

Impact of different types of meteorological data inputs on predicted hydrological and erosive responses to projected land use change

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Introduction

- Land use / land cover (LULC) changes lead to changes in the shape of hydrograph and soil erosion rate
- Typically weather data from a single source (e.g. CFSR) are used as inputs to evaluate the effect of projected future LULC conditions on river discharge and sediment yield.
- Singular source of meteorological input increases the uncertainty in the evaluation

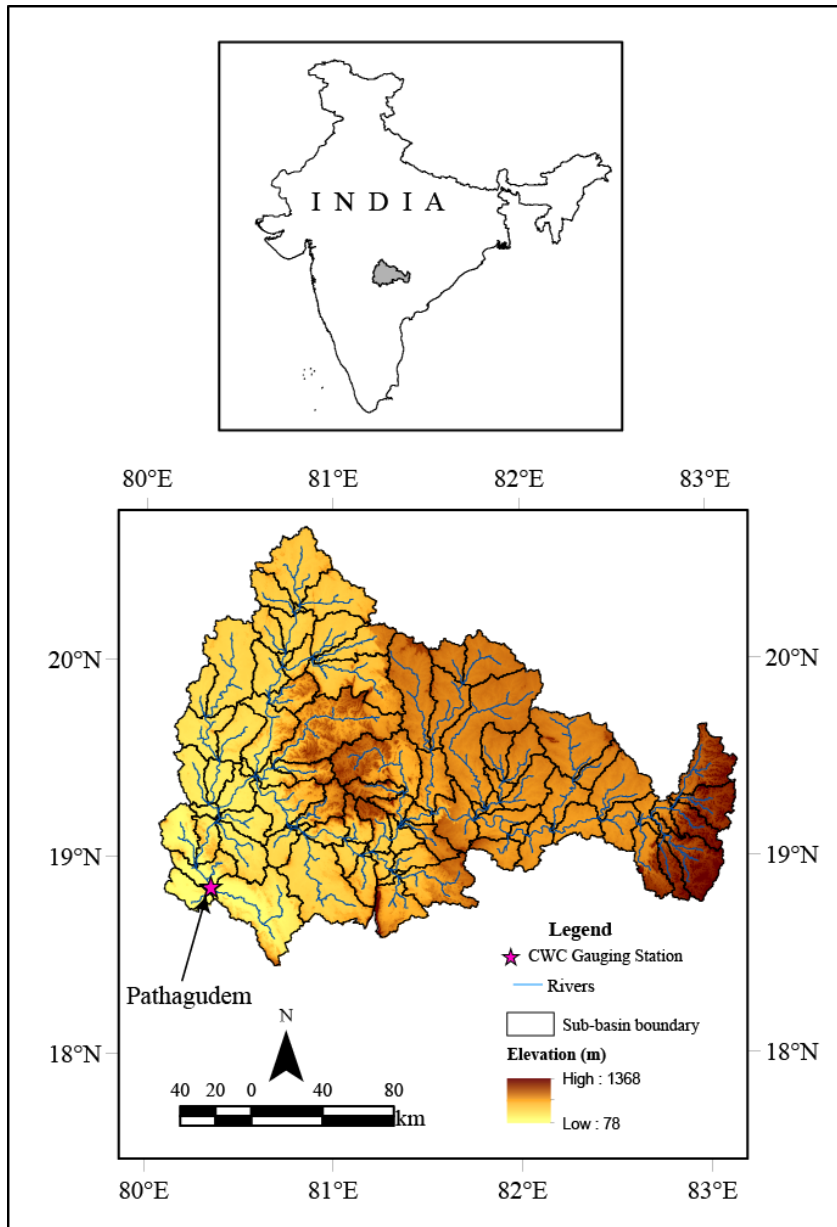
Introduction

Cont.

- CFSR is the most widely used weather data in SWAT model-based studies on the effect of future LULC conditions on flow and sediment yield.
- India has a high potential for rapid LULC changes in foreseeable future and requires attention
- An alternative source of weather data exists for India in the form of Indian Meteorological Department (IMD) gridded rainfall and temperature which is **purely based on gauged records**

Objective

To examine the effects of applying a **global and partially model-driven**(CFSR) vis-à-vis a **regional and purely observation-based** (IMD) weather product on the predicted hydrologic responses to future LULC scenarios



Study Area

□ The Indravati River Basin, a tributary of the Godavari River Basin (The 2nd largest in India)

□ Basin size 40,525 km²

□ Average annual rainfall 1288 mm

□ LULC (2010- GLOBALAND30 Project of China)

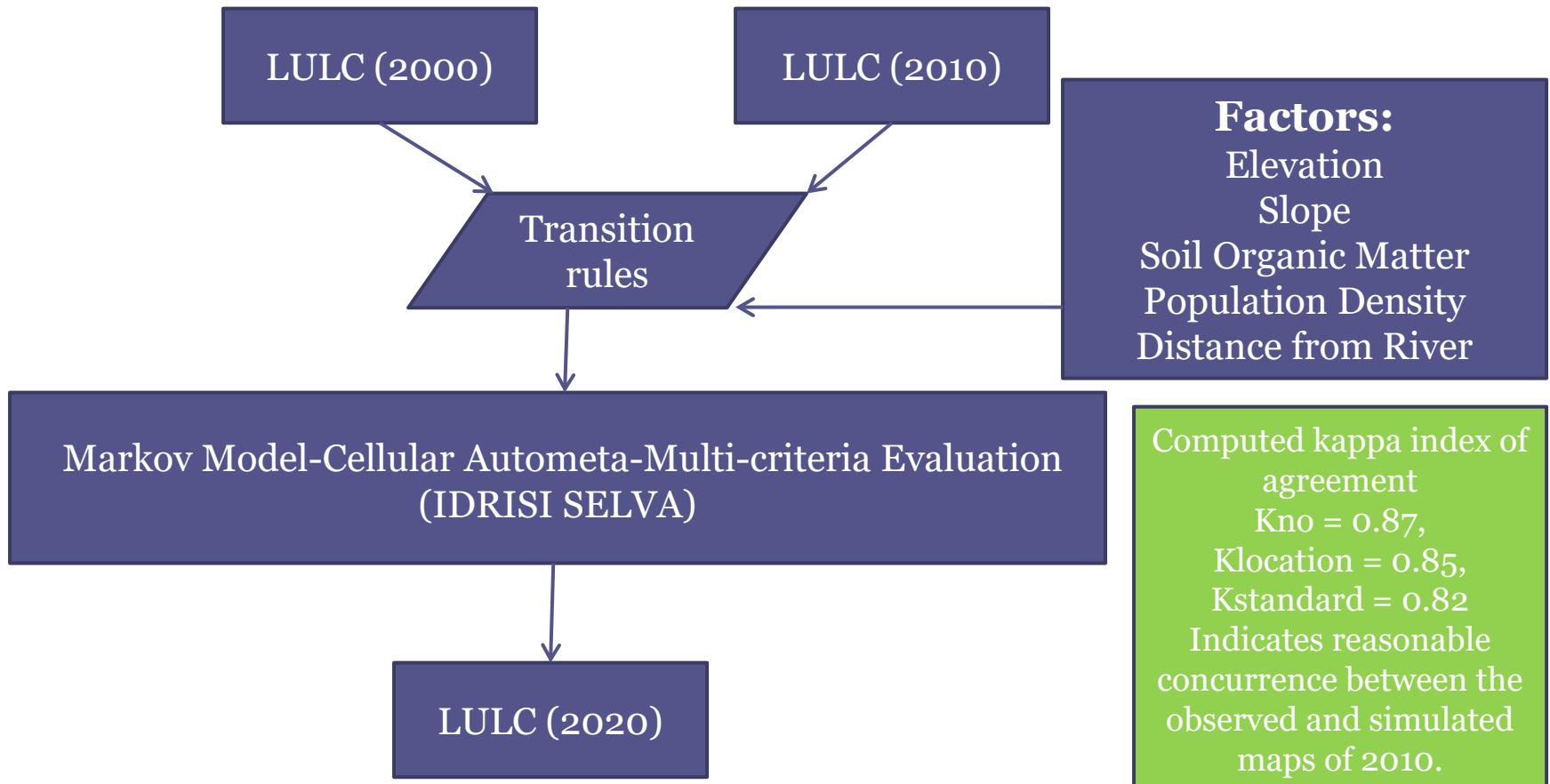
➤ Forest : 43 %

➤ Agricultural Land : 46 %

□ Observed Discharge and Suspended Sediment Concentration data available at Pathagudem

Methods

Land use Change Prediction



Methods

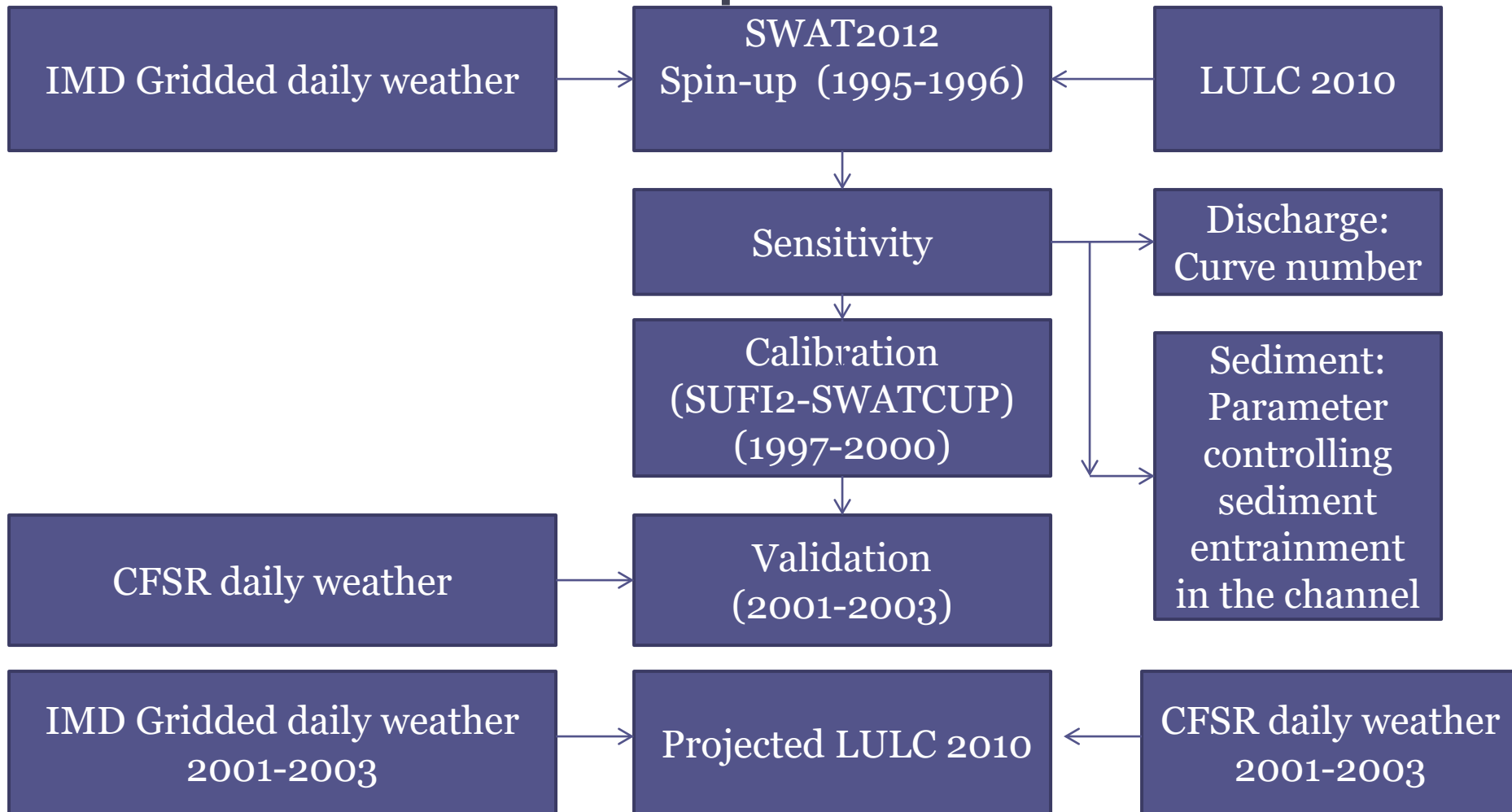
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- SWAT2012 was used to carry out long-term rainfall runoff analysis

Input data for SWAT model in the Indravati River basin.

Input data	Resolution	Source
Digital Elevation Model (DEM)	30m	SRTM DEM (https://earthexplorer.usgs.gov/)
Land use Map	30m	GLOBELAND30, China (http://www.globallandcover.com/GLC30Download/index.aspx)
Soil Map	5km	FAO Digital Soil Map of the world (http://www.fao.org/geonetwork/srv/en/metadata.show?id=14116)
Meteorological data	Daily	CFSR Real Analysis Data (http://swat.tamu.edu/)
Hydrological Data	Daily	CWC, India-wris project, India. (http://www.india-wris.nrsc.gov.in/)

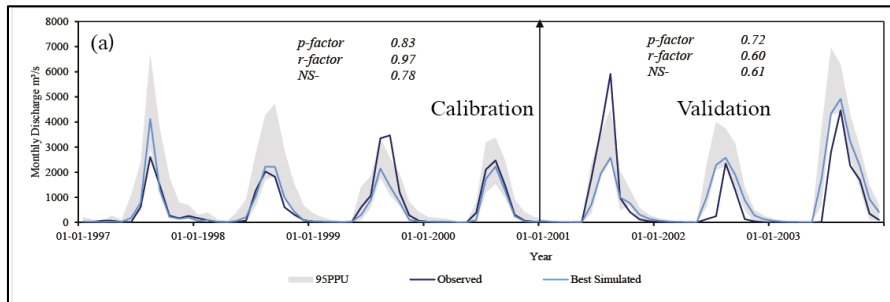
SWAT Model Setup



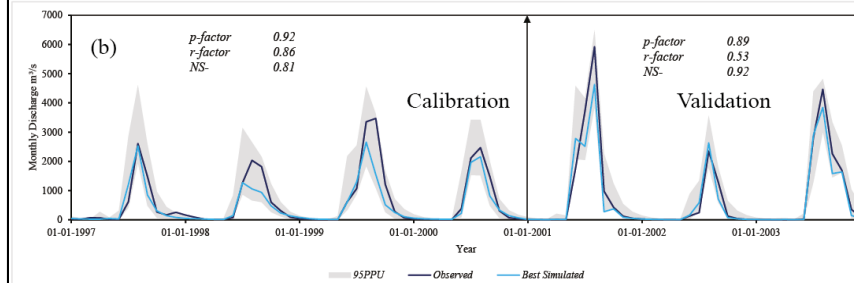
Calibration and Validation (SUFI2-SWATCUP)

SWAT Model Conference, Brussels, 19 - 21 September, 2018

Discharge

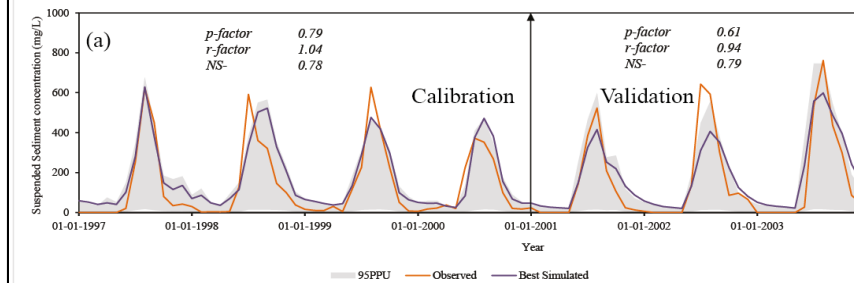


CFSR

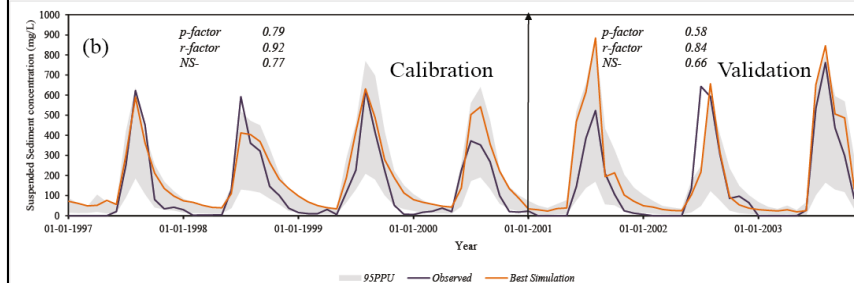


IMD

Sediment Yield

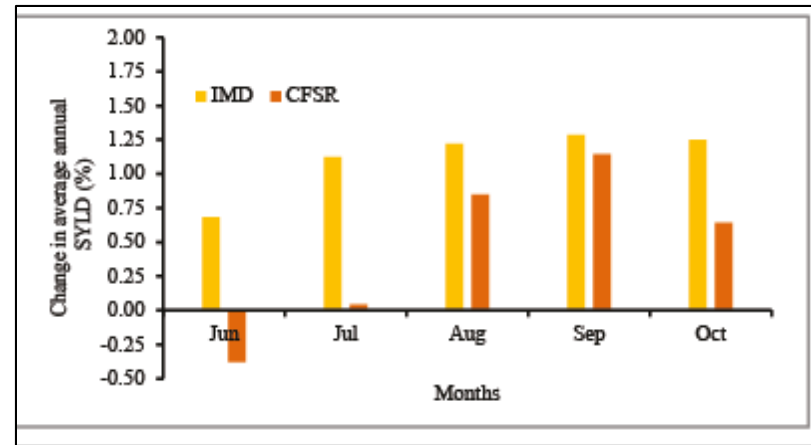
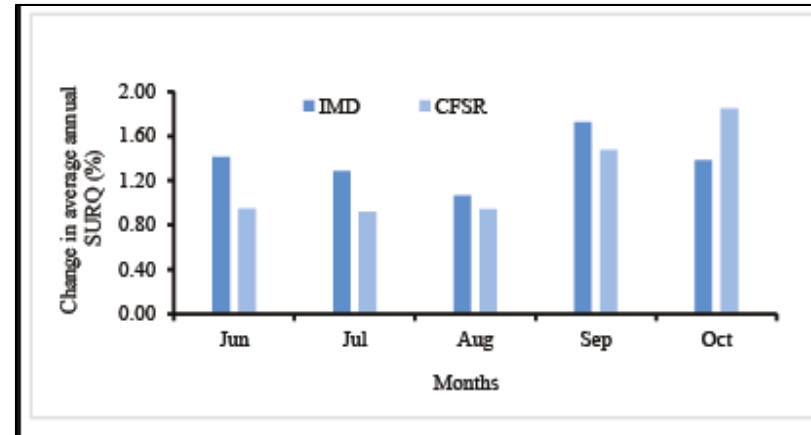
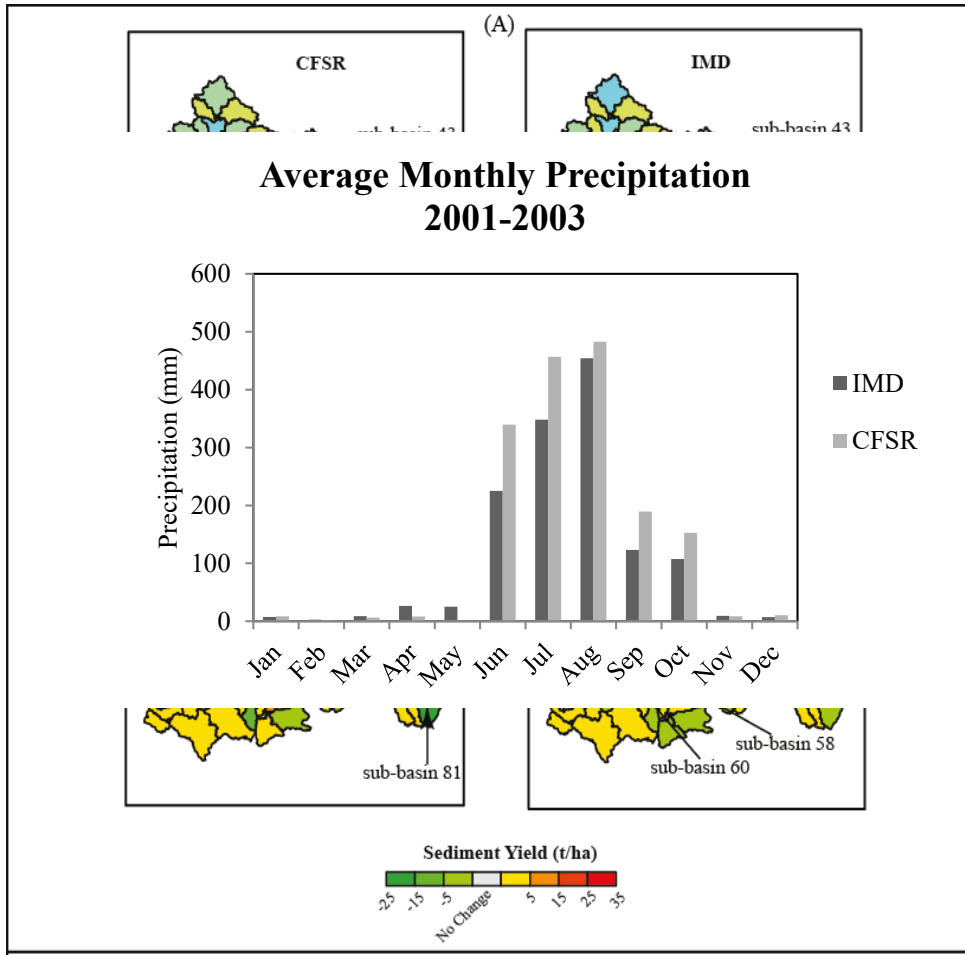


CFSR



IMD

Spatial & temporal changes (2010 – 2020) in discharge and sediment yield to possible LULC conditions (Met data kept constant 2001-03)



Conclusion

- **The location and seasonality** of the predicted changes in discharge and sediment yield due to possible future land use conditions involves **uncertainty** and may depend largely on the particular weather input.
- If possible, it is useful to consult **more than one type of weather dataset** for examining the effect of future land use changes

Publication

Bhattacharyya, S. and Sanyal, J. (Accepted) Impact of different types of meteorological data inputs on predicted hydrological and erosive responses to projected land use changes. *Journal of Earth System Science*

The screenshot shows the Springer website interface for the Journal of Earth System Science. At the top, there is a search bar and navigation links for Home, Research Fields, Services, Product Information, Springer Shop, and About Springer. The main content area features the journal's cover image on the left, which includes the title 'JOURNAL OF EARTH SYSTEM SCIENCE' and the Indian Academy of Sciences logo. To the right of the cover, the journal title 'Journal of Earth System Science' is displayed in a large blue font. Below the title, it states 'Published by the Indian Academy of Sciences' and lists the Editor-in-Chief as N. V. Chalapathi Rao. ISSN numbers for print (0253-4126) and electronic (0973-774X) versions are provided, along with the journal number 12040. A prominent blue circular button with a grid icon and the text 'Read Online' is positioned to the right of the journal information. Below this, the subscription price is listed as '¥9,167' with a note 'Personal Rate eOnly for Japan' and a 'Get Subscription' button. On the right side of the page, there are several sections: 'READ THIS JOURNAL ON SPRINGERLINK' with links for 'Online First Articles' and 'All Volumes & Issues'; 'FOR AUTHORS AND EDITORS' with a '2017 Impact Factor' of 0.890; and other links like 'Aims and Scope', 'Submit Online', and 'Instructions for Authors (pdf, 2.7 MB)'. The Springer logo is visible in the top left corner of the page.

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