



QUANTIFYING DISCHARGE AND SUSPENDED SEDIMENT LOADS OF THE BANGPAKONG RIVER UNDER DIFFERENT CLIMATE SCENARIOS

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Introduction

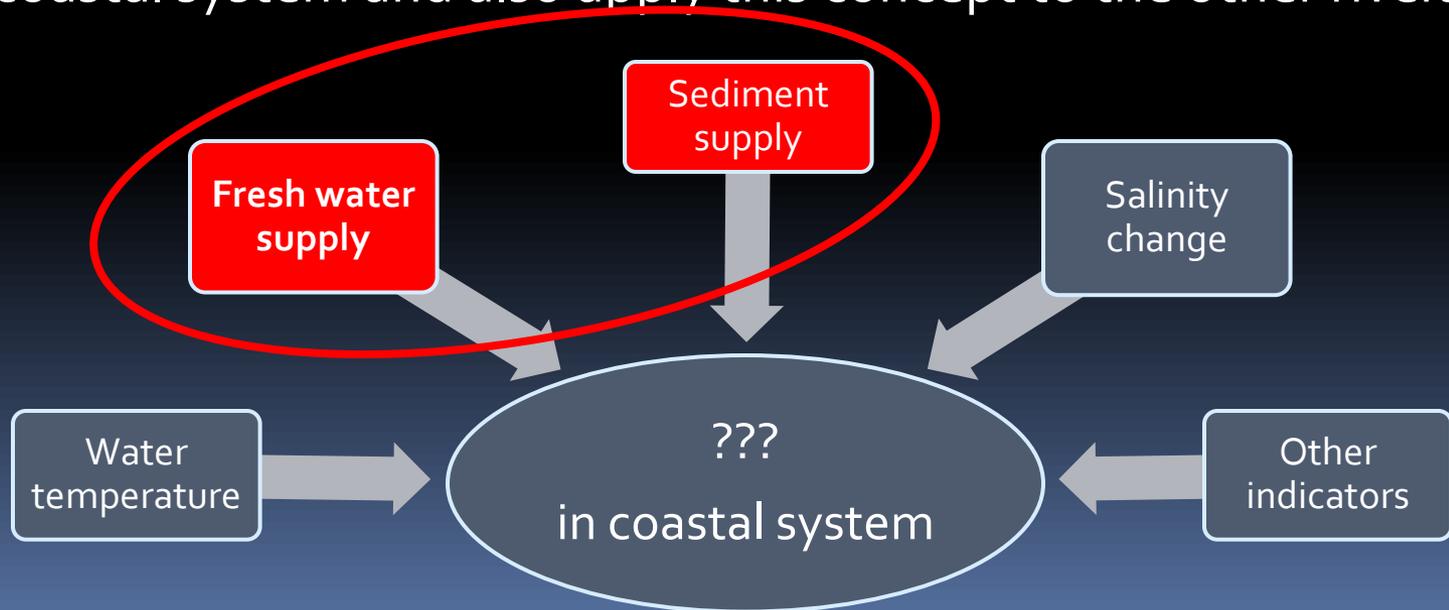
- Future climate change is expected to have major impacts on river systems around the world, and could cause changes in discharge, flood frequency, soil erosion and the delivery of sediments to rivers and coastal areas.
- In order to examine the effects of long-term changes in climate change on **freshwater discharge, and suspended sediment loads from rivers draining to the Upper Gulf of Thailand**, climates scenarios were used to simulate these changes for two time-periods: 1981-2000 as present and 2040-2060 as future, using the Bangpakong River as the pilot study area.

Introduction:

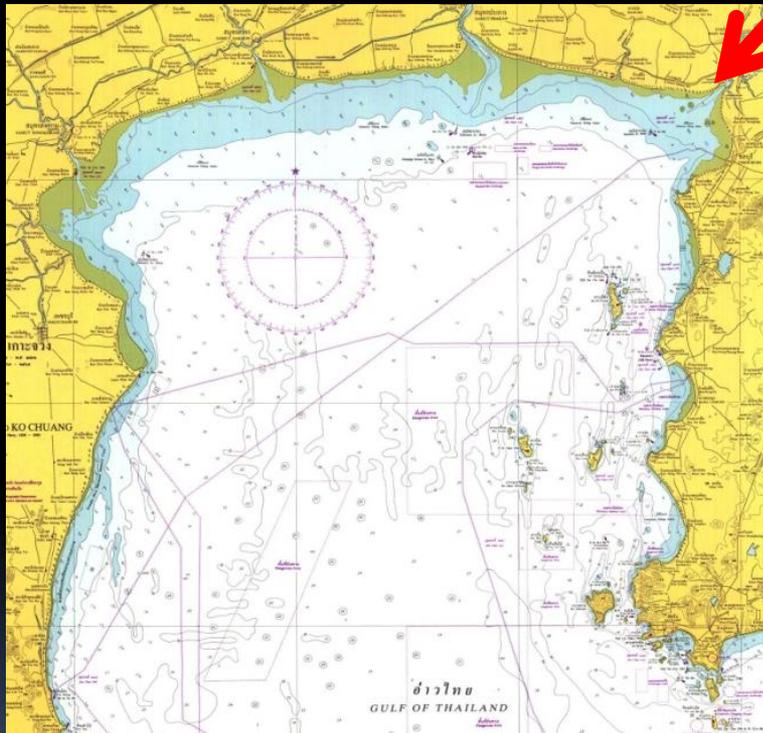
Expected outcome

Objective: To estimate a range of plausible quantity of fresh water and suspended sediment provided by Bangpakong River under different climate scenarios.

Expected outcome: The results that will be used as an indicator in order to assess impact of climate change on any concern in coastal system and also apply this concept to the other rivers

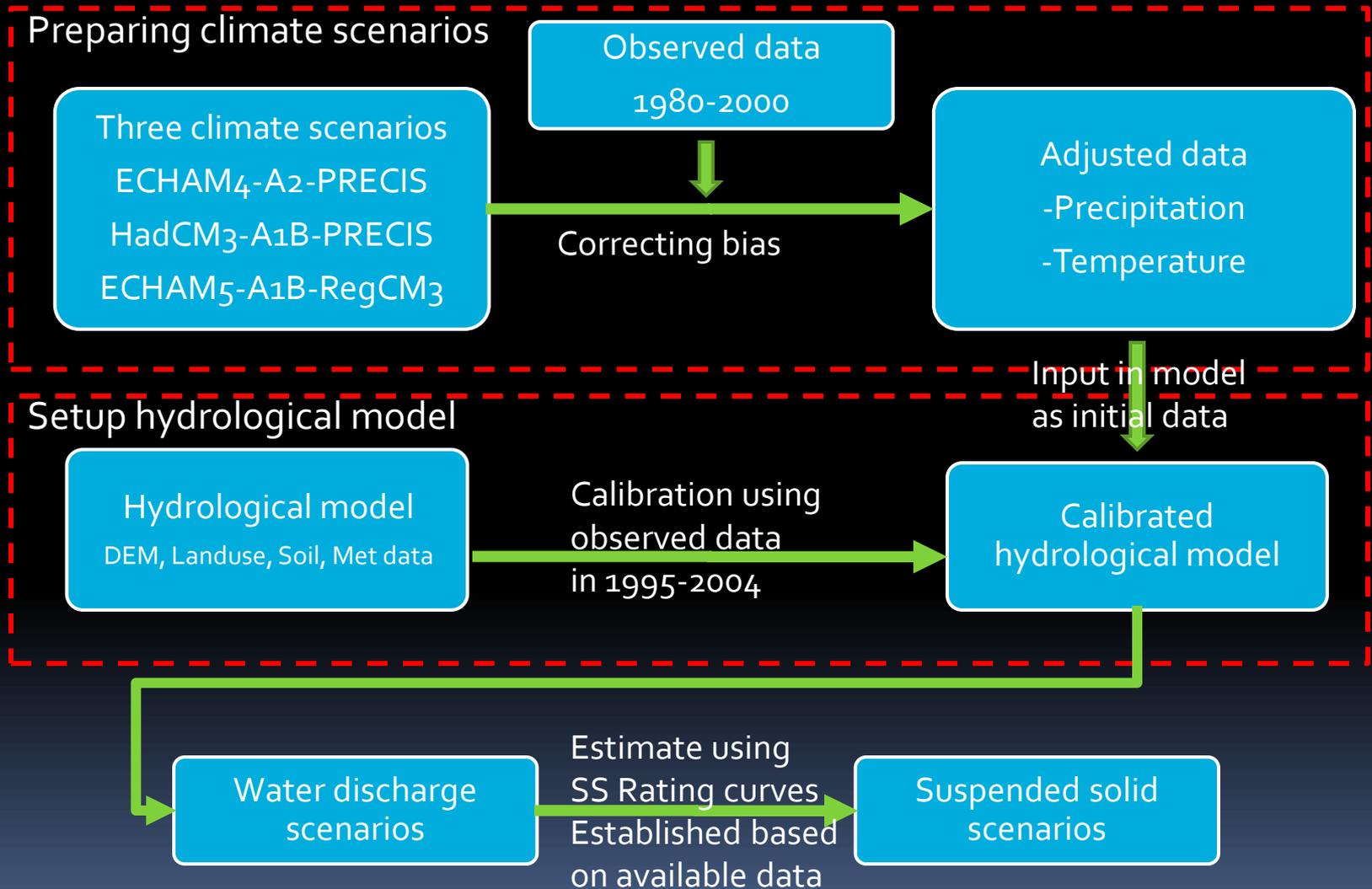


Study area: Bangpakong River



- Bangpakong River is one of the most important river basins in Thailand.
- The total basin area is approximately 8,570 km² and the main river reach length is about 240 km.
- The mean annual rainfall of the Bangpakong Basin is 1,334 mm/year and the mean runoff is 3,667 MCM/year

Methodology: Work Diagram



Methodology: Selected Climate Scenarios

Climate scenarios are set of

ECHAM₄-A2-PRECIS

HadCM₃-A1B-PRECIS

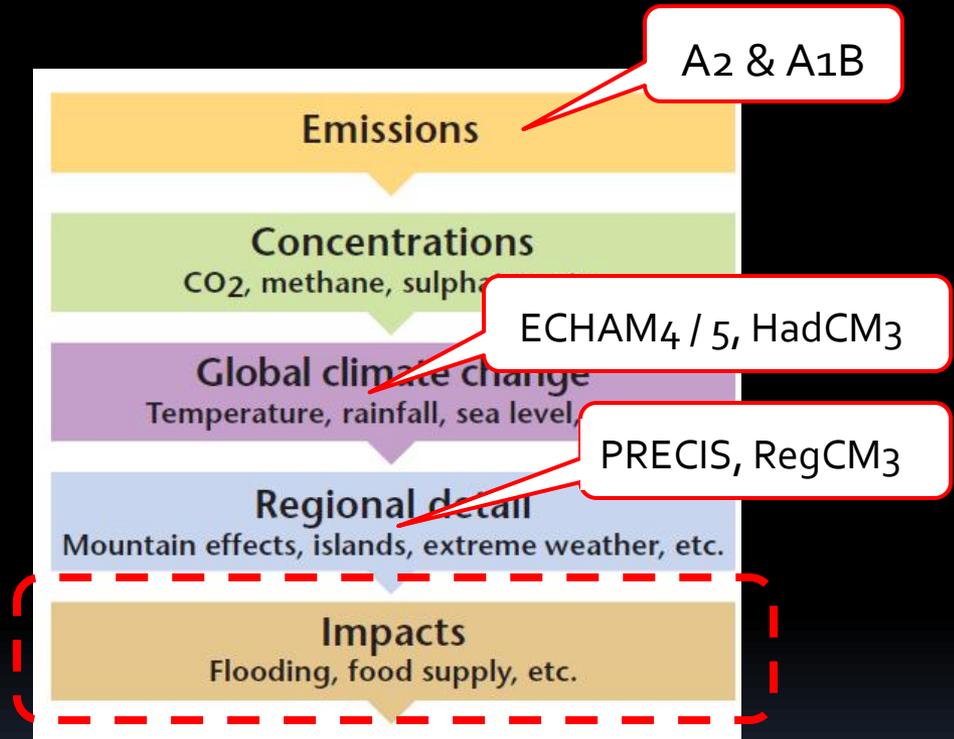
(from SEA START RC)

ECHAM₅-A1B-RegCM₃

(from JGSEE)

Time period

2040-2060 with respect to 1980-2000 (21 years)

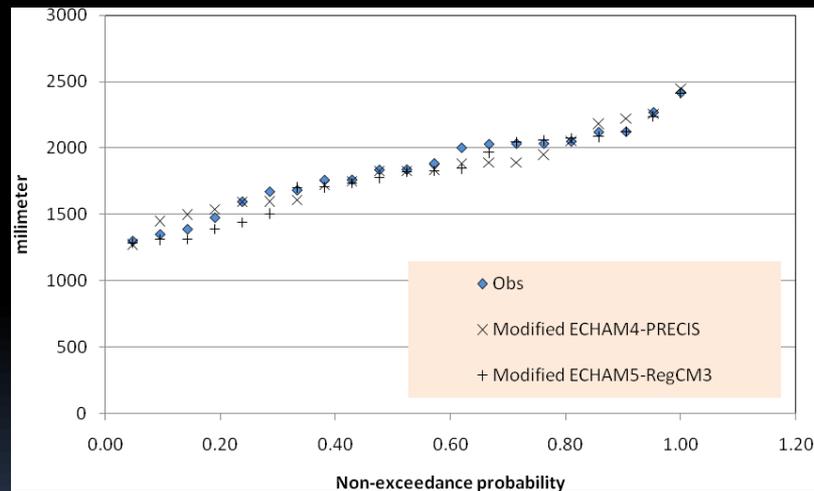


(Jones et al., 2004)

Methodology:

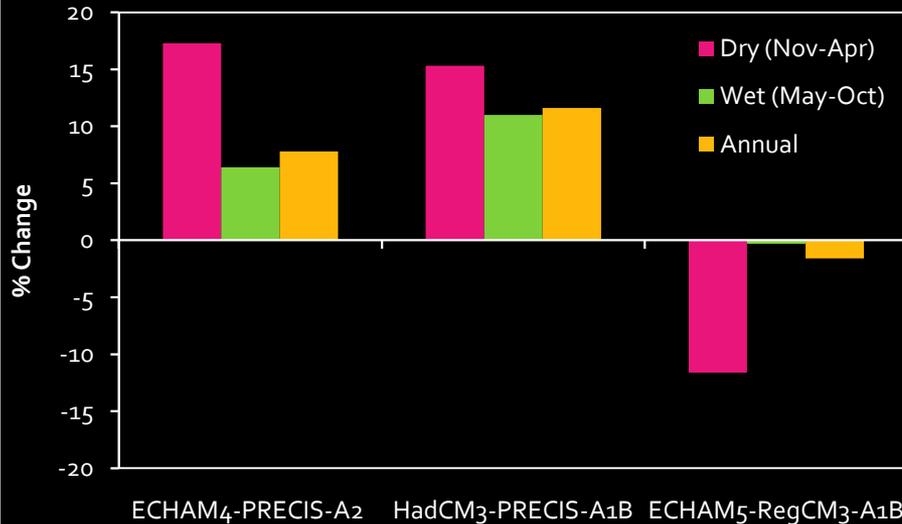
Correcting bias in simulated data

Precipitation: corrected bias at monthly time-step based on Quartile based approach

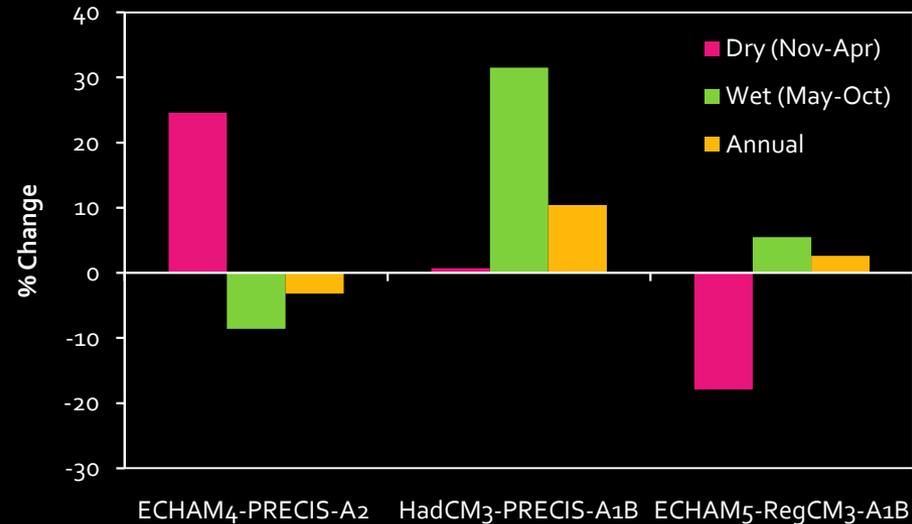


Annual precipitation at Prachinburi Station

Result: Future precipitation scenario changes



Long term mean

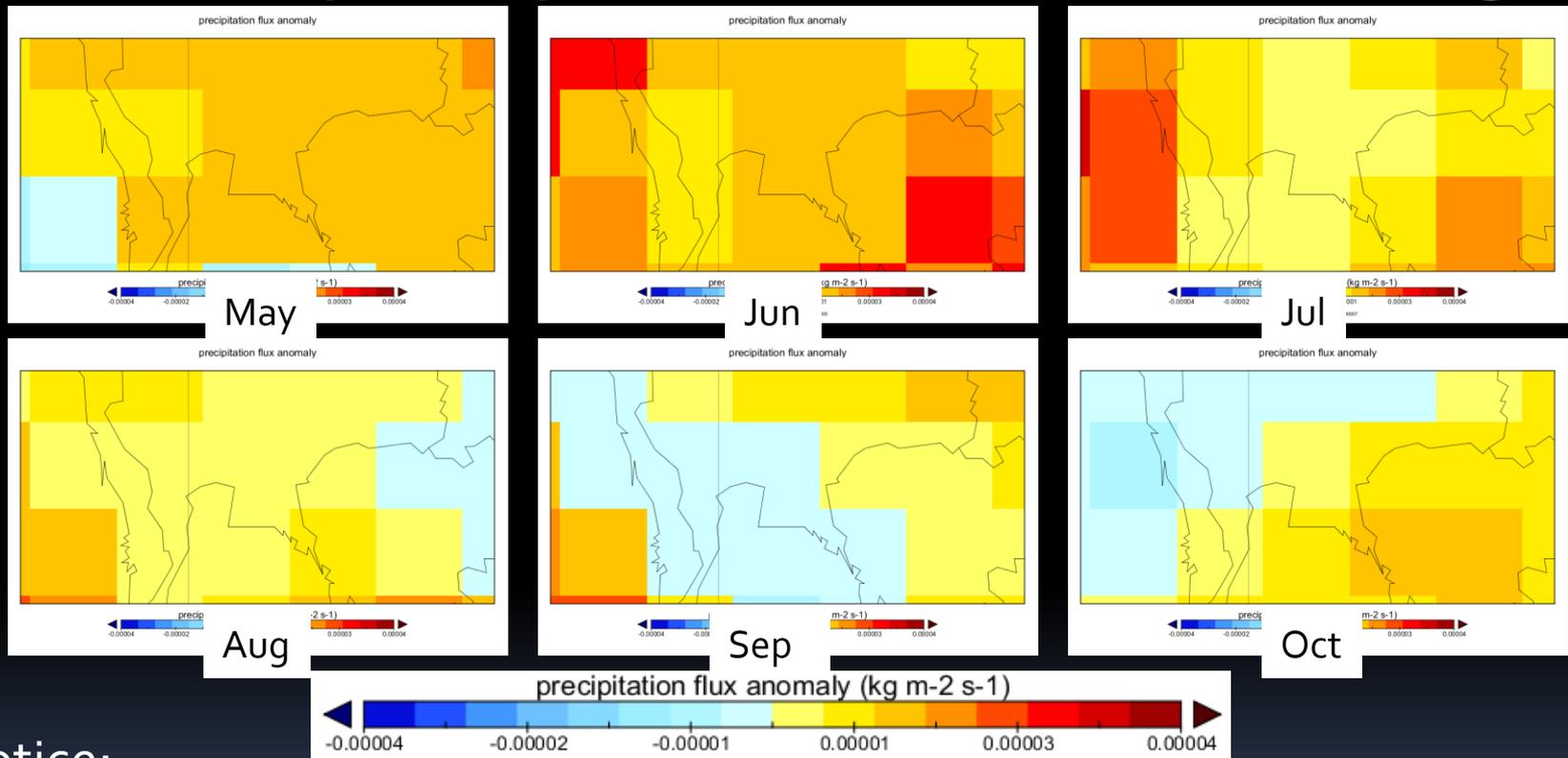


Standard Deviation

Summary: From most scenarios

- Mean prec. tends to slightly increase in future
- No significant change in inter-annual prec. variation
- The **inconsistency** among results from the three RCMs **was observed**

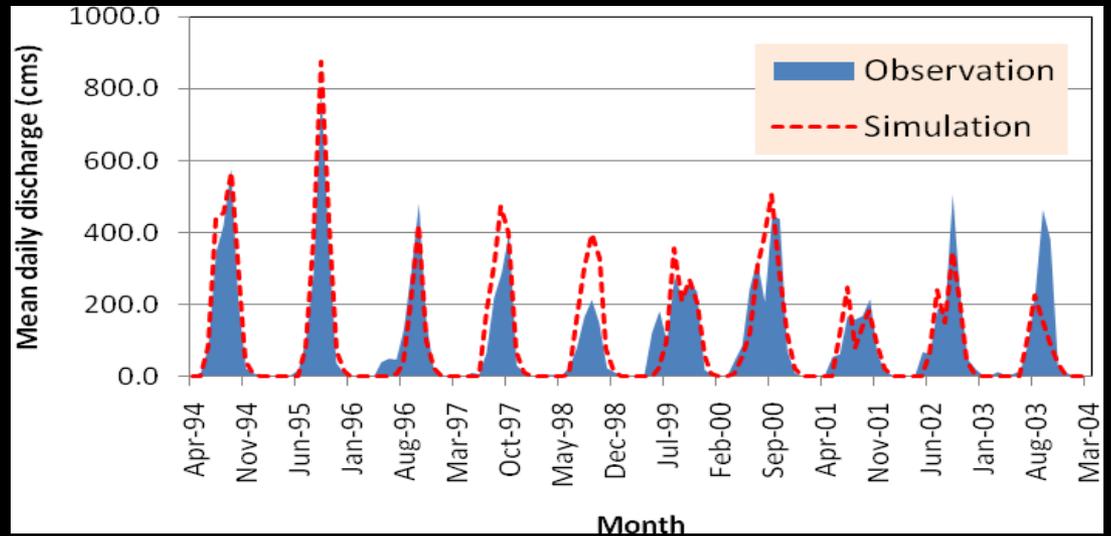
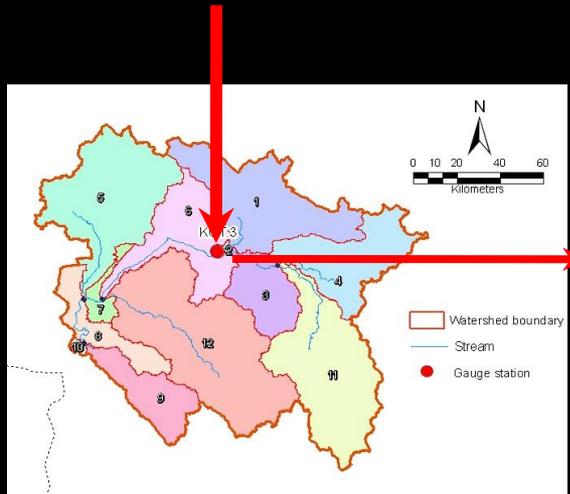
Result: Future precipitation scenario changes



Notice:

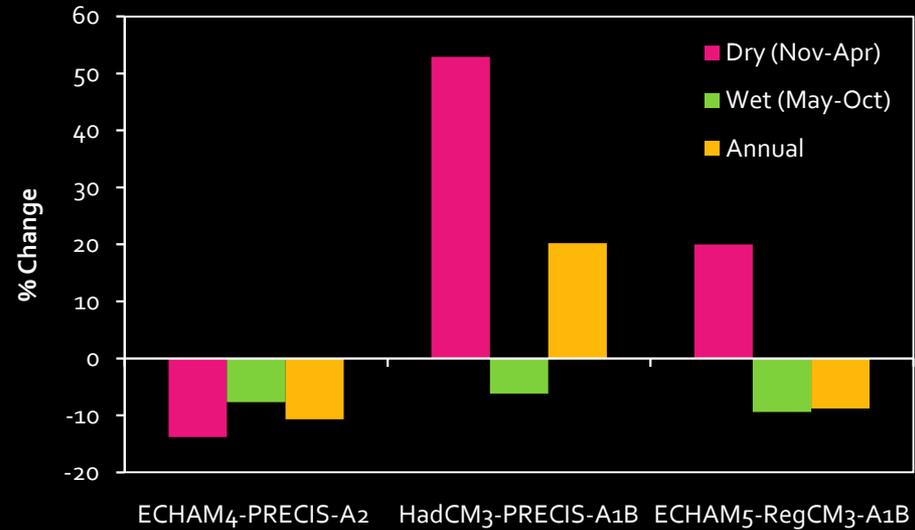
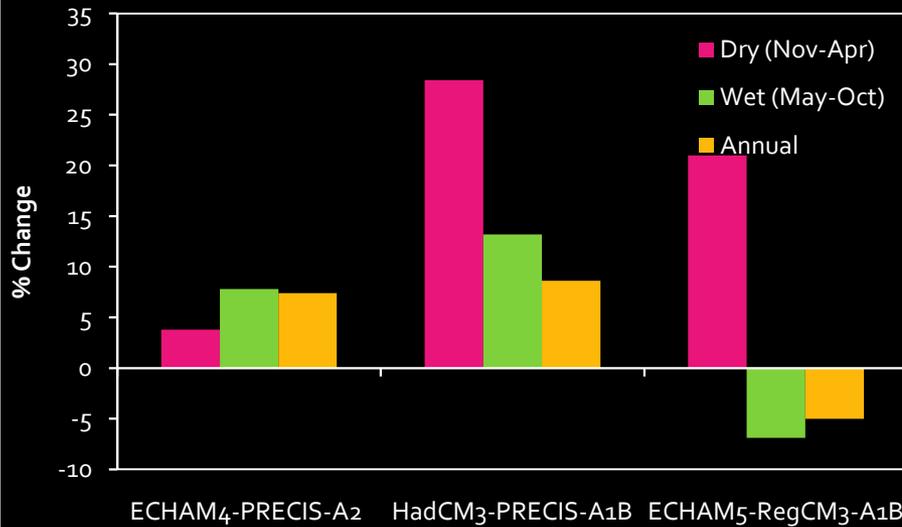
- The different result between GCM and RCM on ECHAM5-RegCM3-A1B might result post-processing, physical processes in RCM or local factors such as topography, that needs investigating.

Methodology (cont.): Model setup and calibration



Station code	Catchment area (km ²)	R-square (Calibration)		R-square (Validation)	
		Monthly	Daily	Monthly	Daily
KGT.3	7,450	0.91	0.85	0.70	0.58

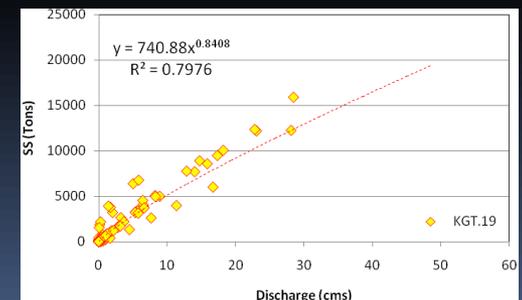
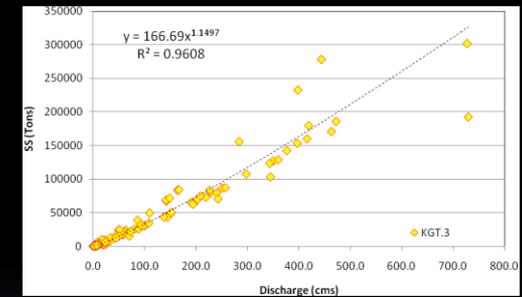
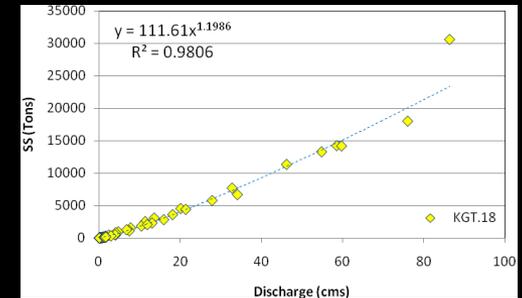
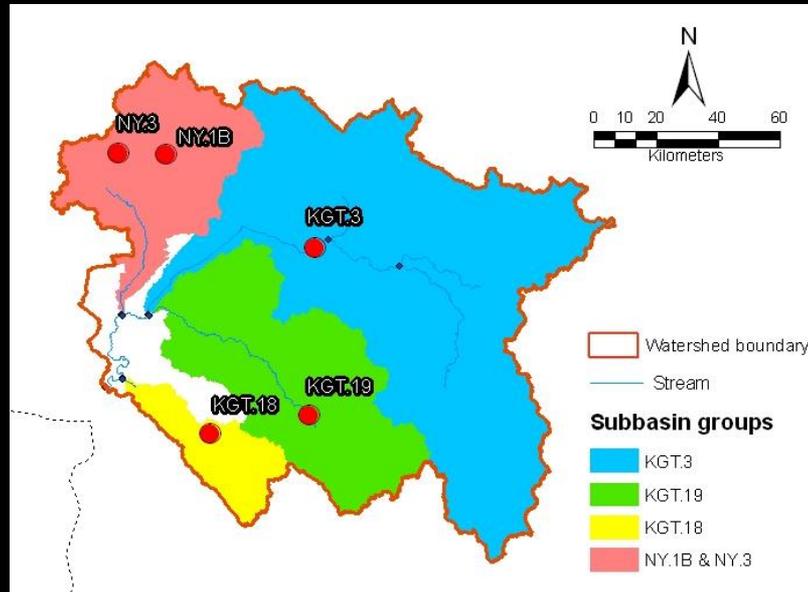
Result: Future Fresh Water discharge



Summary: From most scenarios

- Simulation overestimate about 40% (Water discharge during May-Oct in 2000 of observation and calculation are approximately 384 and 641 m³/s respectively)
- Fresh water discharge tends to slightly increase in future
- Inter-annual/season variation tends to slightly decrease

Methodology: Suspended sediment estimation

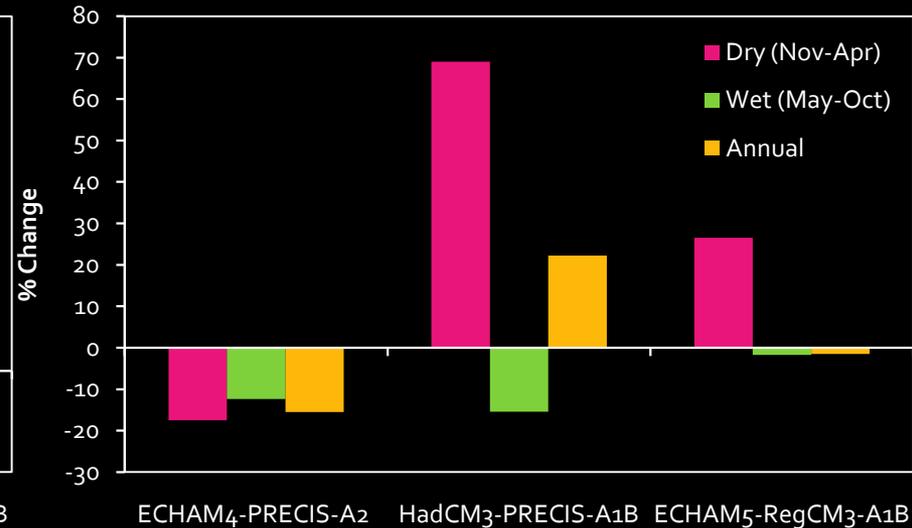
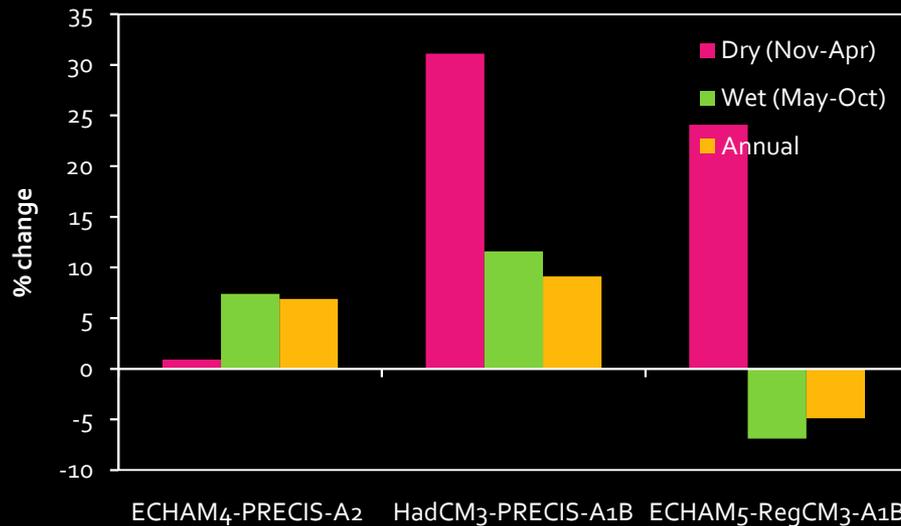


Four SSRCs (Suspended Sediment Rating Curve) were established based on available data

Mathematical relation

$$Q_s = aQ^b$$

Result: Future Suspended Sediment discharge



Summary:

- Calculation overestimate about 40% (Total Suspended Sediment during May-Oct in 2000 of observation and calculation are approximately 818 and 1,177 Mil.Kg respectively)
- TSS during wet season tends to slightly increase in future
- There is still no conclusion of inter-annual/season variation of TSS



Limitation:

- Physical factors; topography, landuse, channel characteristic as present condition are basic assumption of this study.
 - Lacking of the data in long-term at the river mouth to verify the model.
 - Limitation of hydrological model that can't simulate hydrodynamic condition at the river mouth.
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Recommendations

- Need more Climate scenarios to conduct statistical test.
 - Model calibration in each group of the subbasins in the watershed should be conducted in order to get better results.
 - Using more suitable hydrodynamic model at the river-sea interface is encouraged in order to get better result from the model.
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Thank you for your attention