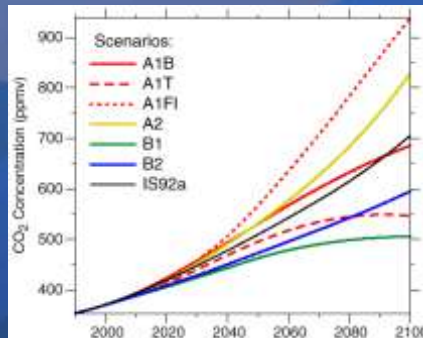
Asses climate change impacts on hydrology

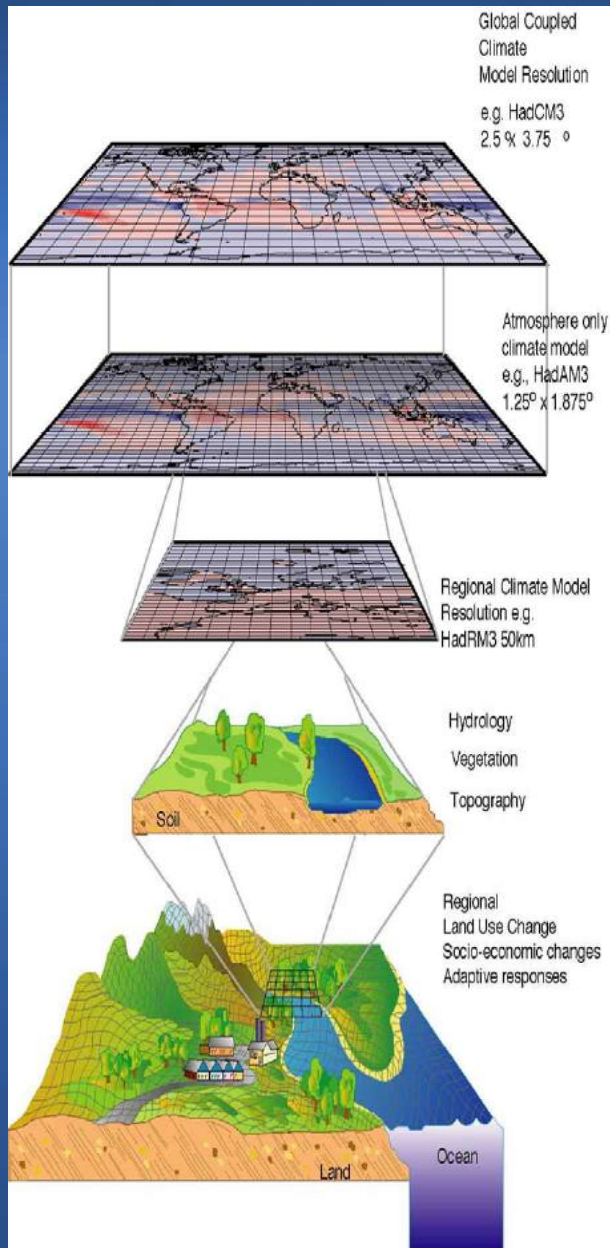
North-East Sealand
(3000 km²)



Information on Climate Change

Global Climate Models
(~150km)





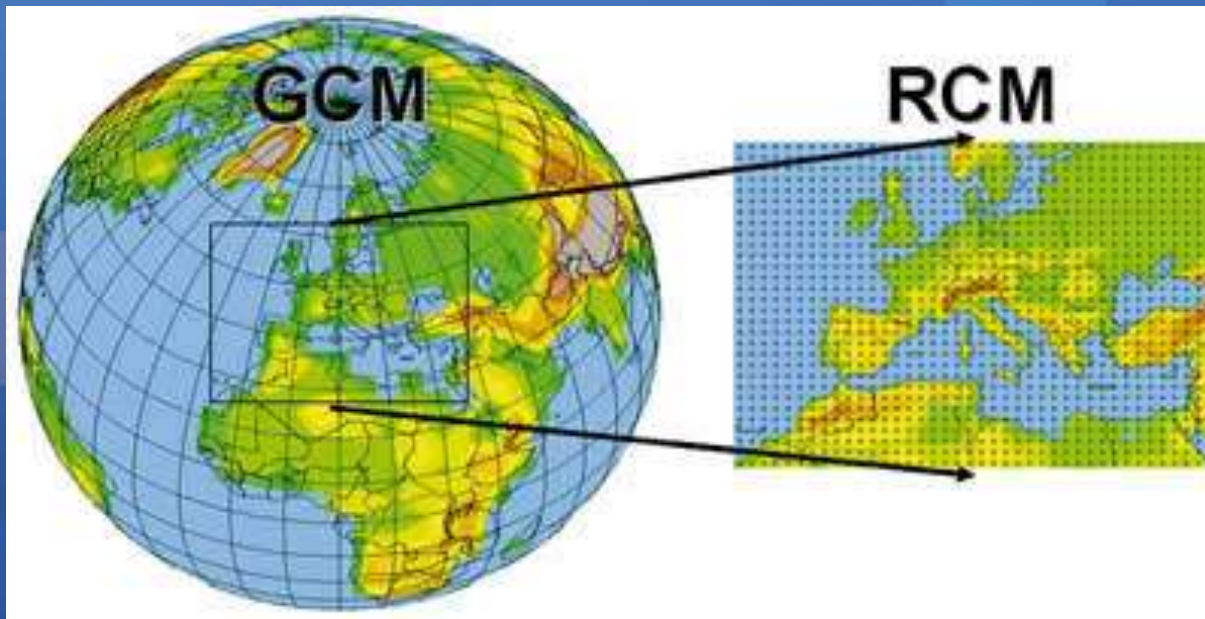
From global climate model projections to local-scale impact assessment



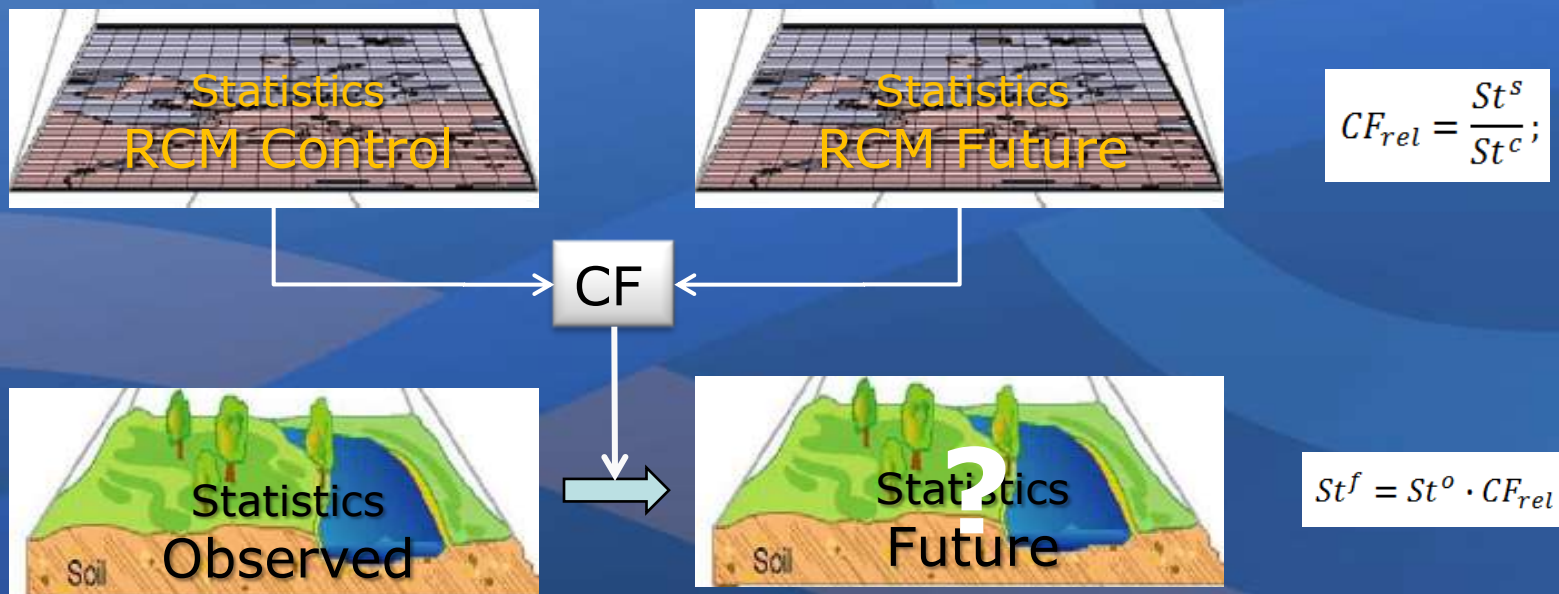
- Dynamical downscaling
- Statistical downscaling

Regional climate model (RCM)

- Driven by GCM boundary conditions
 - Higher-resolution (10-50 km)
 - Accounts for topographical features and land cover inhomogeneity
- **Further statistical downscaling needed**



- Define relationship between large-scale model (GCM or RCM) and local climate
- 3 methods based on Change Factors Methodology:
 - Mean correction
 - Mean and variance correction
 - NSRP Weather Generator



$$CF_{rel} = \frac{St^s}{St^c}; St^f = St^o \cdot CF_{rel}$$

- Change factors:
- Mean
 - Variance
 - Proportion of dry days
 - ...

- Mean correction (delta change)



$$P_{fut} = a \cdot P_{obs}$$

$$a = CF^{mean}$$

- Mean and variance correction

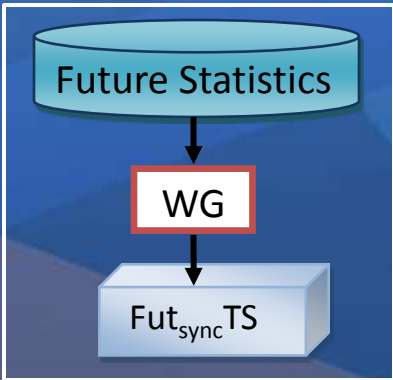


$$P_{fut} = a \cdot P_{obs}^b$$

$$CV^{fut} = CV((P_{obs})^b)$$

$$mean^{fut} = a \cdot mean((P_{obs})^b)$$

- Weather generators

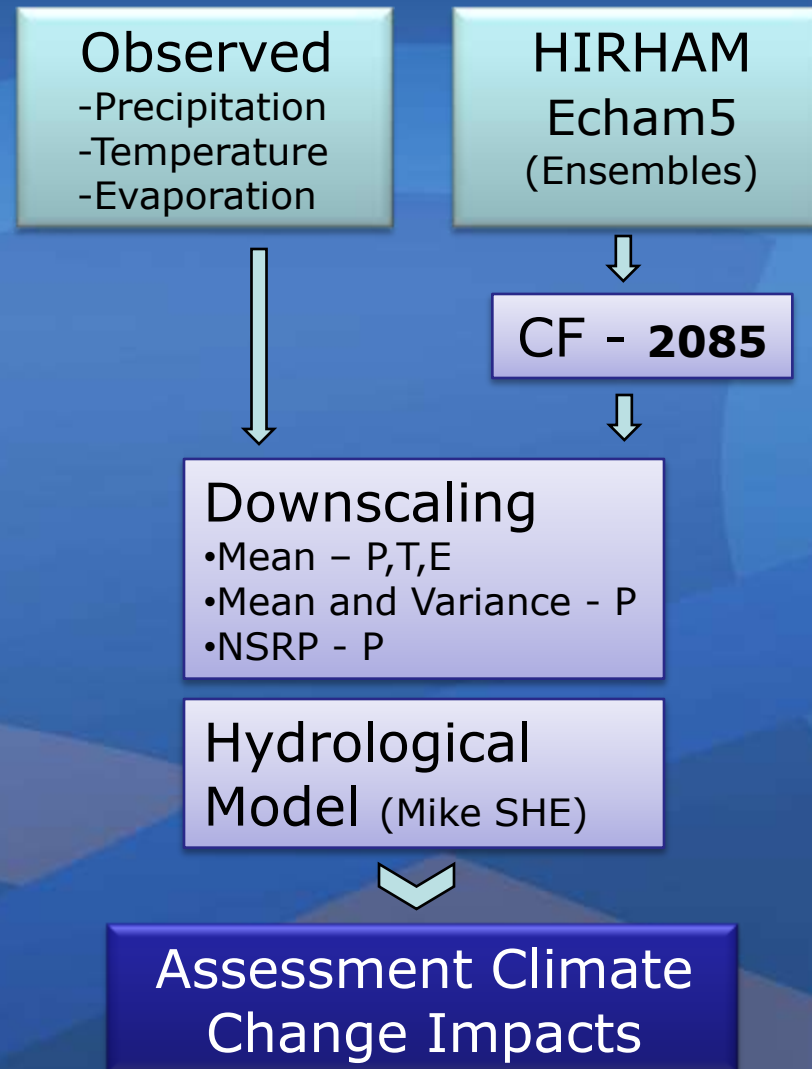


- Model fitting:
- Mean
 - Variance
 - Skewness
 - Dry-day prob.
 - Autocorrelation
 - Cross-correlation

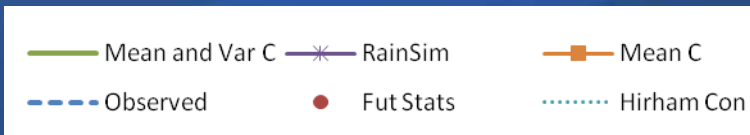
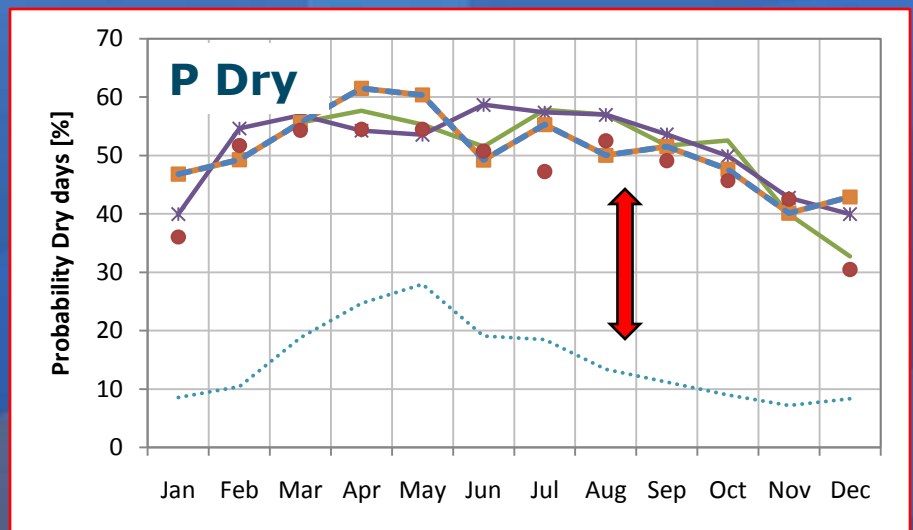
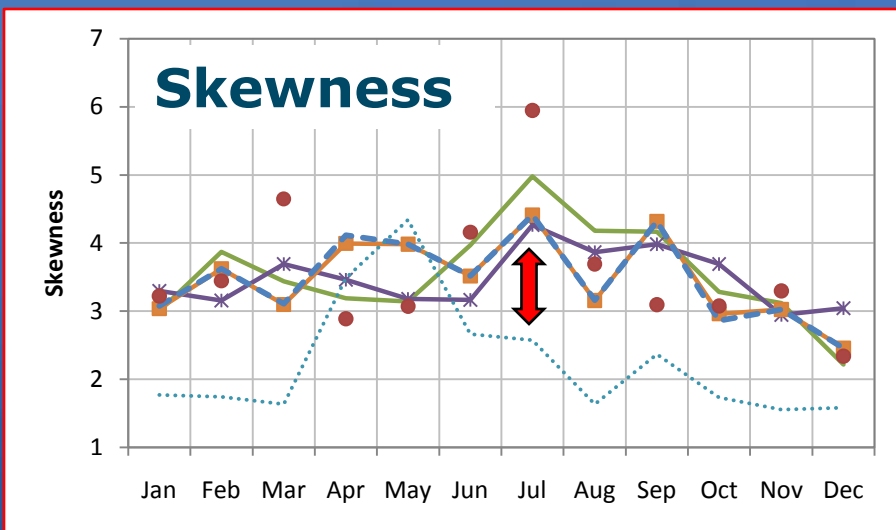
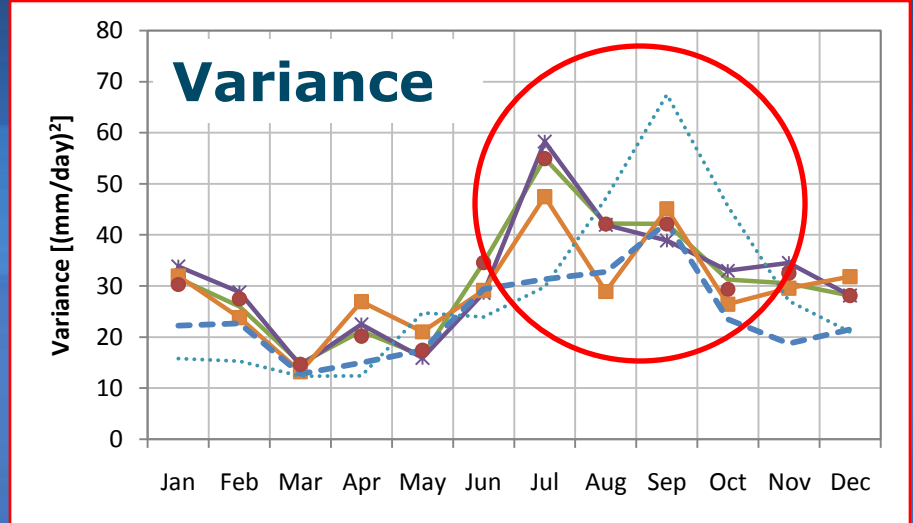
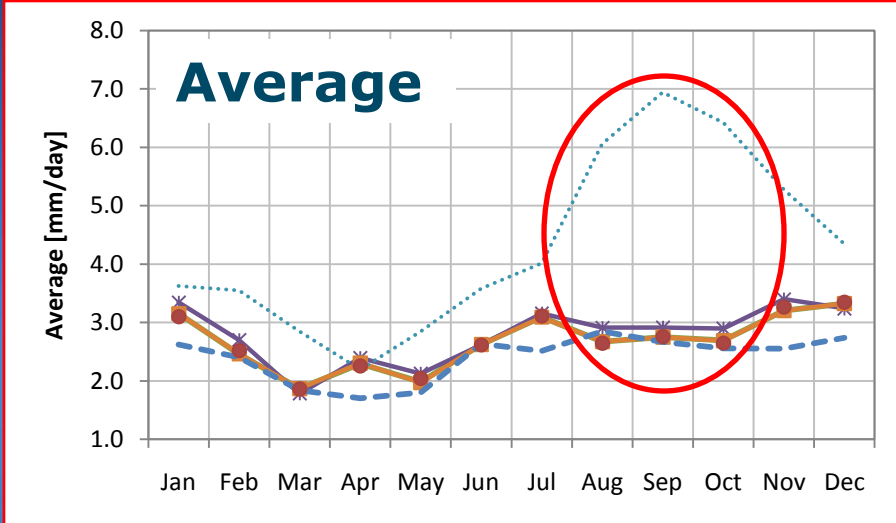
Neyman-Scott Rectangular Pulses

Storm events are defined as clusters of rain cells

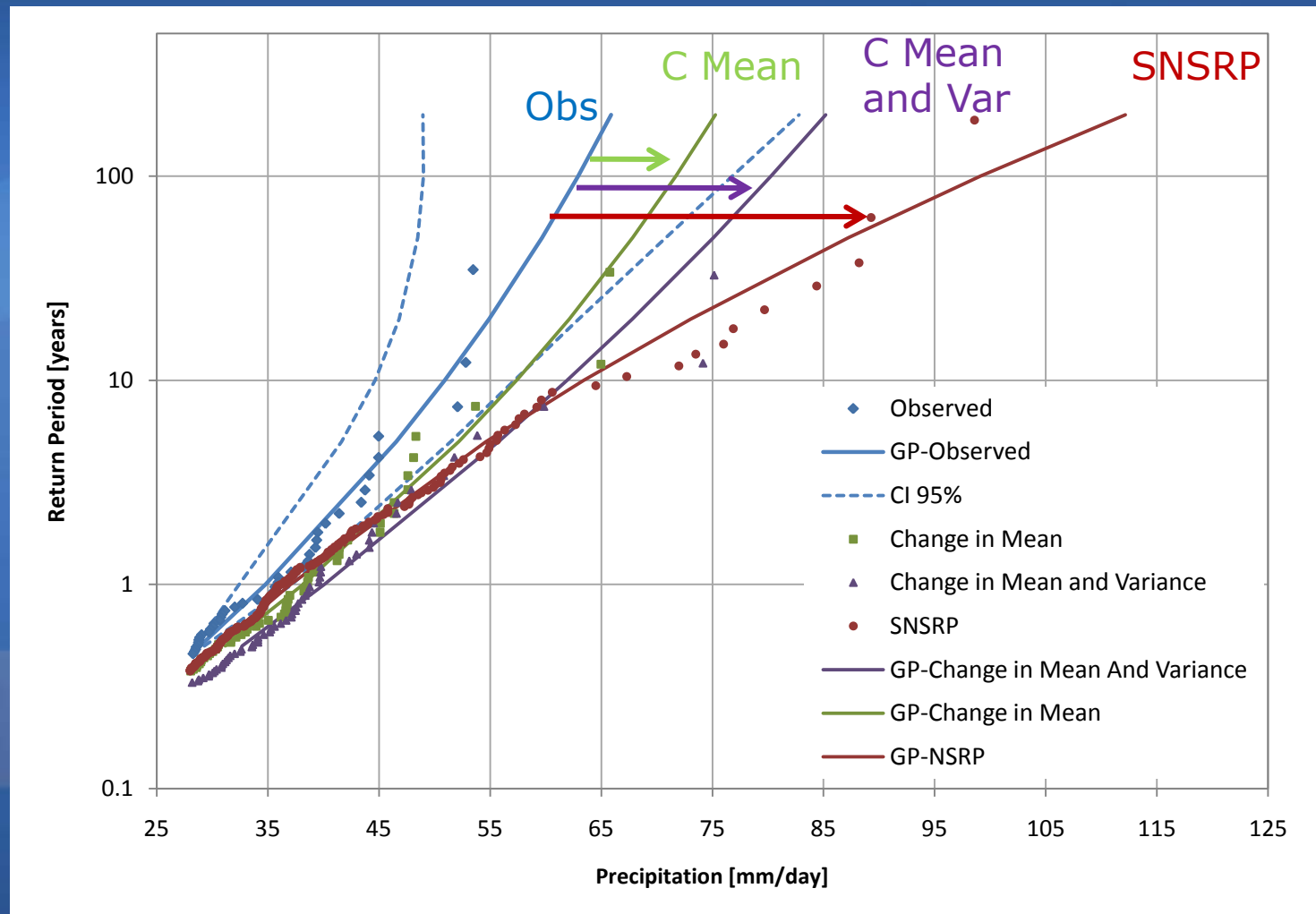




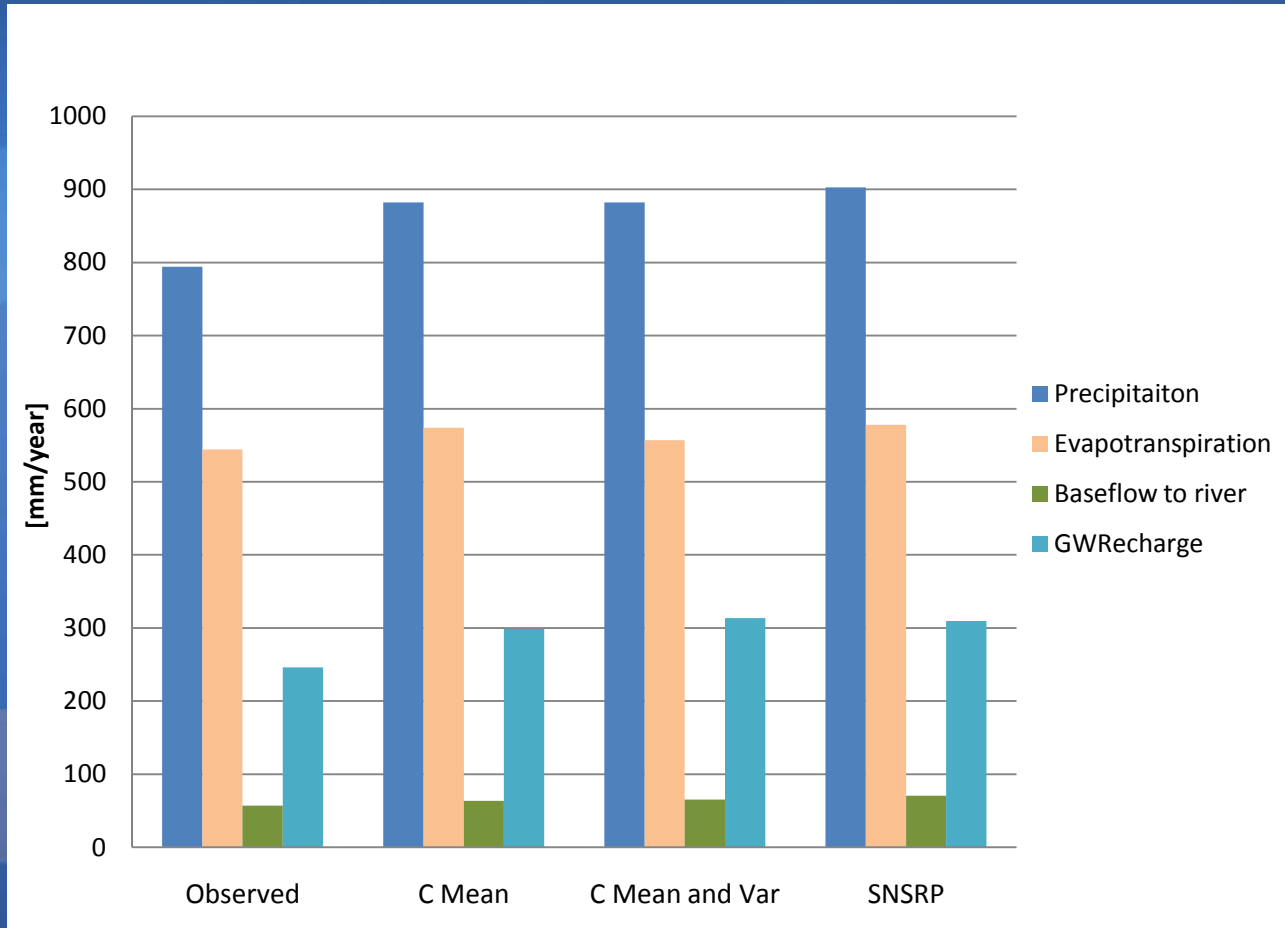
Results downscaling



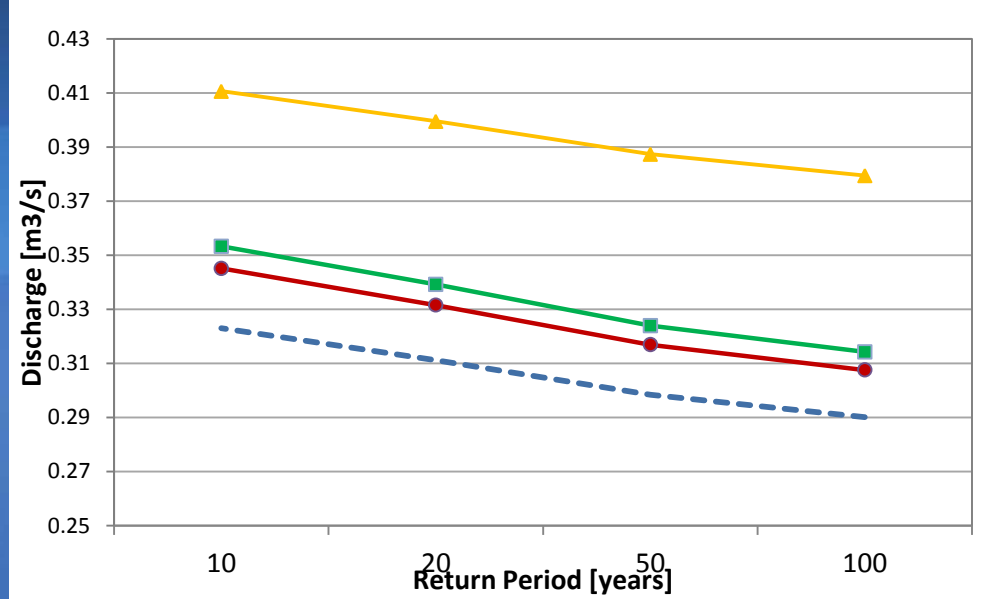
Results downscaling - Extreme events



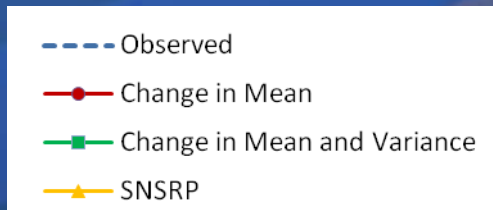
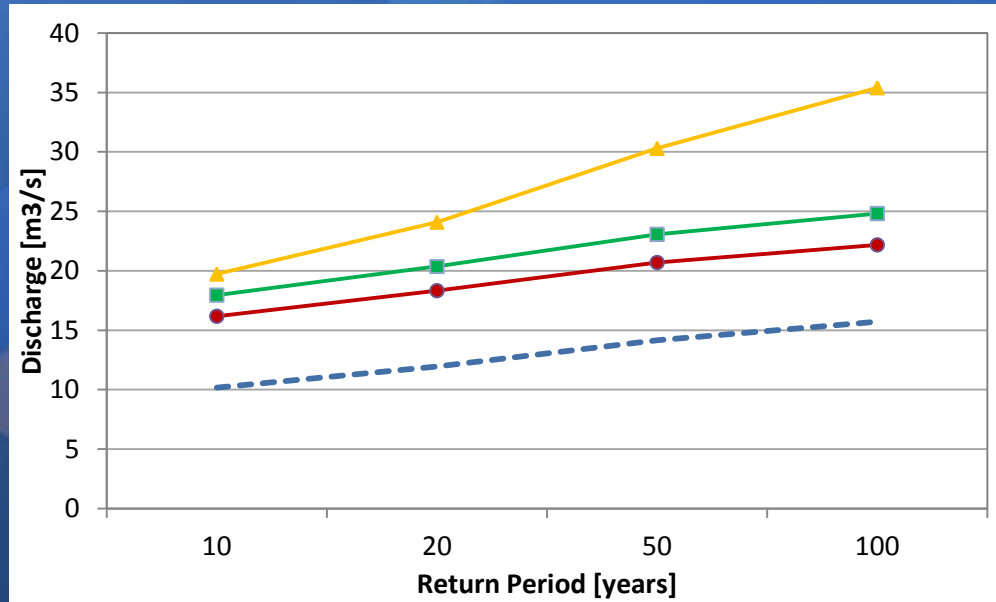
Model results – Water Balance



Annual Maxima Discharge



Annual Minima Discharge



HIRHAM cannot be used directly need for statistical downscaling

Selection of downscaling method depends on cc impact study:

If only water balance

C mean → ✓

If water balance + changes in extreme events

C mean → ✗

C mean and variance → ✓

If extreme events

SNSRP WG → ✓

If the number of dry/wet

C mean and C mean and variance → ✗

SNSRP WG → ✓

Thank you for your attention

Maria Sunyer
mpi@dhigroup.com