

# POTENZIALE DELLA MISSIONE NGGM PER APPLICAZIONI IDROLOGICHE

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# SCHEMA DELLA PRESENTAZIONE

- Potenziali applicazioni idrologiche della missione NGGM:
  - Stima della precipitazione
  - Sicchezza e stima del raccolto
  - Stima della portata fluviale: approccio STREAM
- Scientific Readiness Levels delle diverse attività
- Conclusioni

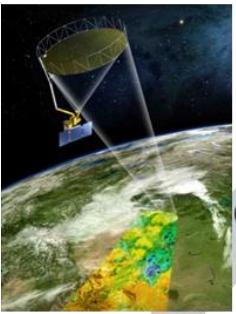
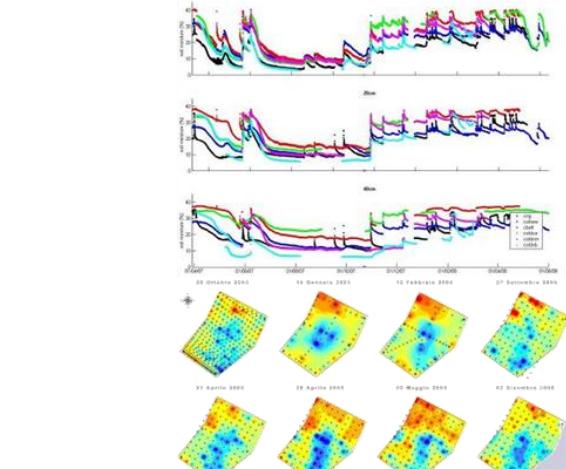
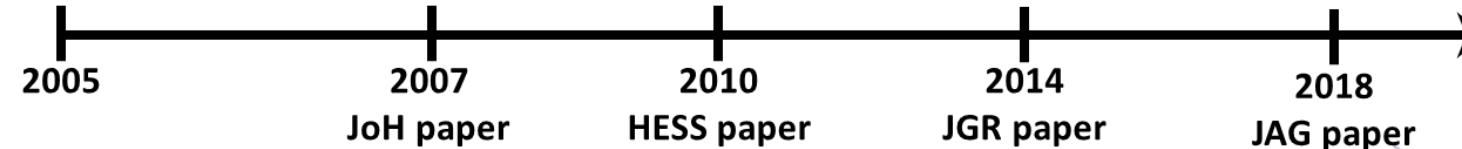
## GRUPPO DI LAVORO



## PROGETTI

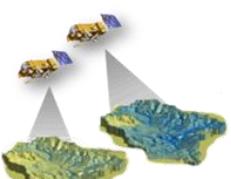


# 15+ ANNI DI RICERCA SULL'UMIDITÀ DEL SUOLO

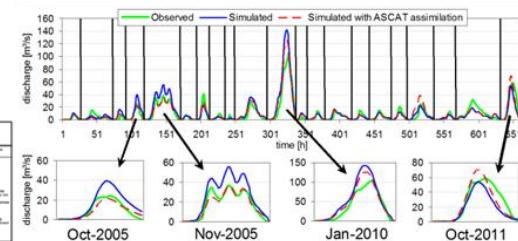
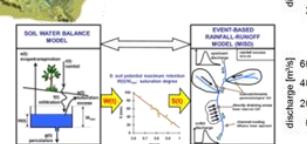


**Soil moisture monitoring** with in situ and remote sensing

Understanding the spatial-temporal **variability** of soil moisture at different spatial scales



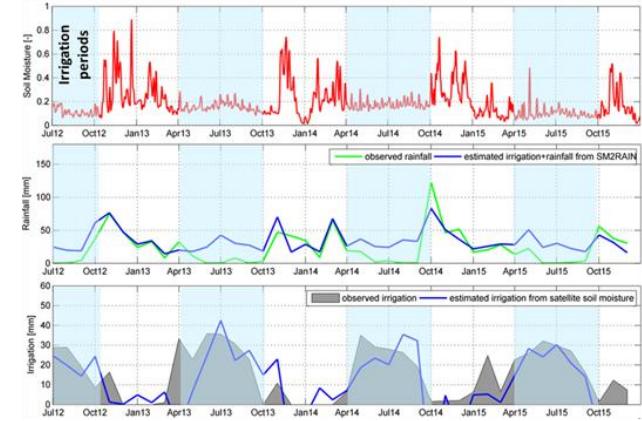
**Assimilation** of in situ and remote sensing soil moisture measurements for **hydrological applications**



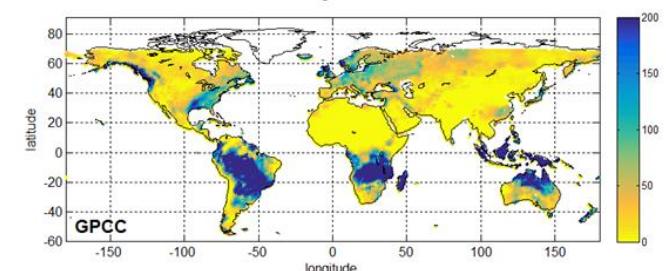
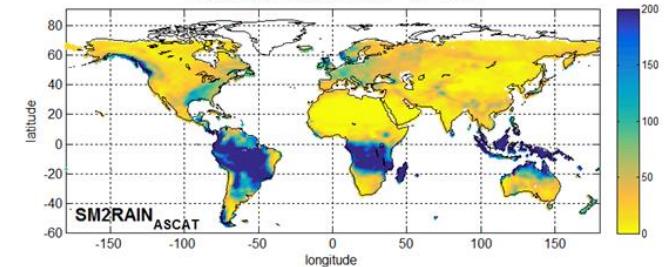
Detecting rainfall from the bottom up: using soil moisture observations for measuring rainfall (**SM2RAIN**)

2014  
JGR paper

**Agricultural drought monitoring:** measuring irrigation from space



MONTHLY RAINFALL - 01-2007

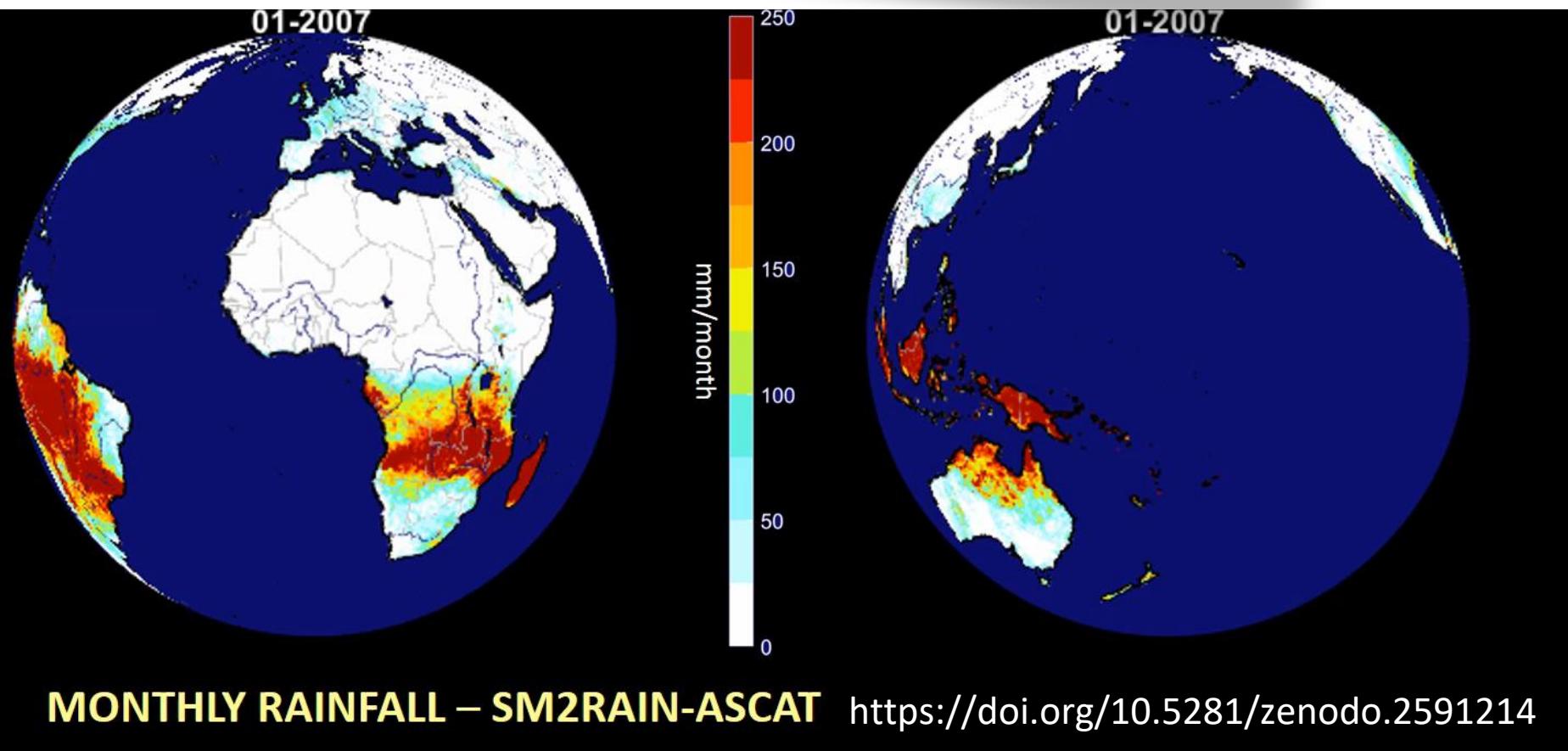


# STIMA DELLA PRECIPITAZIONE

*SM2RAIN-ASCAT (2007–2018): global daily satellite rainfall data from ASCAT soil moisture observations*

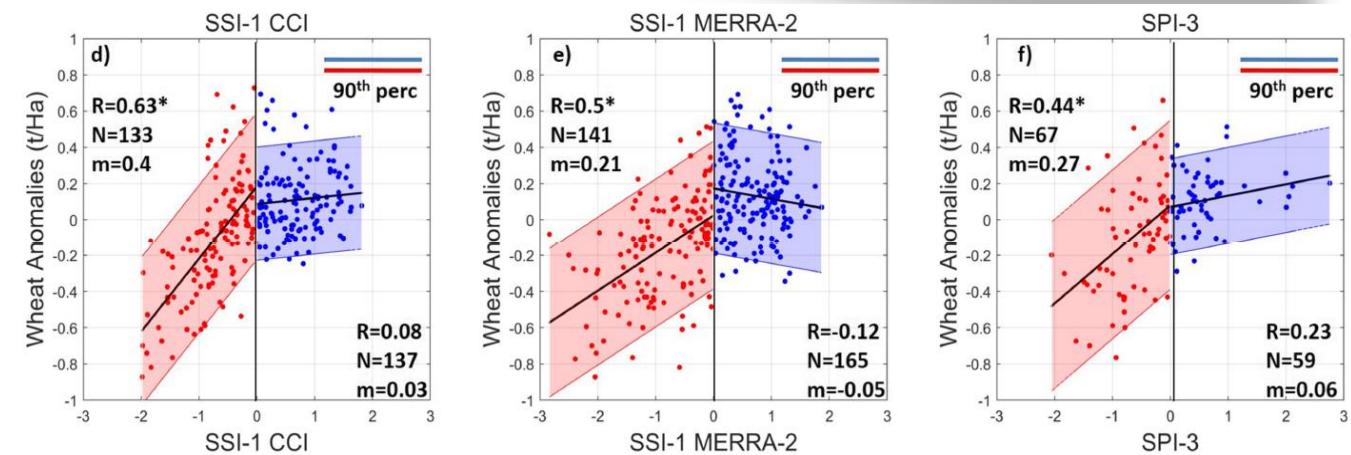
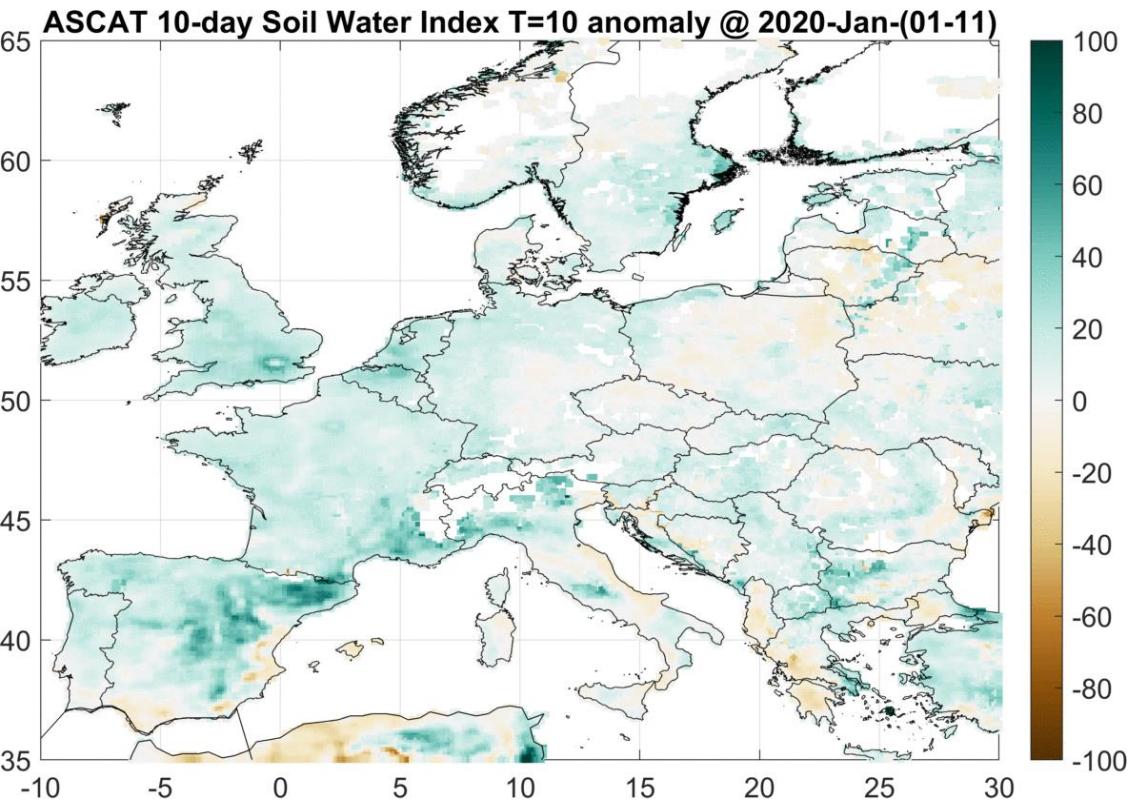
Luca Brocca<sup>1</sup>, Paolo Filippucci<sup>1</sup>, Sebastian Hahn<sup>2</sup>, Luca Ciabatta<sup>1</sup>, Christian Massari<sup>1</sup>, Stefania Camici<sup>1</sup>, Lothar Schüller<sup>3</sup>, Bojan Bojkov<sup>3</sup>, and Wolfgang Wagner<sup>2</sup>

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Data



The high temporal resolution of NGGM (3 day) would allow to apply the SM2RAIN approach and thus obtaining a new global precipitation product

# SICCITÀ E STIMA DEL RACCOLTO



The high spatial resolution of NGGM (100 km) would allow to perform the analysis also over the Mediterranean (climate change hotspot) and by considering the total water storage instead of only surface soil moisture

Disaster Risk Financing & Insurance Program

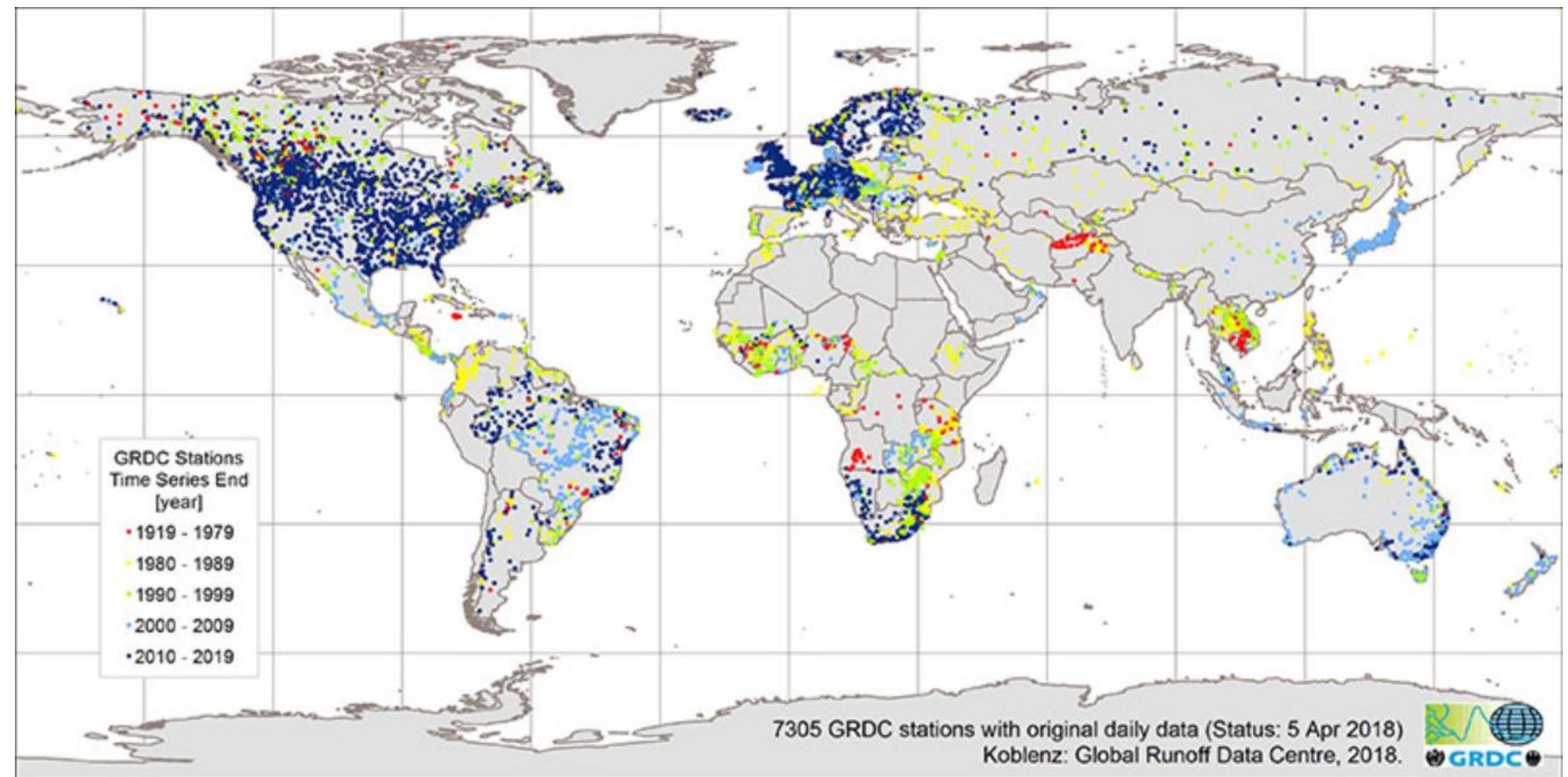
SUPPORTED BY  
WORLD BANK GROUP

SMART-DRI Project

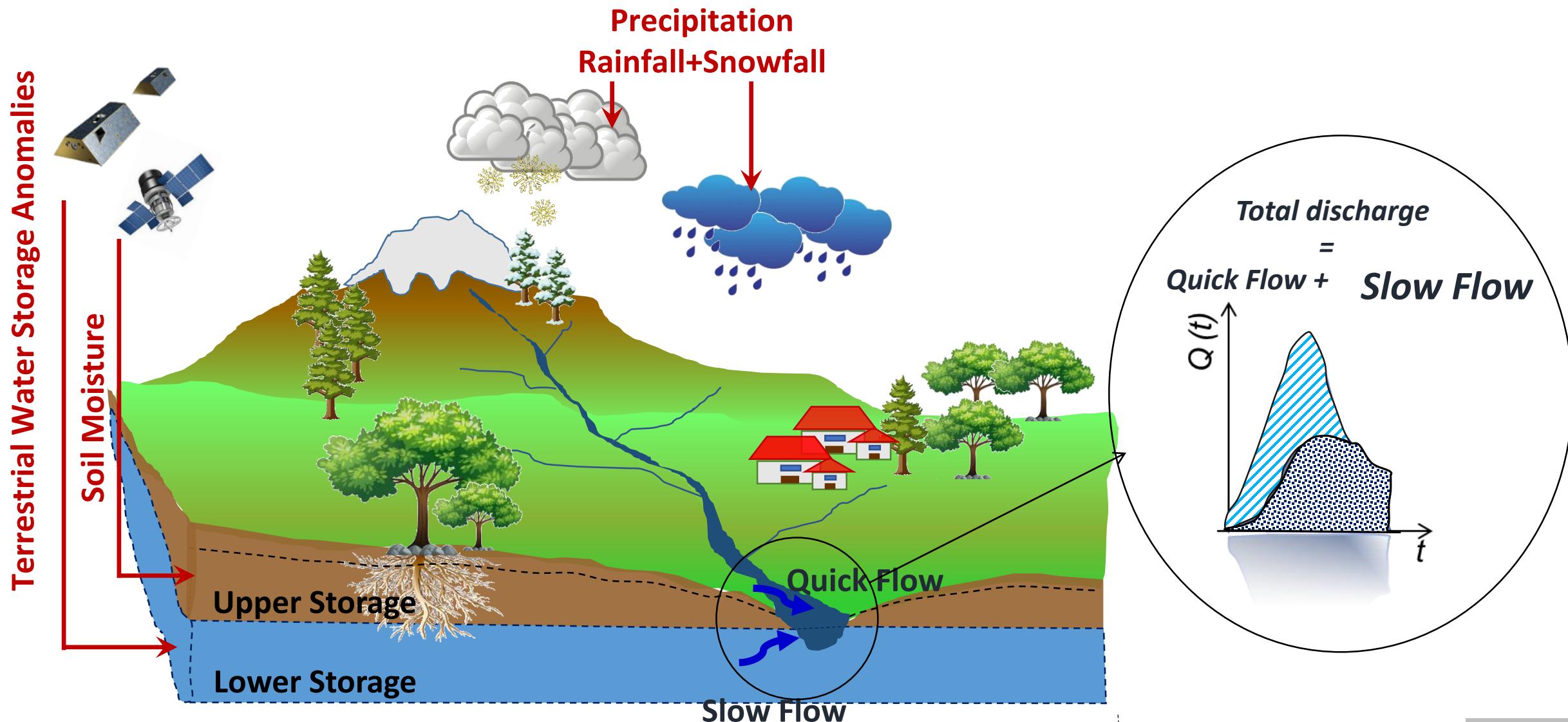
# STREAM: INTRODUZIONE AL PROBLEMA

## RIVER DISCHARGE FROM THE TRADITIONAL MONITORING NETWORK

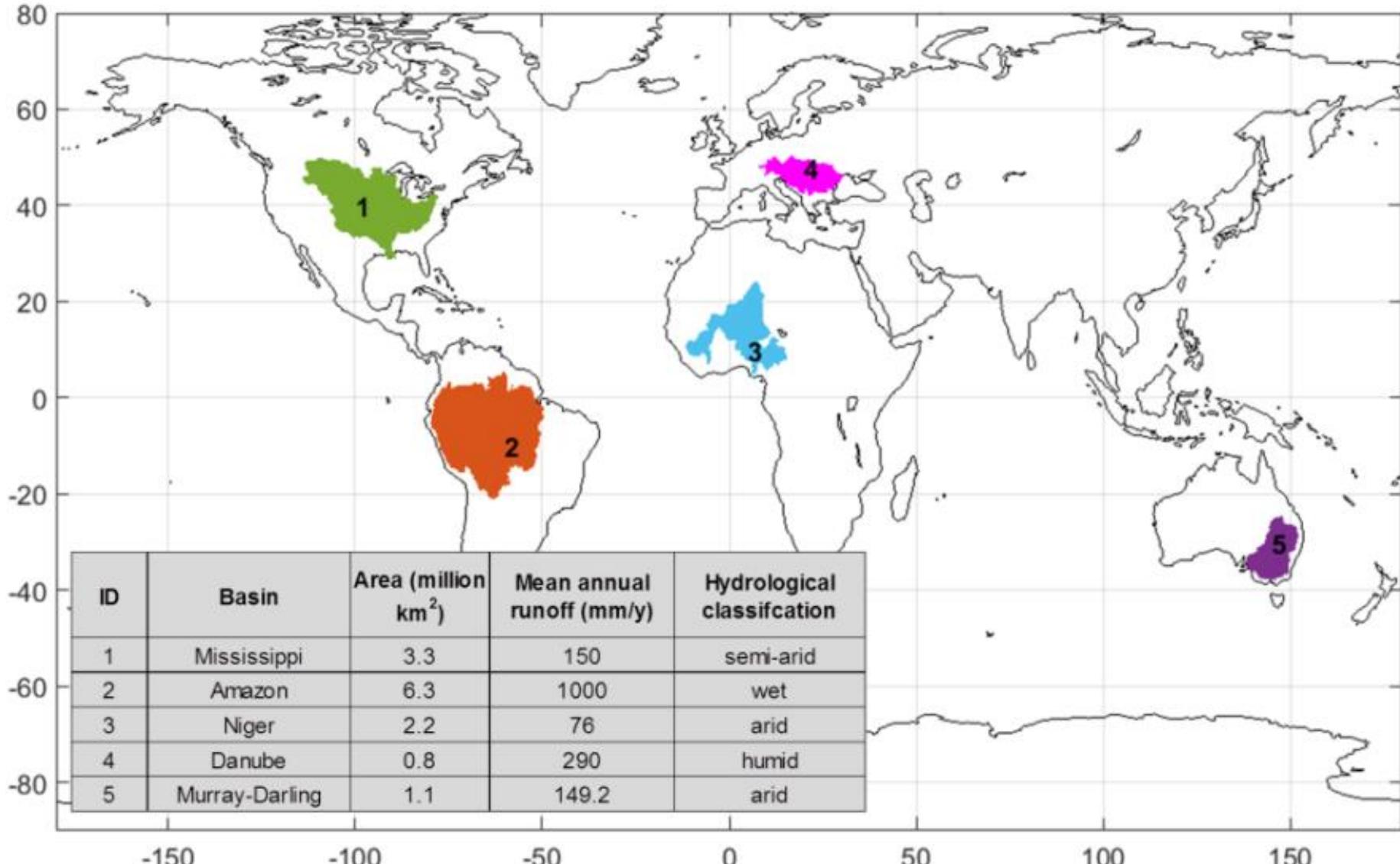
- ❖ Not representative of the global water flow
- ❖ High costs of installation and maintenance
- ❖ Not uniformly distributed in the world
- ❖ Inaccessibility of many remote areas
- ❖ Problems of data sharing among neighbouring countries
- ❖ Reduction of the number of hydrometric stations



# STREAM: METODOLOGIA



# STREAM: BACINI DI STUDIO



Discharge and runoff estimates have been simulated for the period 2003-2017 at 5 pilot basins across the world (Mississippi, Amazon, Niger, Danube and Murray Darling) characterized by different physiographic and climatic features

# STREAM: LA PROCEDURA

Digital Elevation Model  
Location of gauging station

Sub-basin delineation

Input data extraction for each sub-basin

STREAM calibration

STREAM gridded runoff (0.25-degree) and river discharge at the outlet of each sub-basin

Precipitation (TMPA 3B42)

Air Temperature (in situ)

Soil Moisture (ESA CCI)

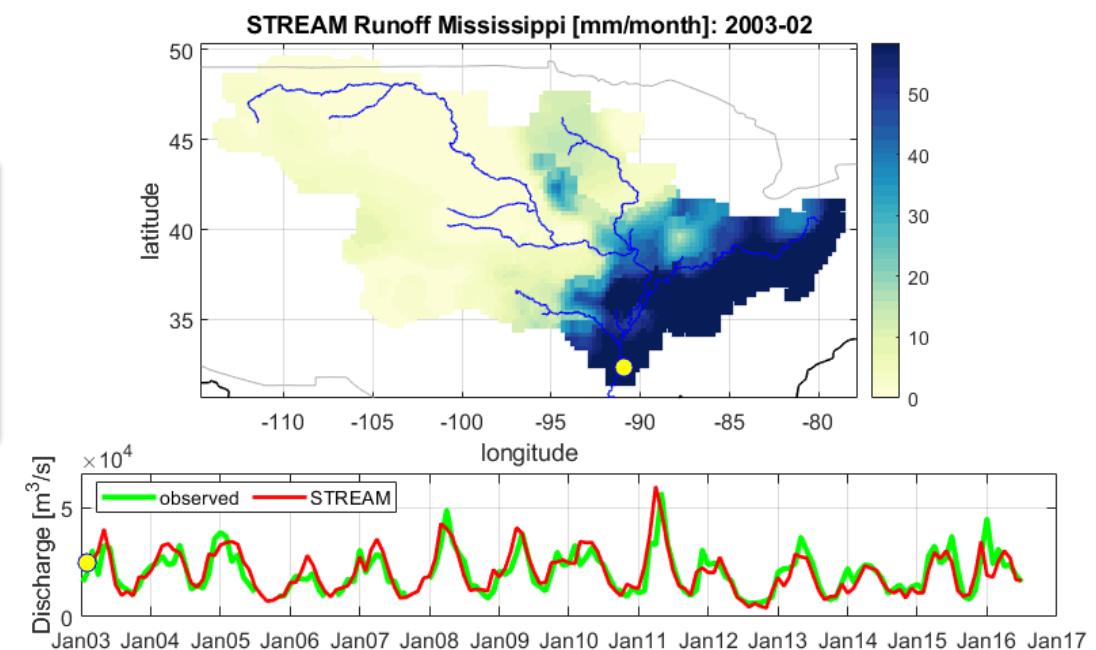
Terrestrial Water Storage Anomalies (GRACE)

Input data

Processing steps

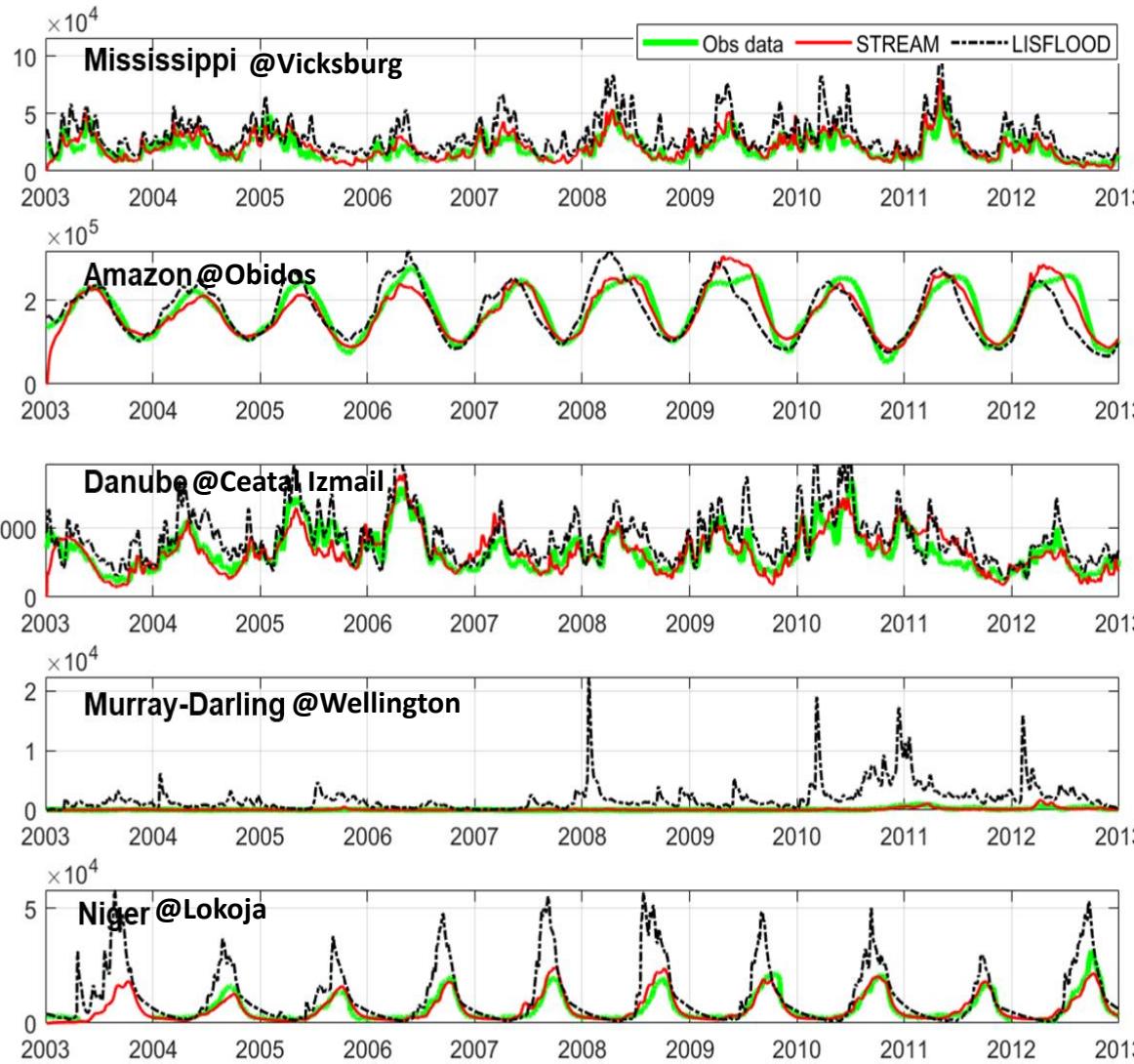
Reference data

Output data

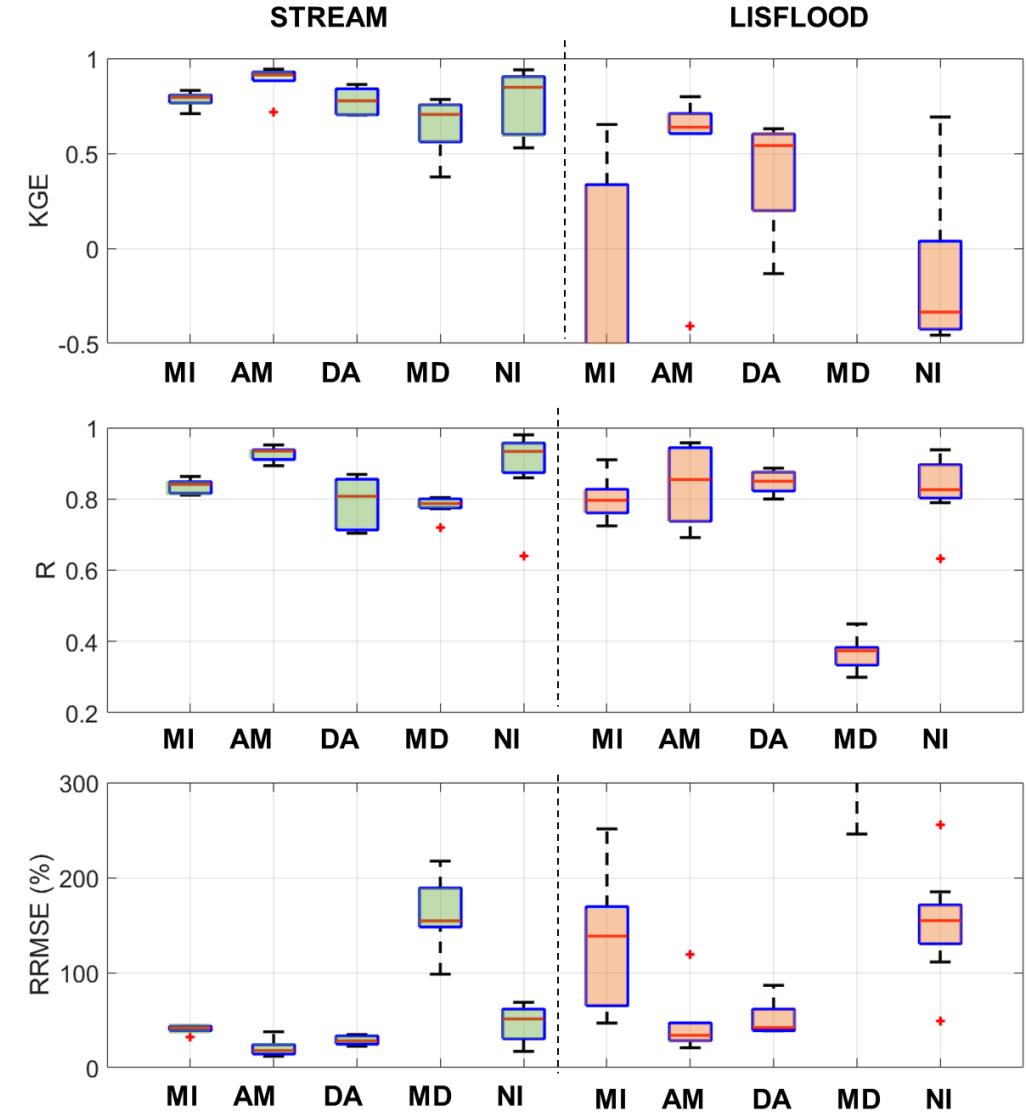


# STREAM: ALCUNI RISULTATI

River discharge ( $\text{m}^3/\text{s}$ ) at the outlet section



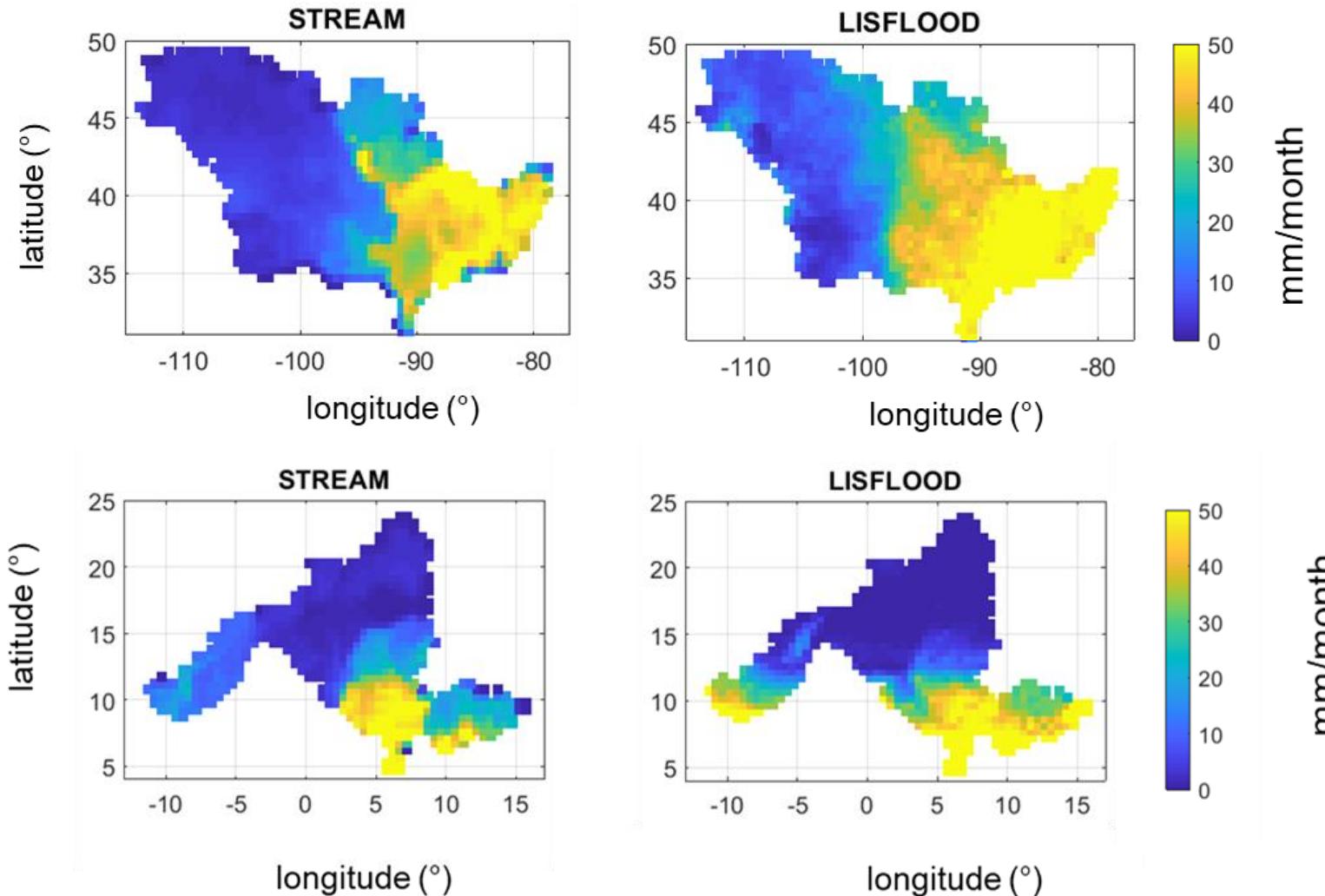
Score values for all the calibrated sections



MI: Mississippi, AM: Amazon. DA: Danube, MD: Murray-Darling, NI: Niger

# STREAM: ALCUNI RISULTATI

## Mean monthly runoff for the period 2003-2012 for Mississippi and Niger basins



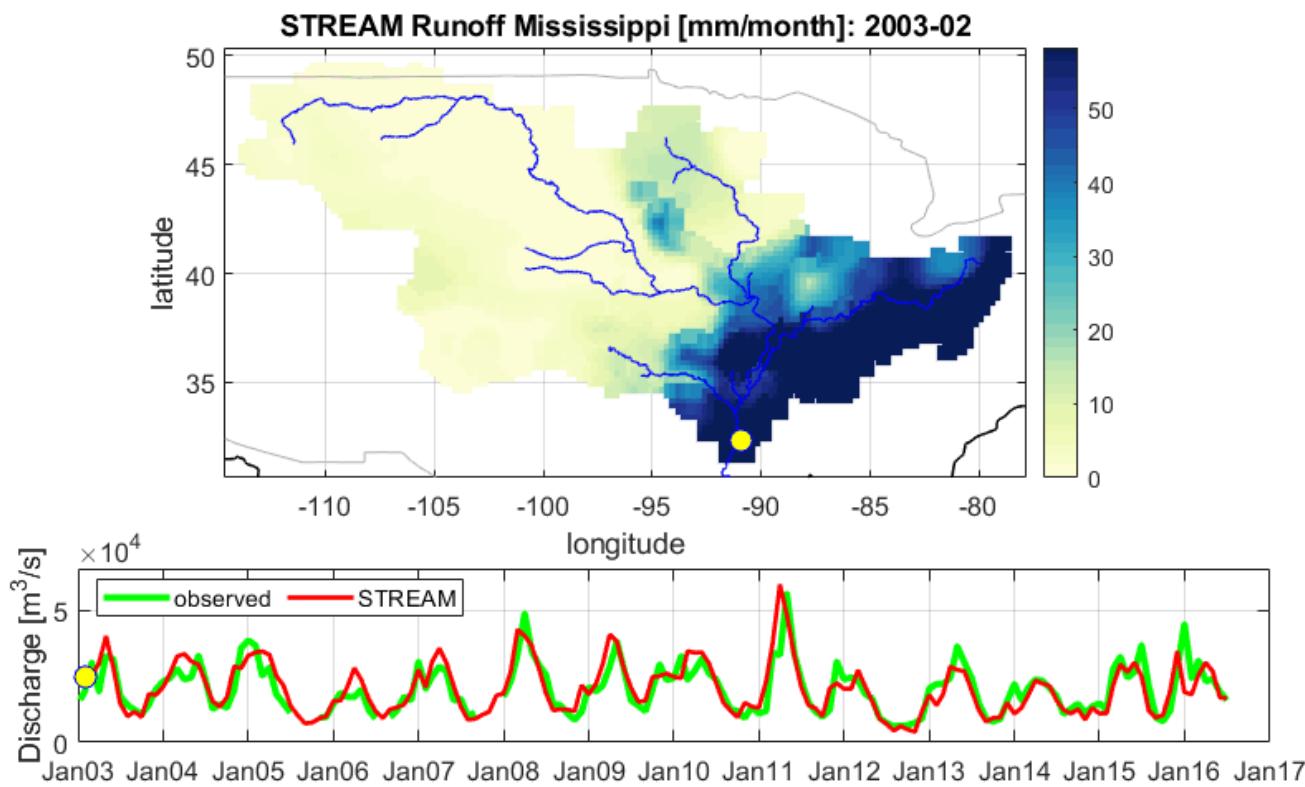
Monthly runoff maps from STREAM and LISFLOOD appear quite similar

# STREAM: KEEP HOME MESSAGE

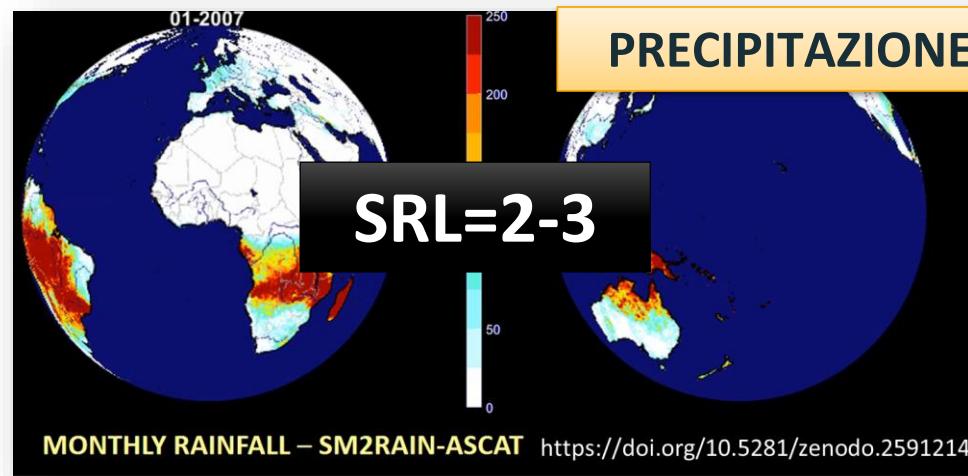
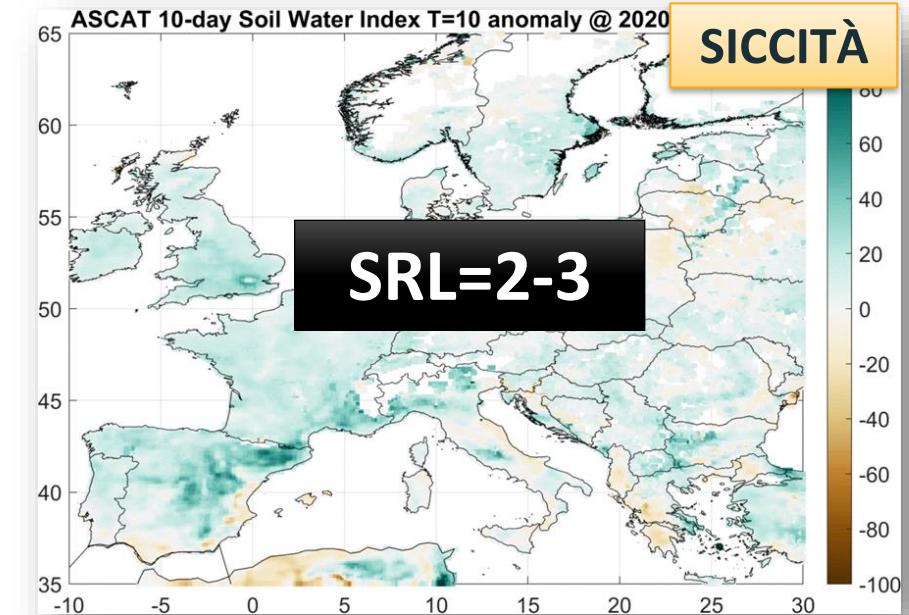
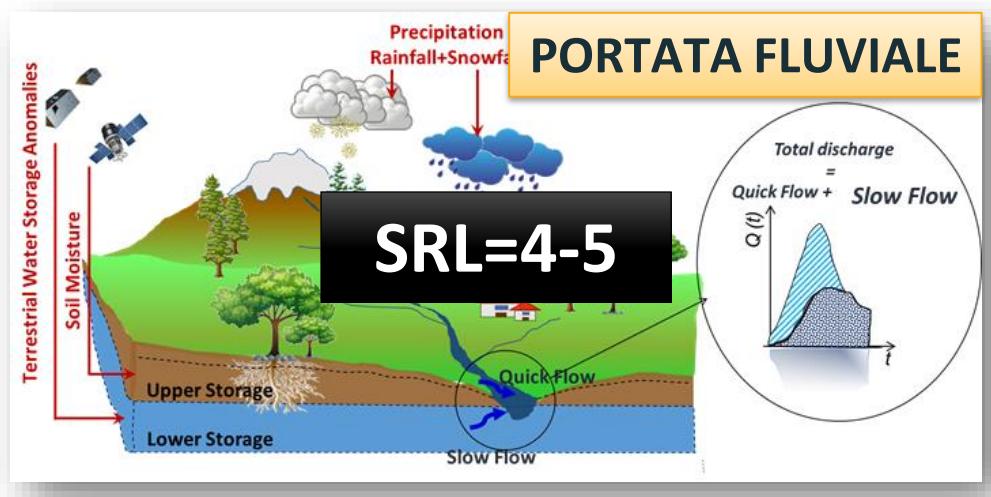
STREAM results demonstrate that:

- ❖ A data-driven approach using satellite soil moisture, precipitation and GRACE is able to provide good performances in river discharge estimation
- ❖ Performance is similar to more complex land surface models

Regionalization of STREAM parameters (5) is ongoing for its implementation on a global scale



# SCIENTIFIC READINESS LEVELS



# CONCLUSIONI

- La missione NGGM potrà rappresentare un'importante passo in avanti per **applicazioni idrologiche**
- La maggior risoluzione spazio-temporale potrà permettere applicazioni anche nell'area del **Mediterraneo** (non possibile con GRACE, GRACE-FO)
- Applicazioni legate alla stima della **portata fluviale**, la **siccità** e la stima delle **precipitazioni** saranno investigate

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