The Abdus Salam International Centre for Theoretical Physics

Rainfall runoff simulation in semi-arid area using distributed CHyM model

(Case study: DEZ River Basin (Iran))

June 2017

Fourth Workshop on Water Resources in Developing Countries: Hydroclimate Modeling and Analysis Tools

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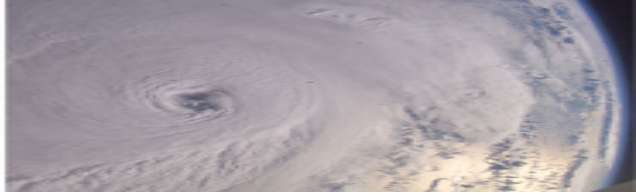
- Introduction
- Rainfall & discharge variability
- Model setup and configuration
- Results
- Conclusion

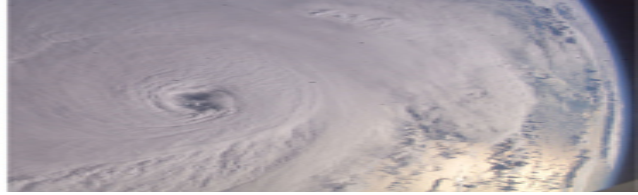


❖Introduction

- Water Budget :7.5 billion m3/y
- Total Capacity Dam: 2.7 billion m3
- Area of Dez Basin:17,600 km3
- Sezar + Bakhtiari= Dez

Inflow of *DEZ* Basin:

Inflow Bakhtiari:	4346 mcm
Inflow Sezar:	1998 mcm
Mid flow	1156 mcm
Sum:	**7500mcm**



❖ Introduction

Why this area…?!!!
Why flood study …?!!!

- ✓ In comparison with the total inflow, Dez dam capacity is very low so spill is very frequent
- ✓ Base on dam rule curve we need a big amount of flood control volume in rainy season
- ✓ In late of rainy season it means we can lose the opportunity of fulfilling dam and encountering drought in down stream
- ✓ If We do not obey the rule curve flooding downstream is a high risk (like 2016 Jan. flood)
- ✓ So we need forecasting of flood discharge parameters (like volume and peak); in this step rainfall-runoff model have a vital rule

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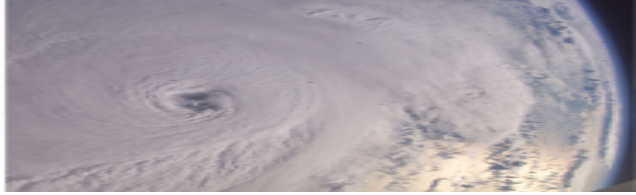
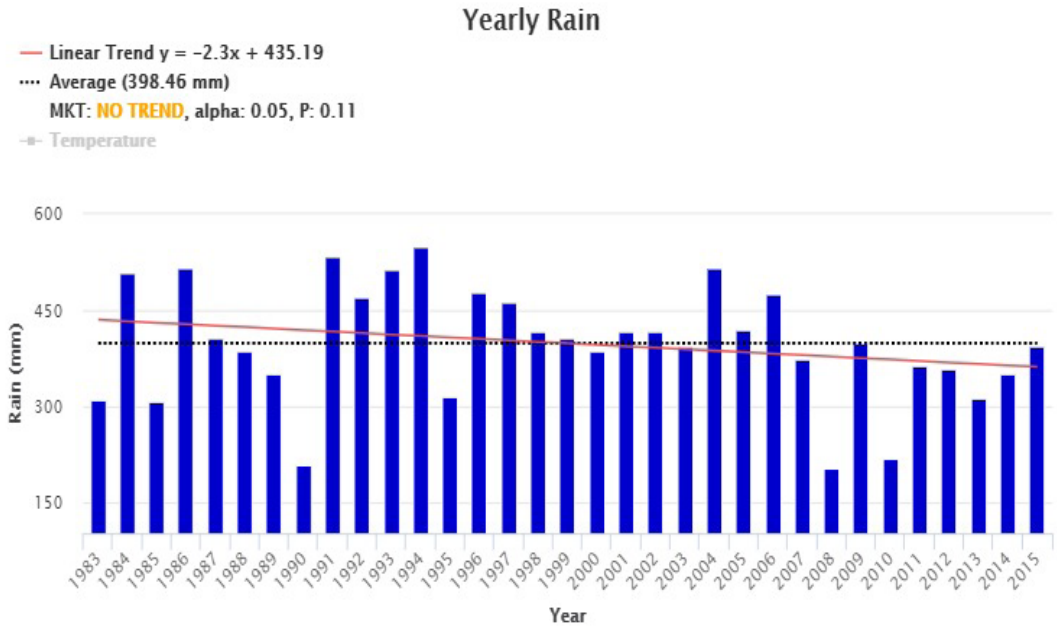
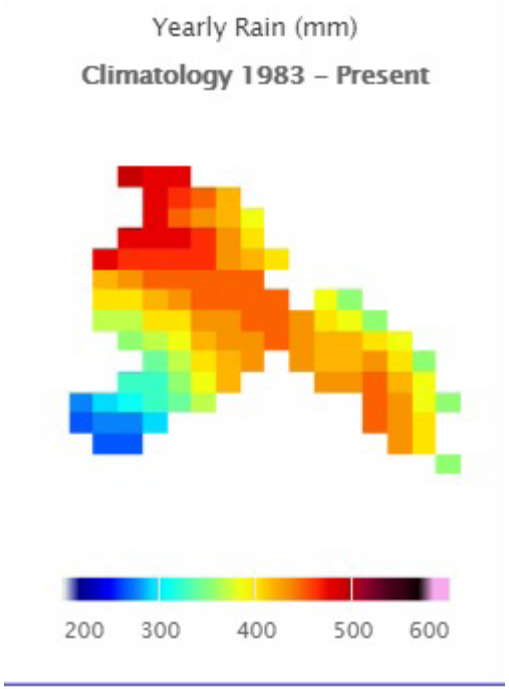
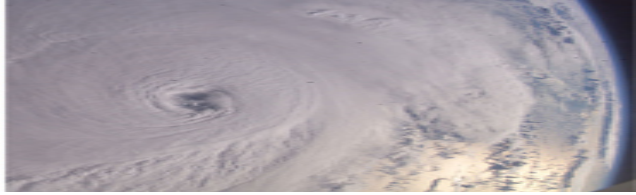


❖ Rainfall & discharge

Longitude: (30.279 34.120)
Latitude: (48.026 51.988)

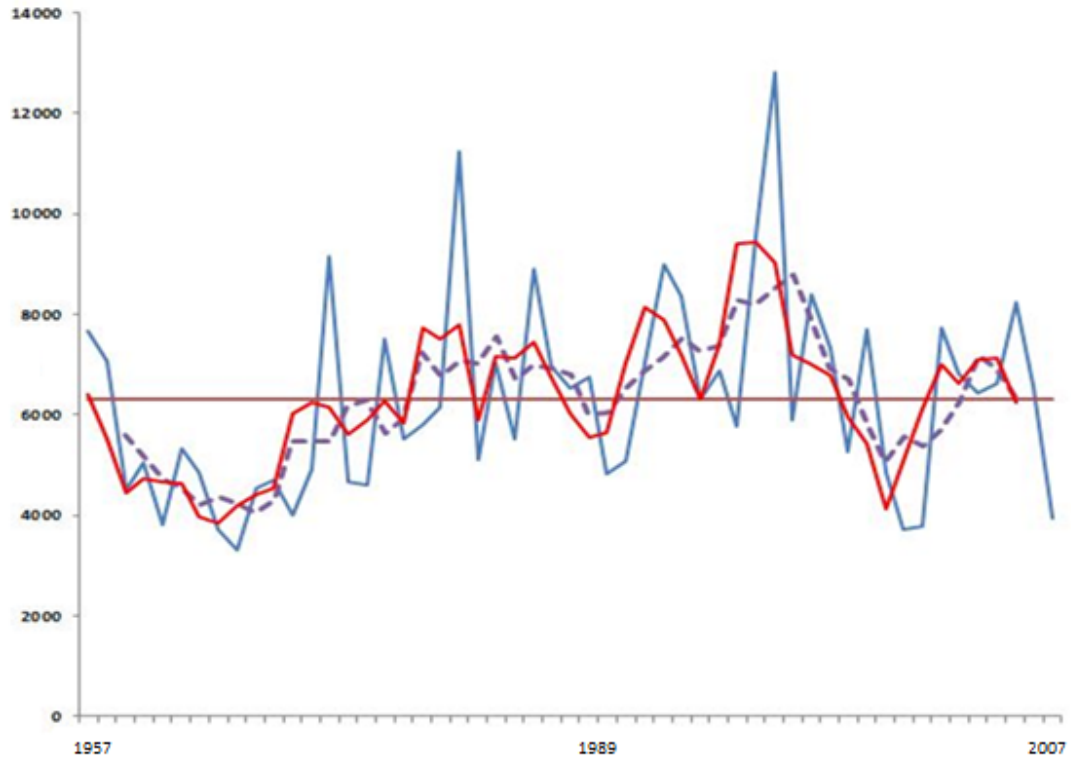






❖ Rainfall & discharge

Wet and dry periods in 50 years



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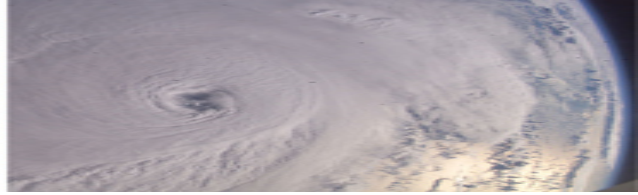
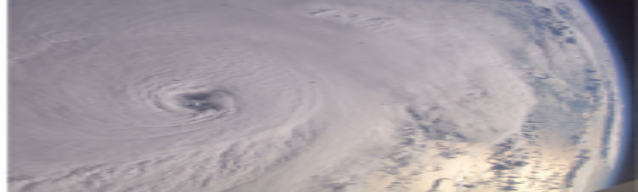


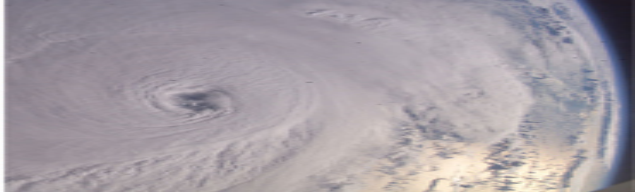
❖ Model setup & configuration

- To preparing to model for simulating a specific period or flood event
- We need a model warmup at a longer period of time to adjust initial condition of favored event.
- In this study first we consider 1 year to spin up but because of area of domain, model runs have taken so much time.
- So we consider only 3 month to spin up.



❖ Model setup & configuration

- Rainfall: TRMM
- DEM: Hydroshed
- Temprature: ERAI
- Start date: 2011.01.01
- Date of event 1 March to 17 March 2011



❖ Model setup & configuration

	nlon	nlat	dij	CHYM steps	α	infiltra	Return flow factor
1	836	622	0.00225	50	0.0015	40	4.8 * 10^-7
2	836	622	0.00225	80	0.0015	40	4.8 * 10^-7
3	836	622	0.00225	120	0.0015	40	4.8 * 10^-7
4	418	311	0.0045	120	0.0015	40	4.8 * 10^-7
5	209	156	0.009	120	0.0015	40	4.8 * 10^-7
6	418	311	0.0045	120	0.0015	80	4.8 * 10^-7
7	418	311	0.0045	120	0.0015	100	4.8 * 10^-7
8	418	311	0.0045	120	0.001	40	4.8 * 10^-7
9	418	311	0.0045	120	0.0013	40	4.8 * 10^-7
10	418	311	0.0045	120	0.0015	100	4.8 * 10^-7
11	418	311	0.0045	120	0.0015	100	2.8 * 10^-7
12	418	311	0.0045	120	0.0015	100	6.8 * 10^-7

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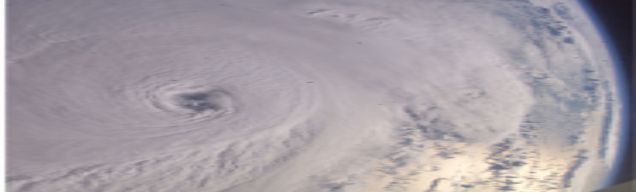
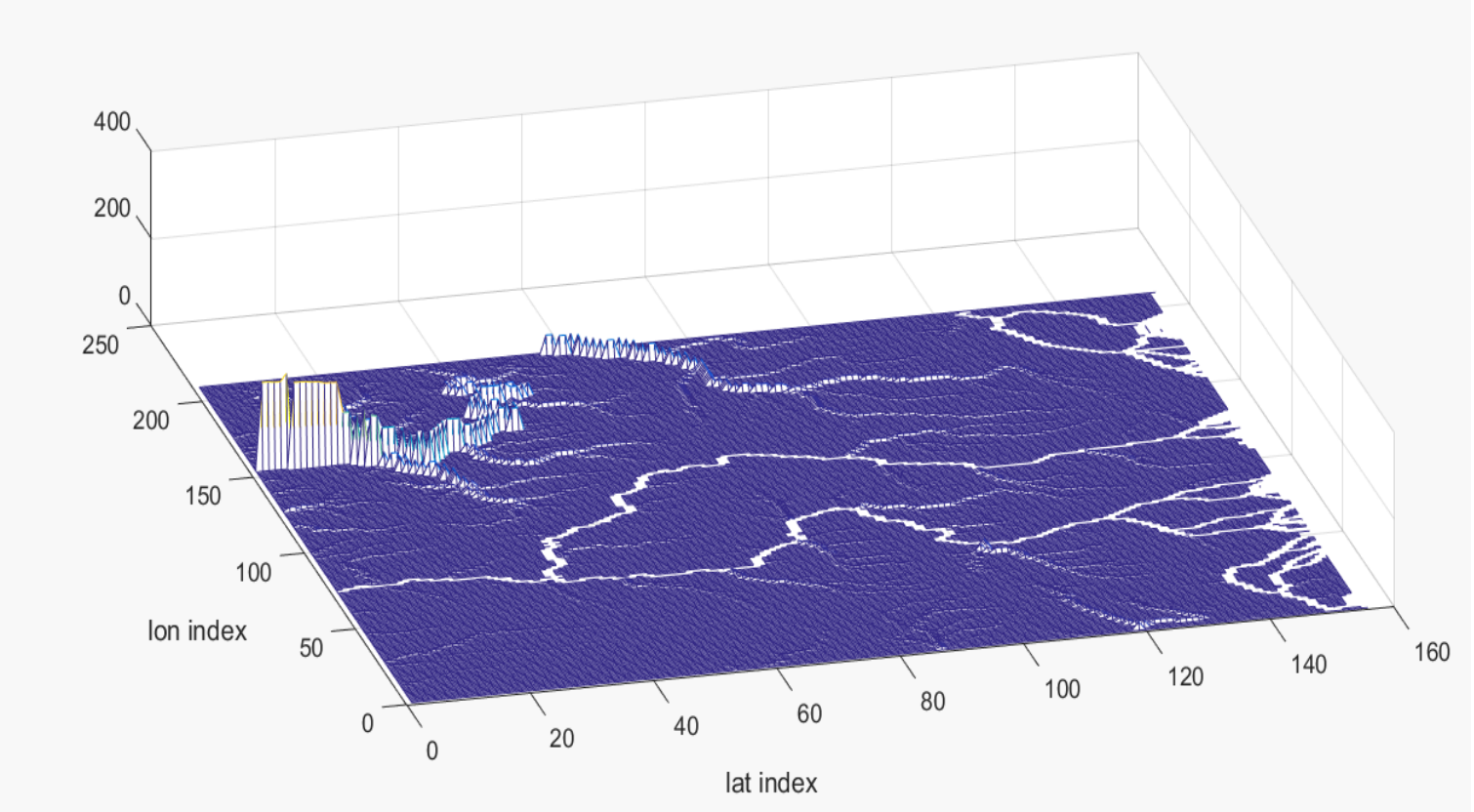
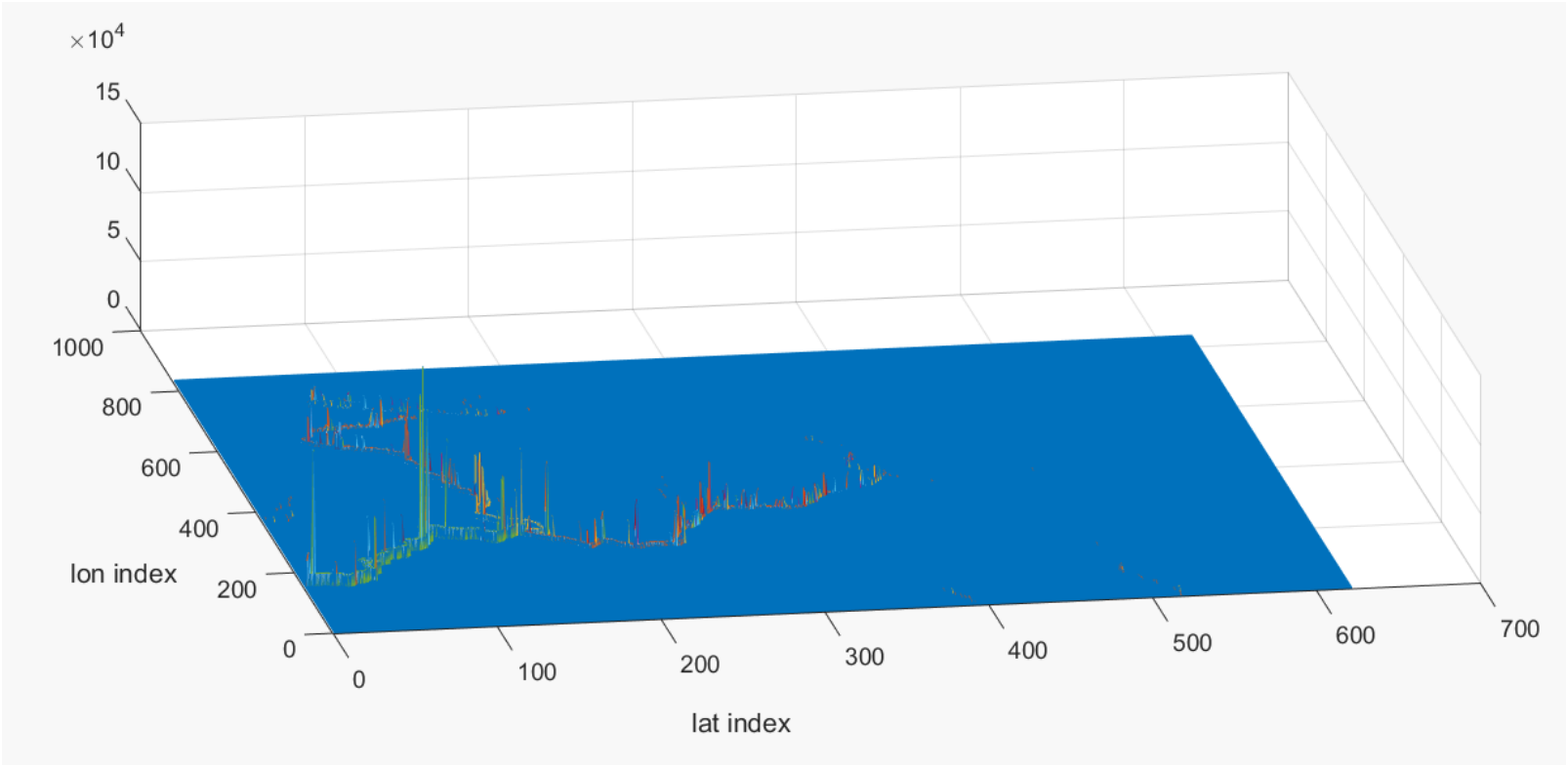


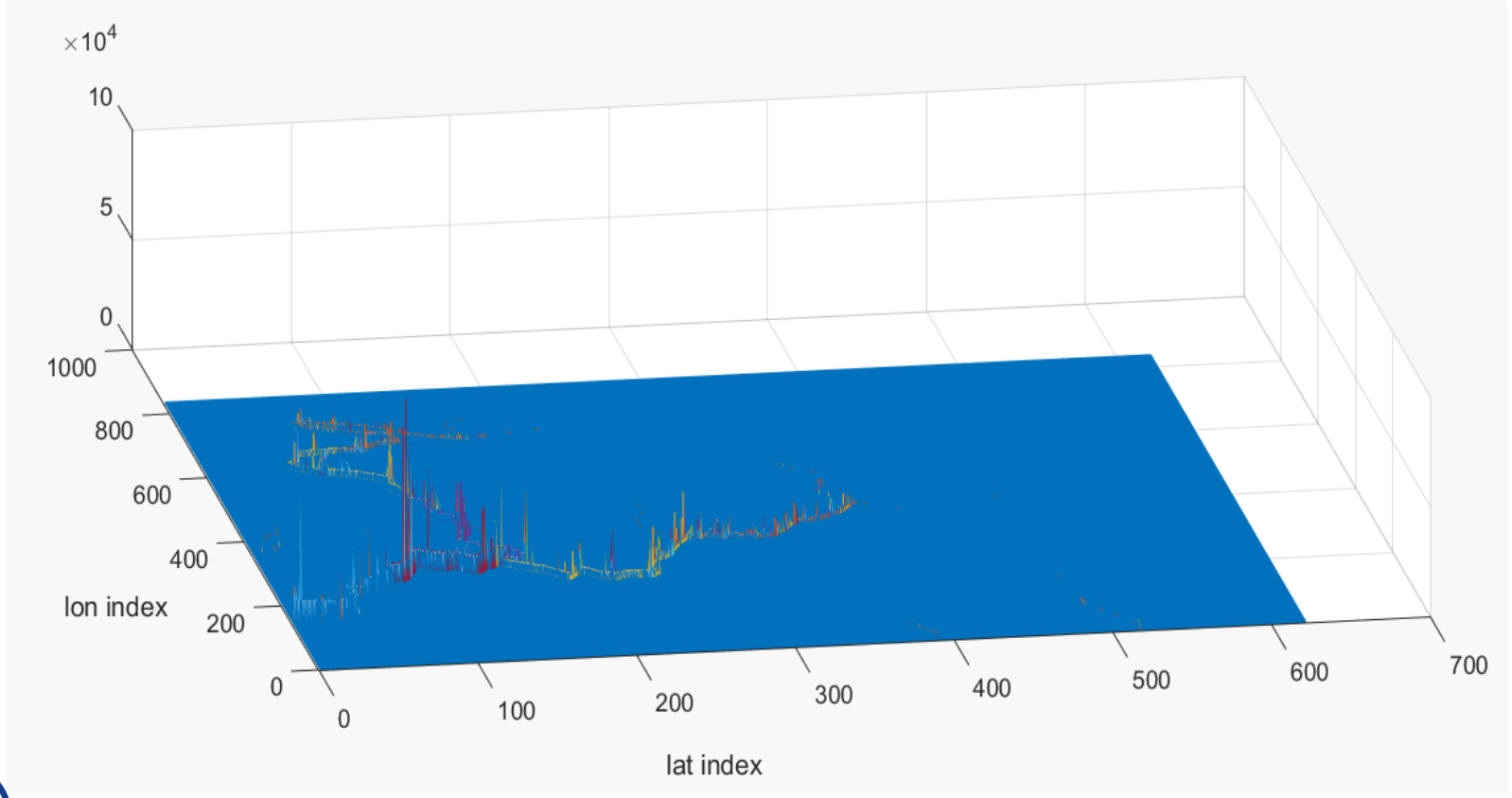
Accumulated discharge during simulation period
pixel size (900m)



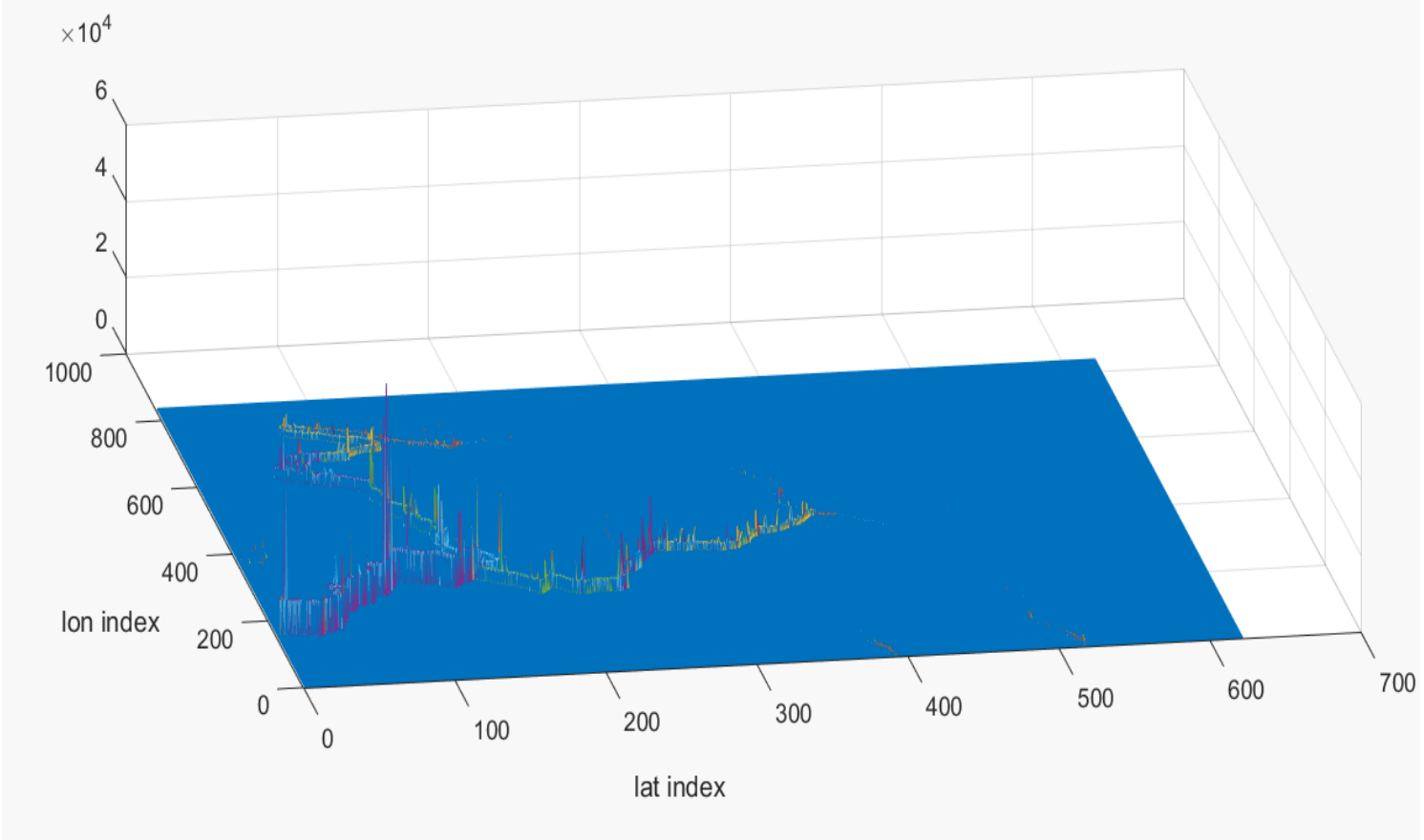
Accumulated discharge during simulation period
pixel size (225m) ΔT=50

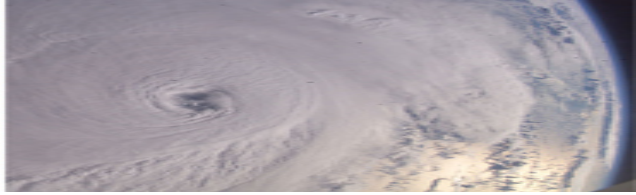


Accumulated discharge during simulation period
pixel size(225m) ΔT=80

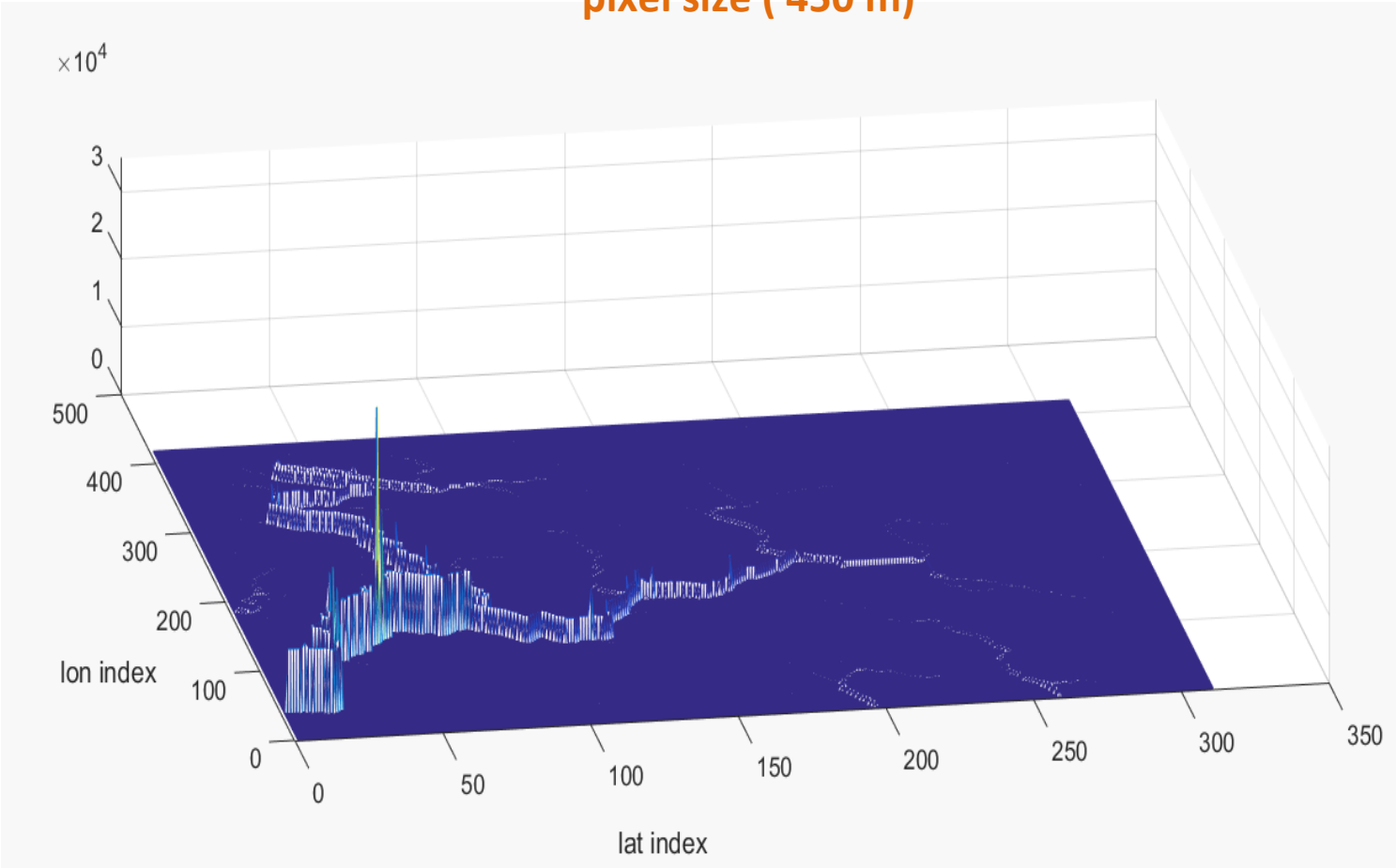


Accumulated discharge during simulation period
pixel size (225m) ΔT=120

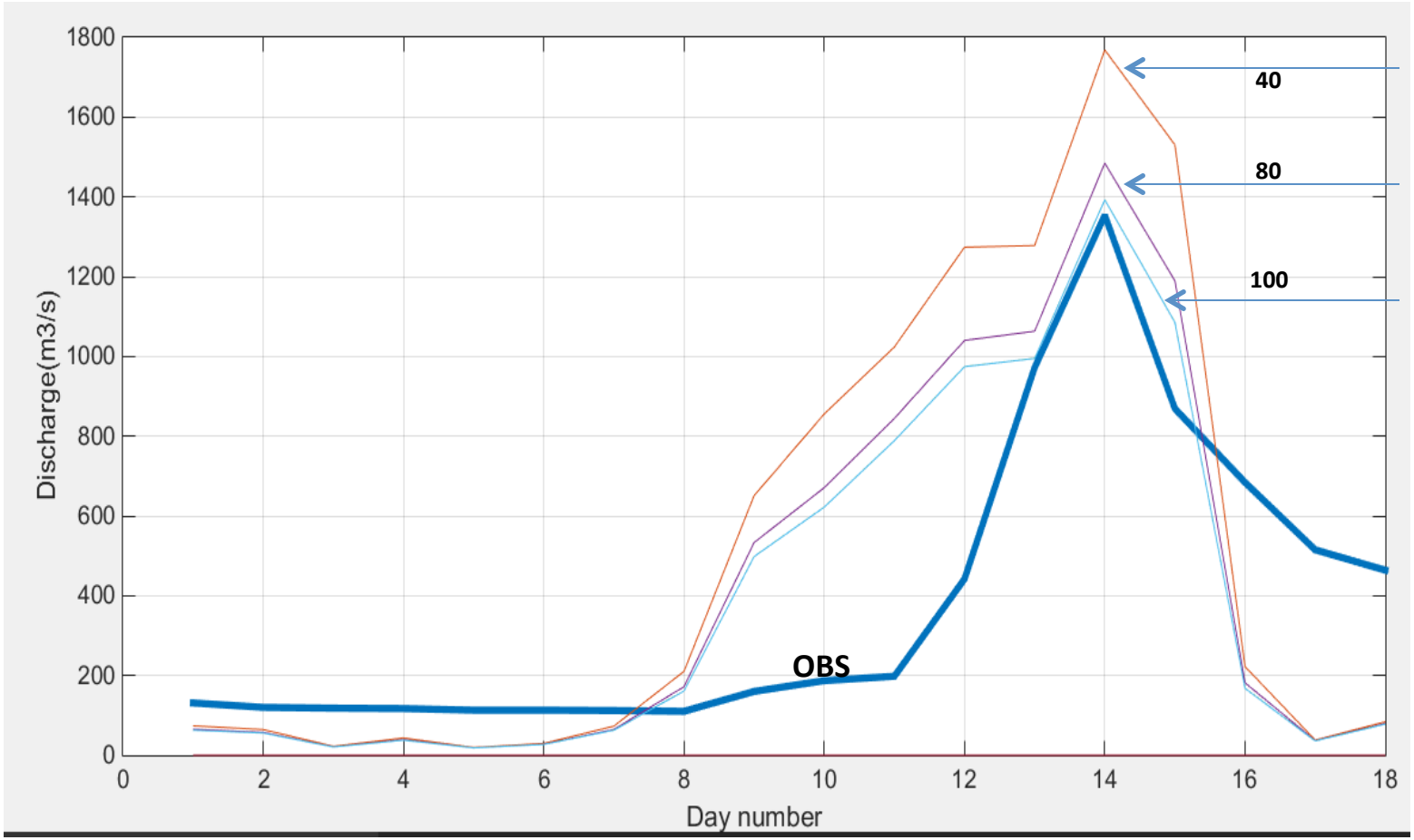




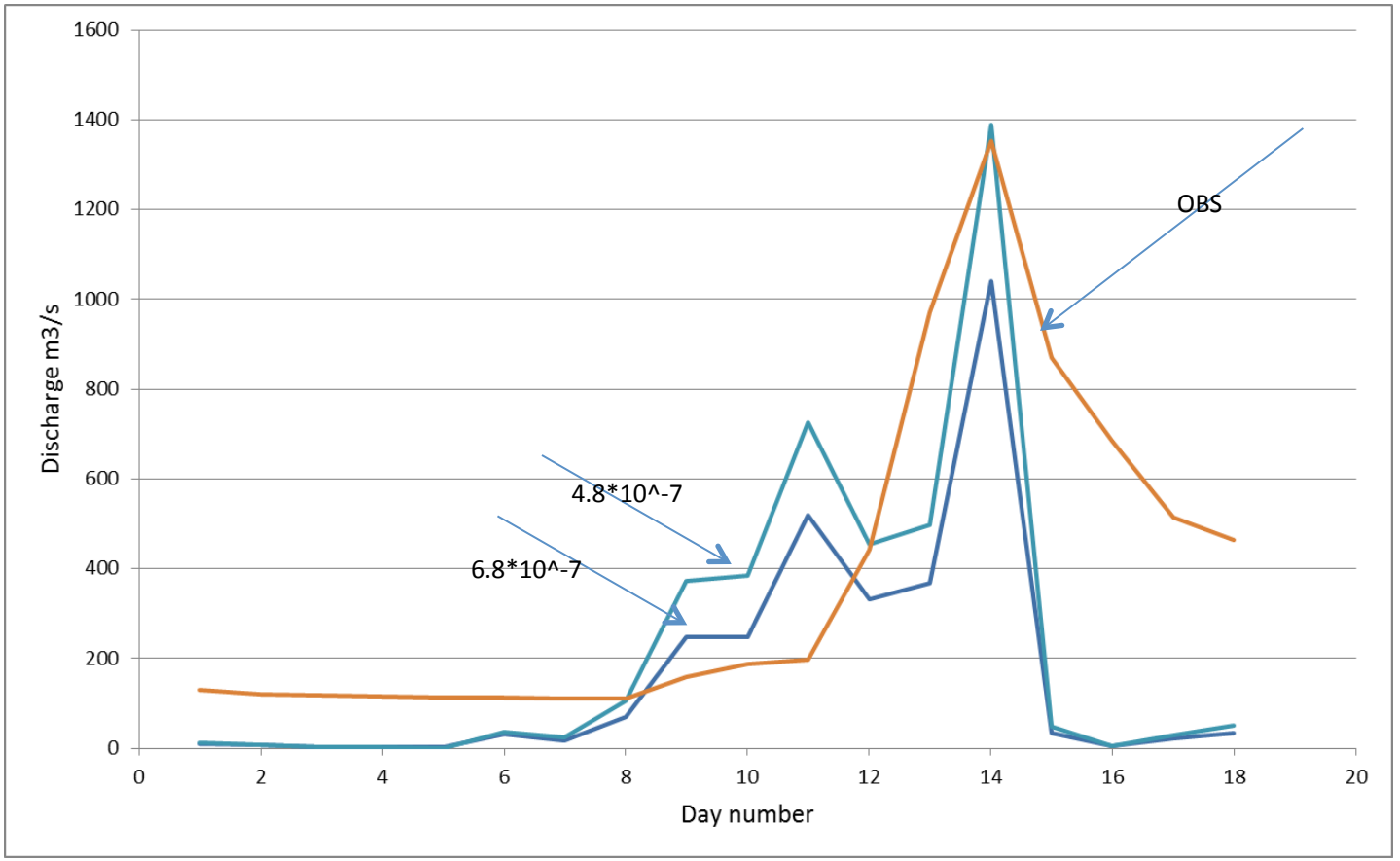
Accumulated discharge during simulation period
pixel size (450 m)



Effect of changing infiltration parameter in output hydrograph



Effect of changing return flow parameter in output hydrograph



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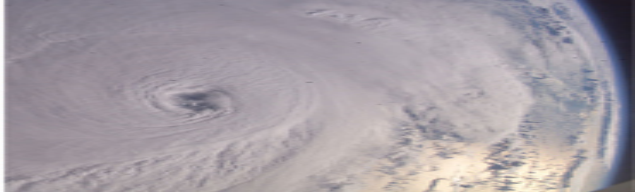

❖ Conclusion

- ✓ Chym Model estimates precisely peaks of Hydrographs for the mentioned basin

More and more study

Sensitivity Analysis

Validation

THANK YOU!