

Taiwan Climate Change Projection and Information Platform Project

Impact and uncertainty of climate change on water resource in Taiwan

Yun-Ju Chen, Jun-Jih Liou, Keh-Chia Yeh

National science and technology center for disaster reduction

Outline



- Introduction
- Uncertainty of climate change assessment
- Case studies (4 major river basins)
 - Impact and uncertainty of climate change on water resources
- Results and discussions



Funded by NSC, the project of Taiwan Climate Change and Information will provide climate projection as the scientific basis for the policy making of climate change adaptation and impact mitigation.

Introduction(1/2)



- Most GCMs indicated that global temperature should increase significantly, and annual dry days probably increase, too.
 - Due to climate change, water resource problems might become harder.
- While making the policy for climate change impact and mitigation, we need useful information from all GCMs' projections.
- Uncertainty assessment of climate change impact might be a nice way to represent the information of GCMs' projections.

Introduction(2/2)



- This study focused on the uncertainty of water resource impact under climate change scenario.
 - Case studies for quantifying uncertainty of hydrological impact under climate change were demonstrated.
 - Studying uncertainty sources included GCMs, GHGs emission scenarios, WGs, projected periods, and spatial resolutions.
- Uncertainty of flow changed ratio was demonstrated by empirical cumulated distribution function(ECDF) and range between max and min values(confidence interval).





General strategies on quantifying uncertainty

- Multi-GCMs data
- Multi-downscaling methods
- Multi-hydrological models
- Multi-parametric estimating methods
- Communicating with climatological researchers
- Impact assessment under different spatial resolutions
- Bias correction on GCMs data

Aims of this study



- www.ncdr.nat.gov.tw
- To estimate impacts and uncertainty of water resources due to climate change through simulating stream flow in wet and dry spell from sources of uncertainty
 To provide useful results to policy making of adaptation and mitigation

Impact of climate change

Water resource

Frequency and Duration of drought Amount and timing of Inflows to reservoirs Reliability of water supplies





Uncertainty analysis



Impact of climate change on stream flow by the combination of various variables.



Results and discussions

- Stream flow impact at wet and dry spell in near future
- Comparison of various variables
 - selected GCMs
- selected girds and rainfall stations
- Rainfall distributions of weather generation
- Comparison between natural variability and GCMs uncertainty
- downscaling-spatial resolutions

Change rate of stream flow under climate change



- 60% of GCMs are shown stream flow increase in wet spell and 80% of GCMs decrease in dry spell in near future.
- Range of change rate of stream flow is -20~20% and -40~50% in wet and dry spell respectively.











Worse case has shown max increasing in wet spell and min increasing in dry spell with respect to all GCMs.

Compare results of selected girds

The result has shown that the combinations of selected gird and rainfall station are not significantly different for cumulative probability of change rate of stream flow.



N_RG_SR : Near Future_ Regional average grid _Single rainfall station
 N_RG_RR : Near Future_ Regional average grid _Regional average rainfall
 N_SG_SR : Near Future_ Single grid _Single rainfall station
 N_SG_RR : Near Future_ Single grid _Regional average rainfall





Comparison between natural variability and GCMs uncertainty

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The range of GCMs uncertainty is greater than the range due to natural variability.



Concluding remarks



- This study had shown that stream flow would increase in wet spell (+20%), and decrease in dry spell (-40%) in near future about 70% probability in Taiwan.
- The uncertainty of water resource impact of south Taiwan is larger than north Taiwan.
- The 25km resolution is good enough to evaluate the climate change impact of water resources.
- To yield useful impact results, sources of uncertainty should be assessed comprehensively by multi- models, methods, and GCMs data, and spatial resolutions.



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Thank you for your attention.