



Open Science Practices in Hydrology Research

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Roots for Resilience Program

- Forging new interdisciplinary collaborations
- Bring people together from different programs
- Global scale environmental problems
- Data science techniques and large amount of data
- Building teamwork and team science skills





Open Science

- Making science accessible for all
- Open Access Publications
- Open Data
 - FAIR Principle
- Open Educational Resources
- Open Methodology
- Open Source Software
- Open Peer Review



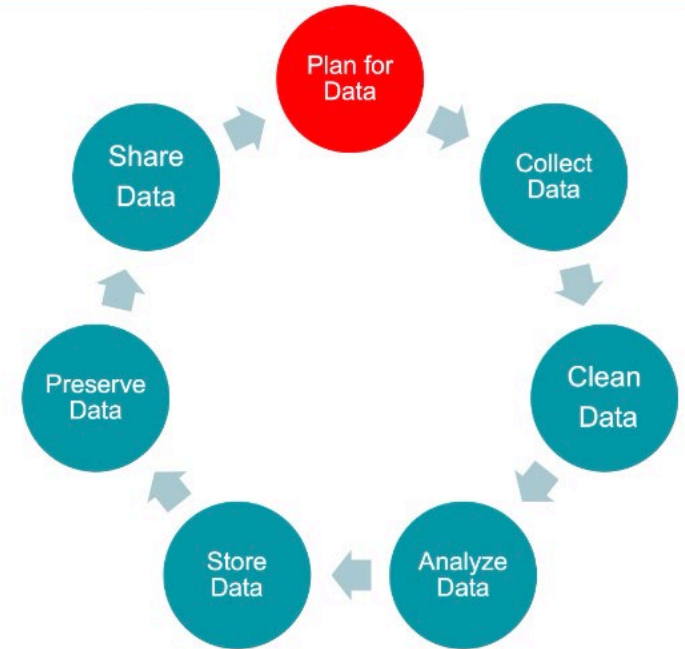
2023 is the year of Open Science



Data Management Plan

- What is DMP?
- Why should you care about data management?
- Elements of a good DMP
 - Information about data & data format(s)
 - Metadata content and format(s)
 - Policies
 - Long-term storage

Data Lifecycle



Documentation & version control

- Project Documentation
- Scientific papers
- Public Repositories for Documentation
- Using GitHub for version control
- https://mfarmani95.github.io/FOSS_Weekly/

The screenshot shows a web page with a blue header containing 'Home', 'Search', and 'FOSS_Weekly' with a user profile icon. On the left, a navigation menu lists: 'UoA Noah-MP/SMAP research team', 'Home', 'Data', 'Our team', 'Method', 'Results', and 'Noah-MP'. The main content area has the title 'So what is wrong with it?' with a sad face emoji. The text explains that overestimating soil moisture leads to artificially elevated streamflow and baseflow due to infiltration and saturation excess. It then presents a scenario where surface soil moisture is overestimated in an arid region, leading to increased runoff. Below the text are six maps of the United States, labeled (a) through (f), showing 'surface SMI (cm³/cm³)'. Maps (a) and (b) show SMAP and MF_CH data. Maps (c) and (d) show DPM_vGM and MF_vGM data. Maps (e) and (f) show MF_vGM0 and MF_vGM200 data. Each map has a color scale from 0.1 to 0.4. At the bottom, a partial view of the OWP (Office of Water Prediction) interface is visible, showing a map and a dropdown menu for 'National Water Model'.

Home Search FOSS_Weekly

UoA Noah-MP/SMAP research team
Home
Data
Our team
Method
Results
Noah-MP

So what is wrong with it? 😞

When the soil retains more moisture than is realistically present, it can lead to the generation of artificially elevated streamflow and baseflow. This is because soil water content is intrinsically linked to the two primary mechanisms of streamflow generation: **!** Infiltration excess and Saturation excess **!**

Imagine a scenario where an arid region's surface soil moisture is overestimated. If this surface soil approaches or reaches saturation due to such overestimation, its capacity to absorb subsequent rainfall diminishes. This condition can amplify infiltration excess, resulting in increased surface runoff. Essentially, this means models might portray streamflow values that diverge from true conditions. ●

(a) SMAP (b) MF_CH
(c) DPM_vGM (d) MF_vGM
(e) MF_vGM0 (f) MF_vGM200

OWP National Water Model



Application of Soil Moisture Memory to evaluate parametrization of soil hydraulic schemes in Noah-MP.

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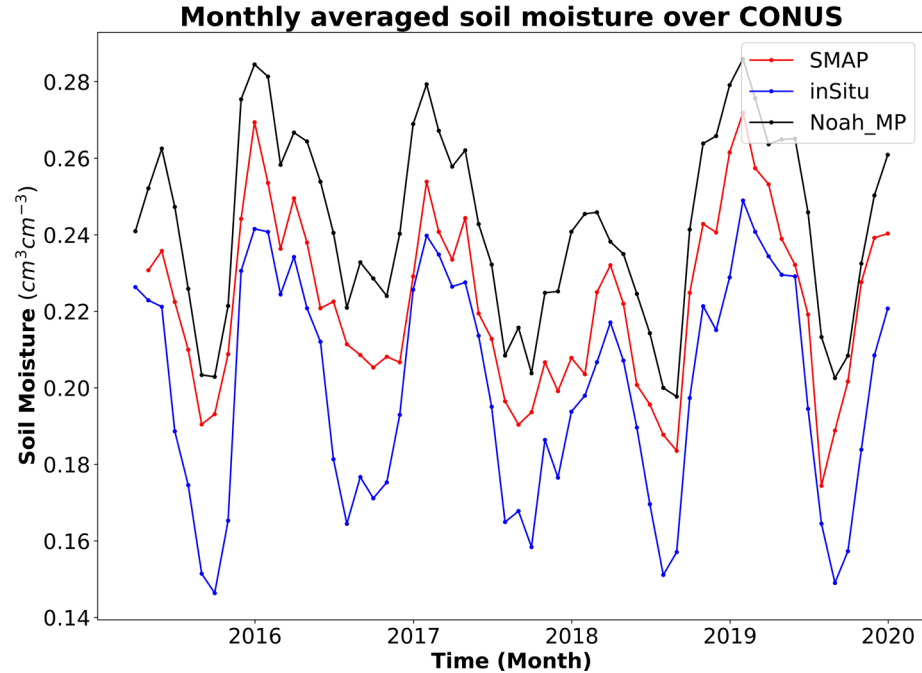
Motivations

- A prevalent trend observed in Land Surface Models (LSMs) is the overestimation of surface soil moisture when compared to SMAP and in-situ observations.
- This results in the unrealistic representation of the soil moisture-precipitation coupling feedbacks



Soil moisture variation

- Noah-MP Control-Run overestimate soil moisture compared to SMAP





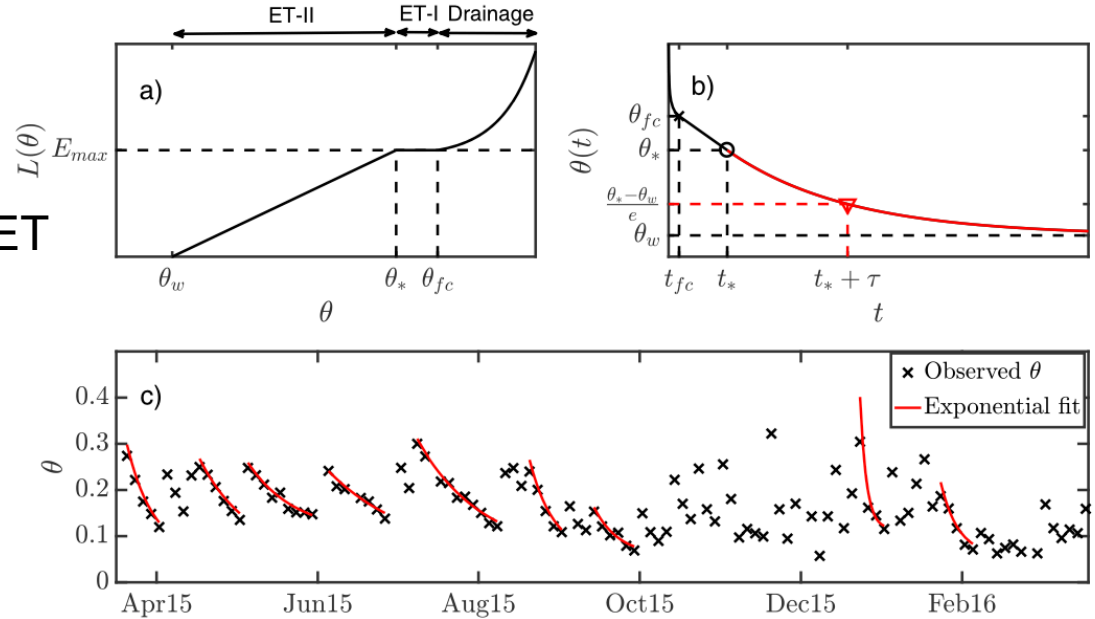
Objective

- Implementing soil moisture memory to enhance soil moisture dynamic in Noah_MP using SMAP and InSitu soil moisture, particularly during dry periods.



Soil Moisture Loss function

- Hybrid model developed by McColl et al. (2019)
- Drainage dominated and Stage-I ET as Energy-limited
- Stage-II ET as Water-limited



Schematic of surface water loss process adopted from McColl et al. (2017),



Data

- SMAP L3 surface soil moisture
- International Soil Moisture Network (ISMN) root zone soil moisture
- Noah-MP surface and root zone soil moisture



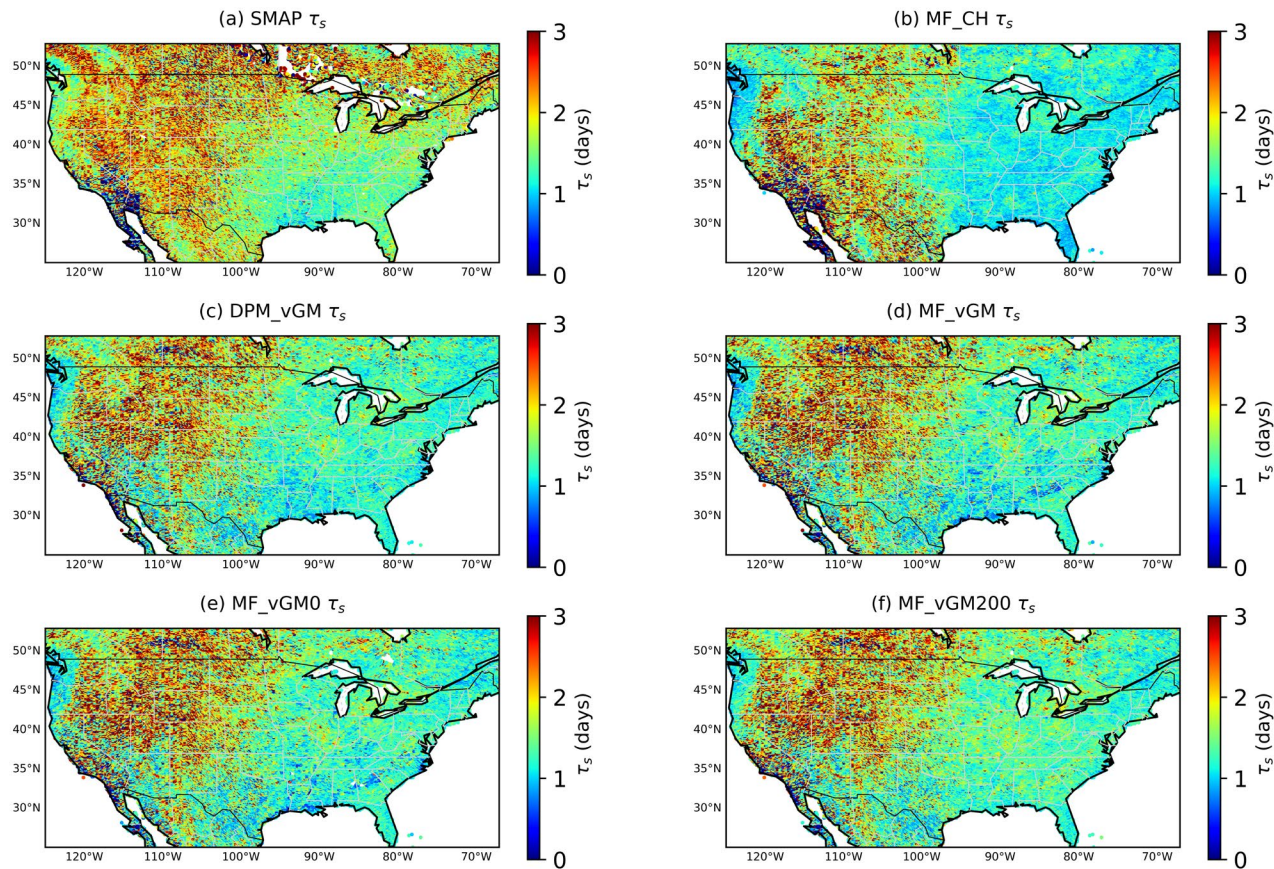
Noah-MP Scenarios

Scenario	Infiltration scheme	Water retention scheme	Ponding depth threshold (mm)	
MF_CH	Matrix flow	Clapp and Hornberger	50	NWM uses this scheme
DPM_vGM	Preferential Flow (Dual permeable)	Van Genuchten	50	
MF_vGM	Matrix flow	Van Genuchten	50	
MF_vGM0	Matrix flow	Van Genuchten	0	
MF_vGM200	Matrix flow	Van Genuchten	200	



Short-term surface SMM

- various parametrizations are consistent with SMAP



Conclusion

- CH generates higher SSM and SMM compared to VG.
- An increase in ponding depth leads to a rise in surface soil moisture, as well as enhanced soil moisture memory, both long-term and short-term.
- The presence of macropores enhances infiltration, thereby resulting in a reduced long-term memory and an increase in short-term memory of Soil Surface Moisture (SSM).



Acknowledgements

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