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A Multi-Sourced Flood Inventory in Contiguous United States During TRMM Era

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Global Active Archive of Large Flood Events
(Dartmouth Flood Observatory)

Emergency Disasters Database
(Centre for Research on the Epidemiology of Disasters)

RelifWeb
(UN OHCA)

A Digitized Global Flood Inventory (GFI)
(Adhikari et al., 2010)

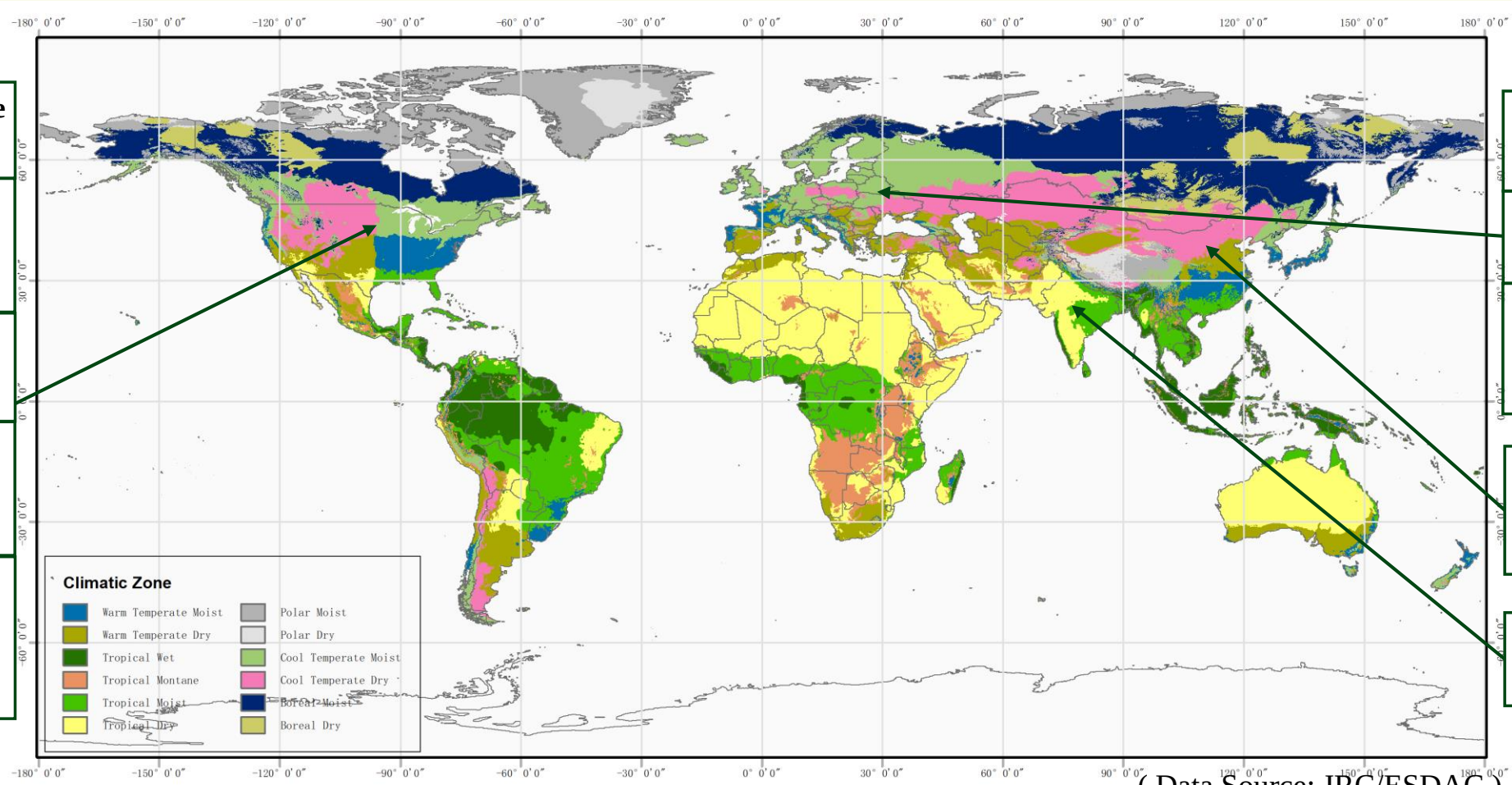
Storm Event Database
(NOAA NCEI)

Unified Flash Flood Database
(Gourley et al., 2013)

SHAVE Dataset
(Gourley et al., 2010)

Impact-focused Database
(Calianno et al., 2013)

Comprehensive Database of Flood Events
(Shen and Mei, 2017)



(Data Source: JRC/ESDAC)

European flash floods
(Gaume et al., 2009)

Floods in Greece
(Diakakis et al., 2012)

Flood Records in Northern Portugal
(Santos et al., 2015)

Newspaper-based Database in Shanghai
(Du et al., 2015)

Flood Events in India
(Singh and Kumar, 2013)

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Regulation and Urbanization → Floods

A Comprehensive Flood Event Inventory

- impact of human activities on floods
- validation of flood modeling
- prediction of future changes in river

Numerical Model Results

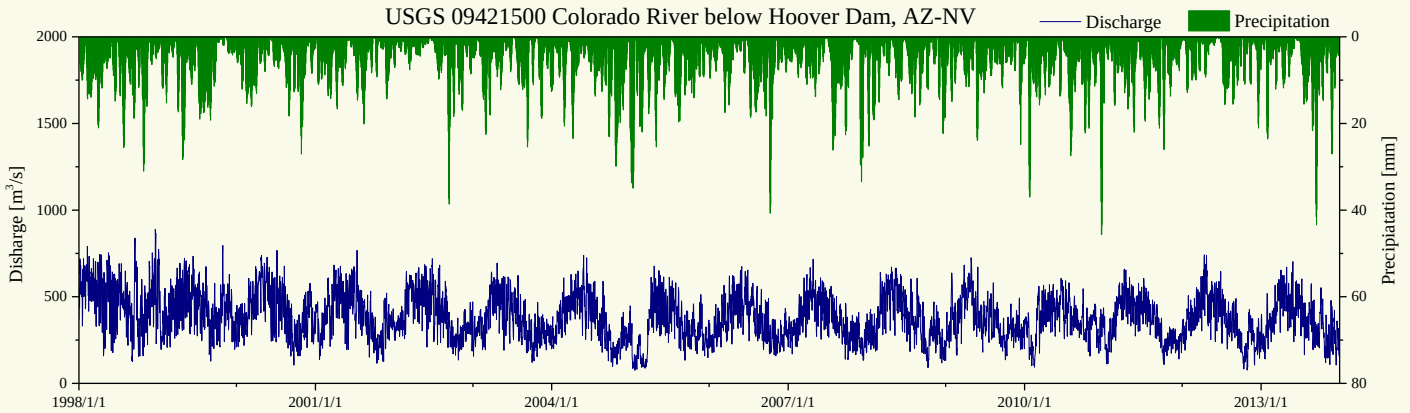

Fig. 2. Example of observed hydrograph at USGS gauge 09421500. This gauge is located below Hoover Dam and downstream of another 70 dams.

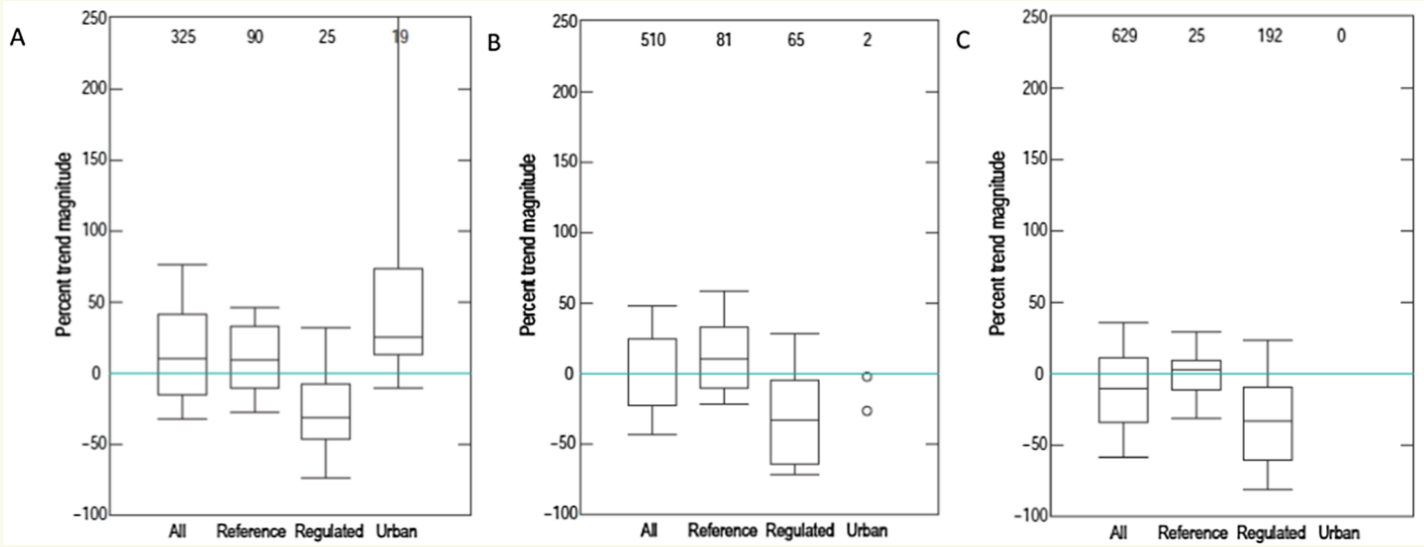

Fig. 3. Boxplots of annual peak-flow trend magnitudes for the conterminous United States for 1941–2015, for three different basin size classes: (A) small ($< 469\ km^2$), (B) medium ($469–2{,}036\ km^2$), (C) Large ($> 2{,}036\ km^2$). (Hodgkins et al., 2019)

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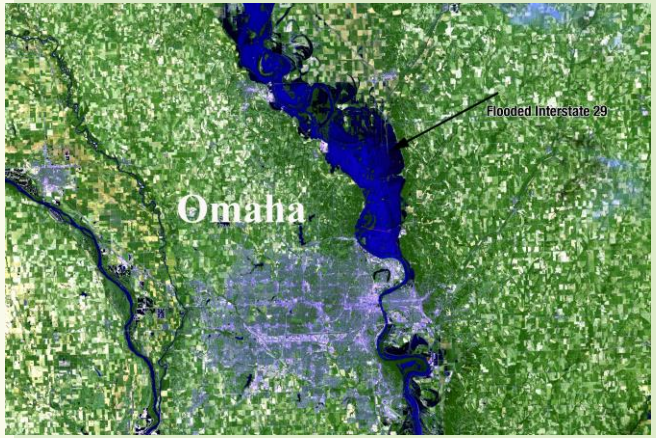
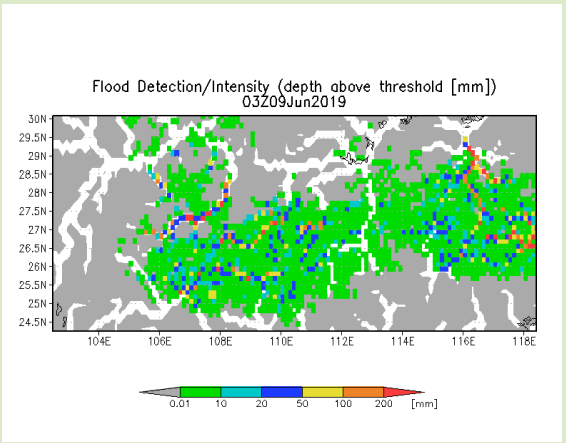
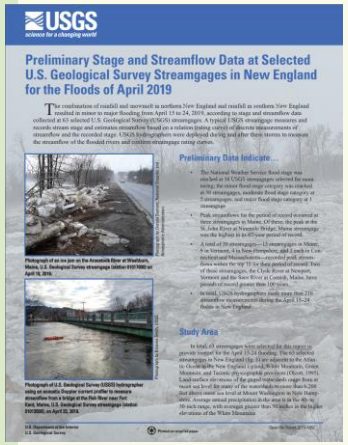
In-situ Observation

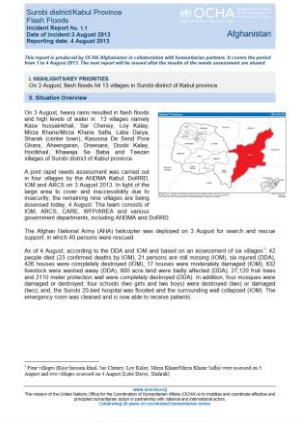


Remote Sensing Images

Model Simulation







Disaster Reports

Multi-sourced Flood Inventory (MFI)

- In-situ observation
- Remote sensing dataset
- Model simulation results

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Data

In-situ observation:

- Daily discharge data from 1419 USGS gauges (selected out of 19,217 in total)

Remote sensing dataset :

- 198 flood events derived from Dartmouth Flood Observatory Archive (DFO)

Table 1. The proportion of the number of sub-catchment with selected USGS Gauges and DFO events to all sub-catchment

	2nd	3rd	4th	5th	6th	7th
Proportion	13.5%	34.7%	66.3%	54.7%	72.2%	100%

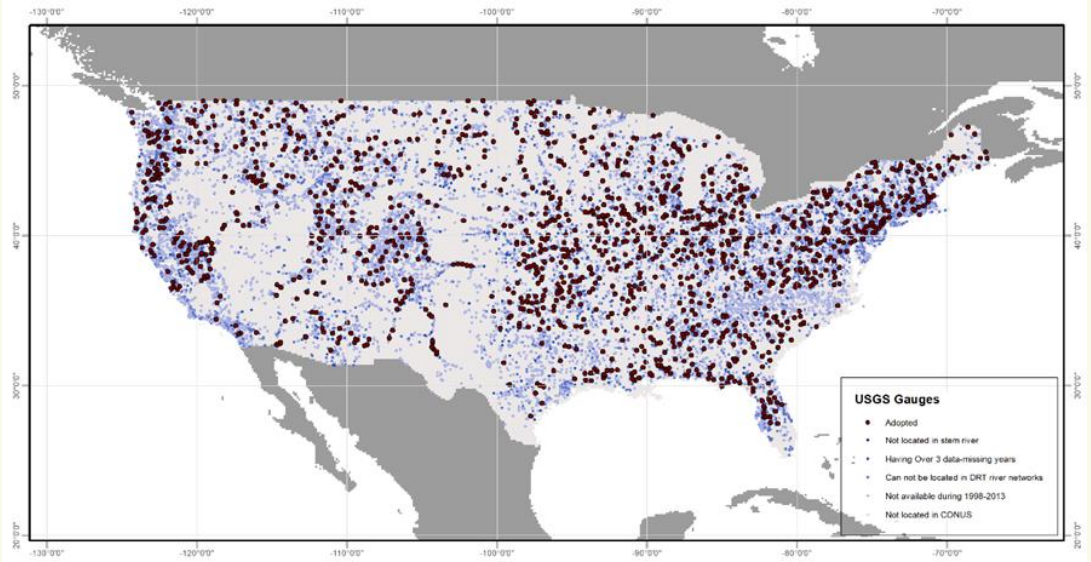

Fig. 4. The distribution of 1,419 selected USGS gauges.

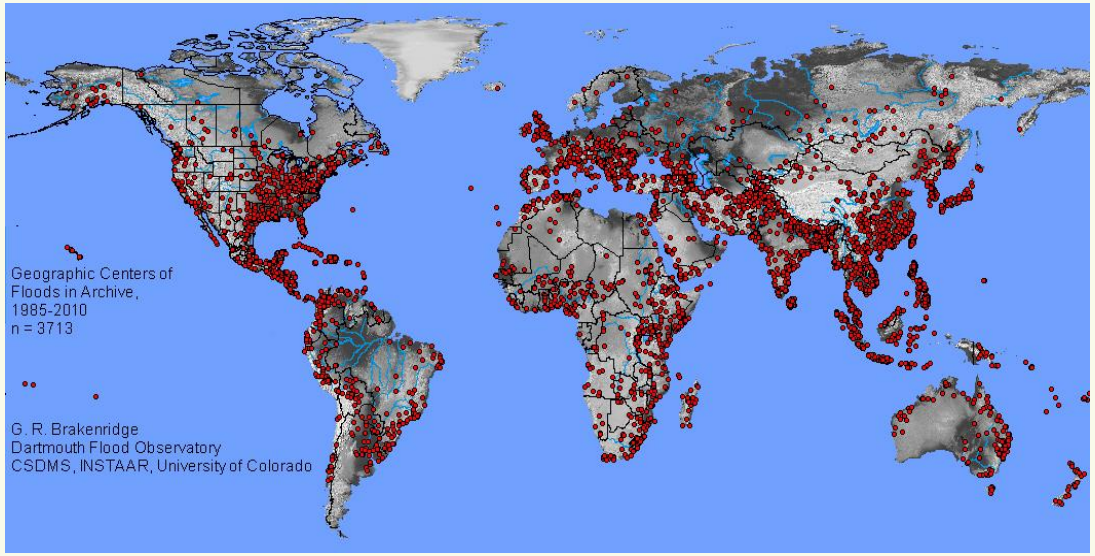

Fig. 5. Geographic Centers of floods in the Global Active Archive of Large Flood Events

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Data

Model Simulation:

- retrospective simulation results by the **DRIVE** model

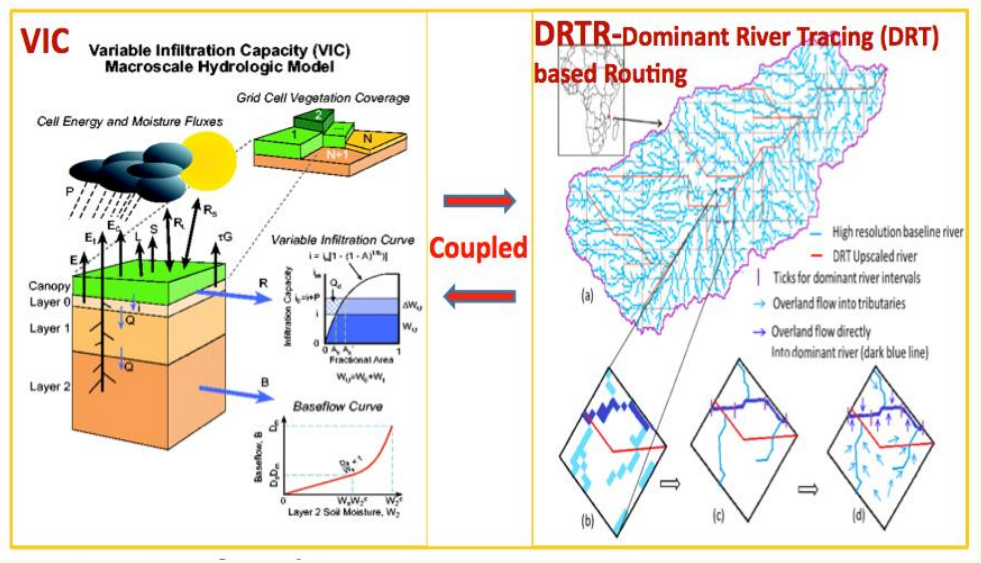

Fig. 6. The concept of the Dominant river tracing-Routing Integrated with VIC Environment (DRIVE) model

Five Precipitation Dataset:

→ used for simulated flood event validation

Product	Main Sources	Temporal Resolution	Spatial Resolution
NLDAS-2	Gauge, radar and satellite	1 h	0.125°
TMPA-RP	Satellite	3 h	0.25°
Stage IV	Radar and gauge	1 h	4 km
CPC-U	Gauge	1 day	0.25°
MSWEP	Gauge and satellite	3 h	0.1°

Table 2. Flood Detection Verification Against 1419 USGS gauges in CONUS

	All	2nd	3rd	4th	5th	6th	7th
POD	0.83	0.846	0.834	0.790	0.836	0.857	-
FAR	0.13	0.134	0.131	0.131	0.129	0.133	0
CSI	0.72	0.82	0.69	0.62	0.49	0.80	-

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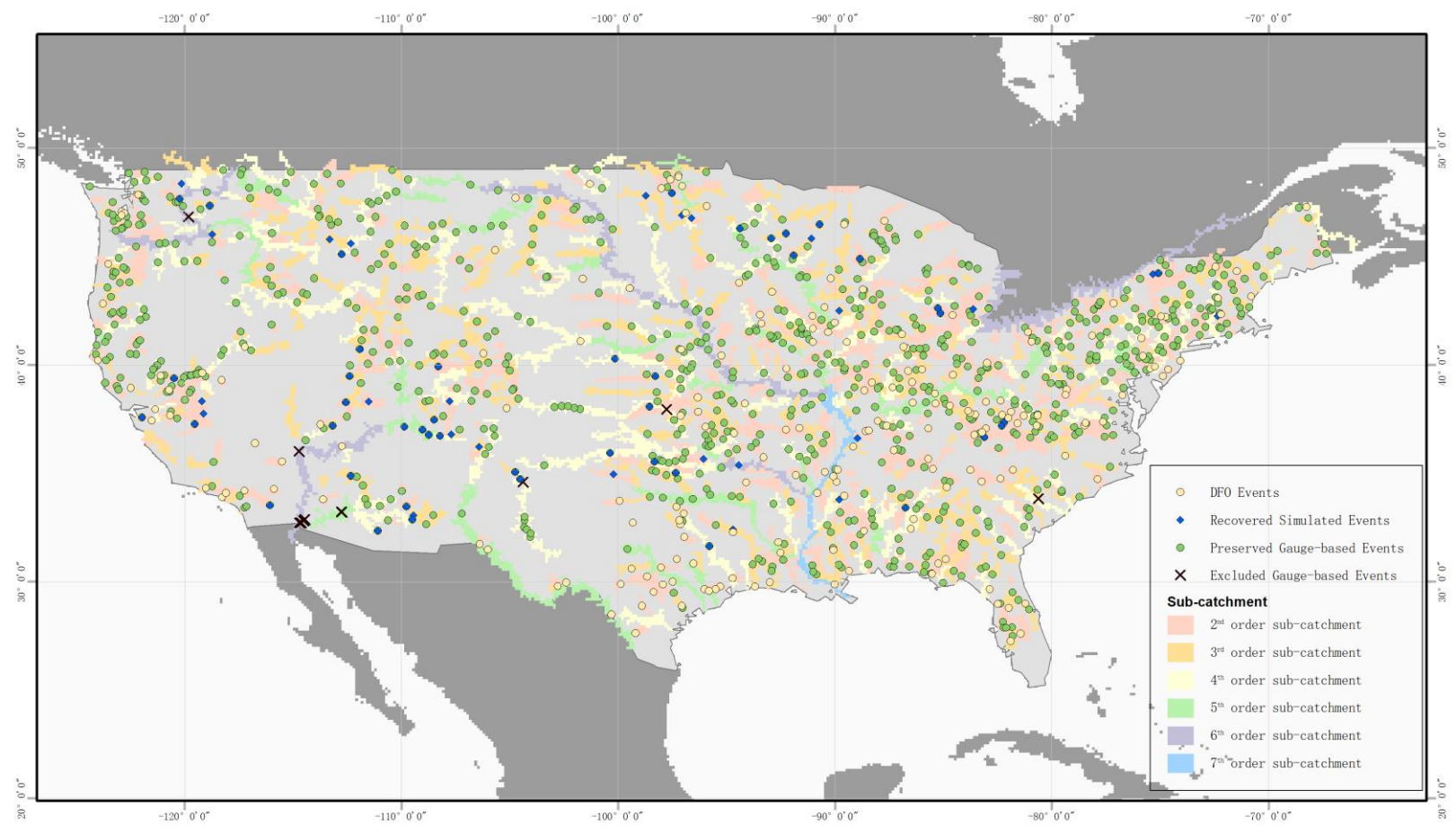
Preliminary Results

- USGS gauges: 981 extreme flood events → removed 24 insignificant events
- DFO database: 198 events
- Model simulation: recovered 71 events



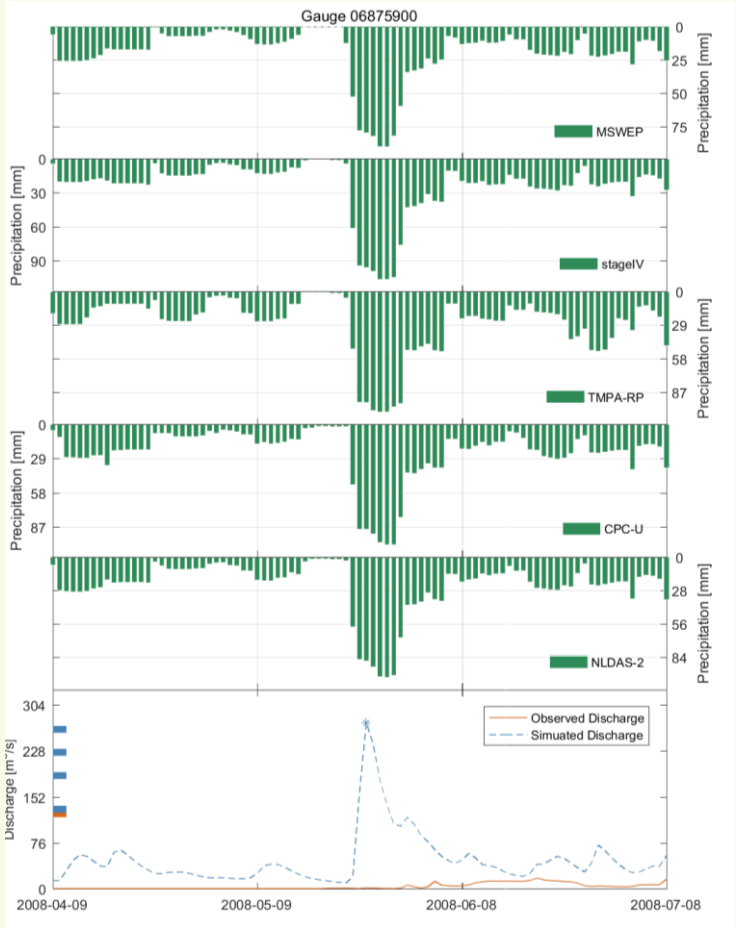


Fig 4. The distribution of preserved events, discarded events and recovered events

Thank you for your attention.

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