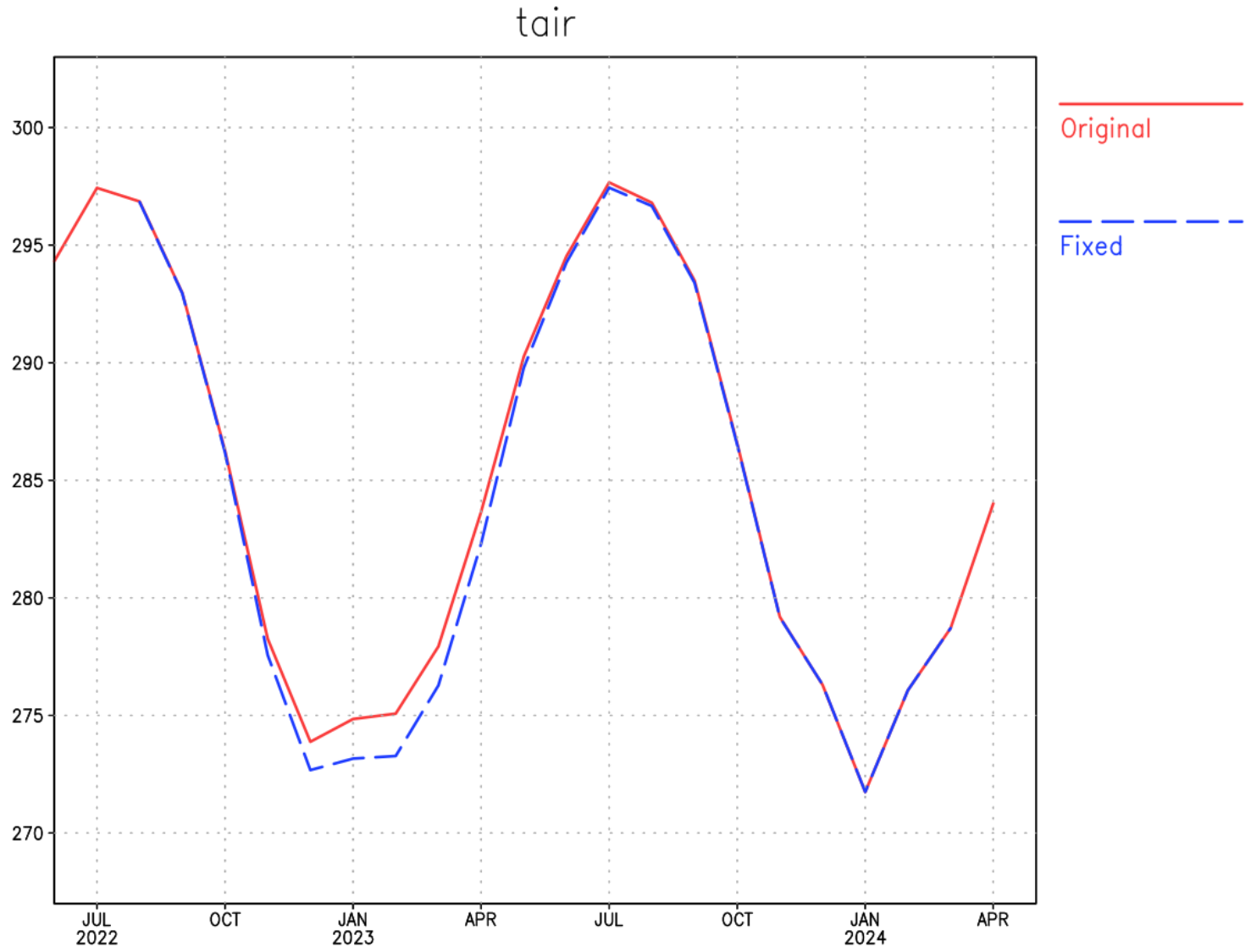
NLDAS-2 re-run summary

- Sometime in August 2022, NCEP configured an update for input of snow depth amounts into their R-CDAS system. R-CDAS is the real-time extension of the NARR model, which is used for surface meteorological input to NLDAS-2. For details on how R-CDAS (NARR) is used for generating NLDAS-2 surface forcing, please see: https://ldas.gsfc.nasa.gov/nldas/v2/forcing
- However, the R-CDAS update did not properly account for the units and magnitude of the snow depth input, resulting in much lower snow depths in the R-CDAS system than were observed.
- These too low snow depths produced too warm surface temperatures in the R-CDAS, which carried over to the NLDAS-2 2-m surface temperature forcing.
- The R-CDAS issue also resulted in changes to other surface variables, such as 2-m humidity, winds, surface pressure, and surface radiation.

NLDAS-2 re-run summary

- NLDAS-2 surface temperatures were too warm in the winter of 2022-2023, which resulted in unrealistically lower snow accumulations. The lower snow amounts resulted in lower snowmelt and infiltration into the soil, producing soil moistures that were generally too dry in many northern areas.
- This issue with the snow depth input in R-CDAS was noticed during the winter of 2022-2023. The issue was fixed in the R-CDAS forward stream in July 2023.
- However, due to the memory of soil moisture and the longer term effects of this issue in NLDAS-2, the simulated results into the fall and winter of 2023 still showed the effects of this R-CDAS issue.
- Re-generation of NLDAS-2 forcing and LSM model re-runs from 1 August 2022 (before the R-CDAS error) to 1 March 2024 were performed. It is shown that the NLDAS-2 forward stream from 1 March 2024 to present has sufficiently recovered from this issue, in comparison to the re-run model simulations.

NLDAS-2 monthly time series

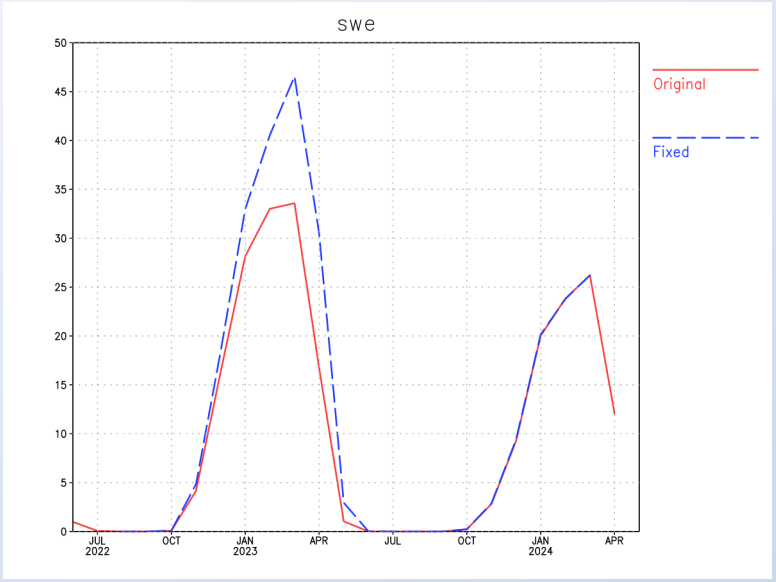


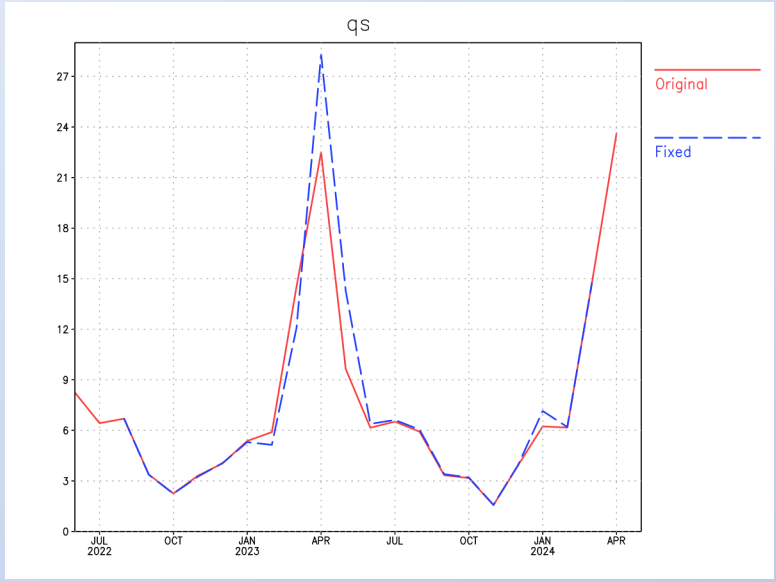
Shown is the NLDAS-2 area-average 2-m surface temp. from the “FORA” monthly-average collection.

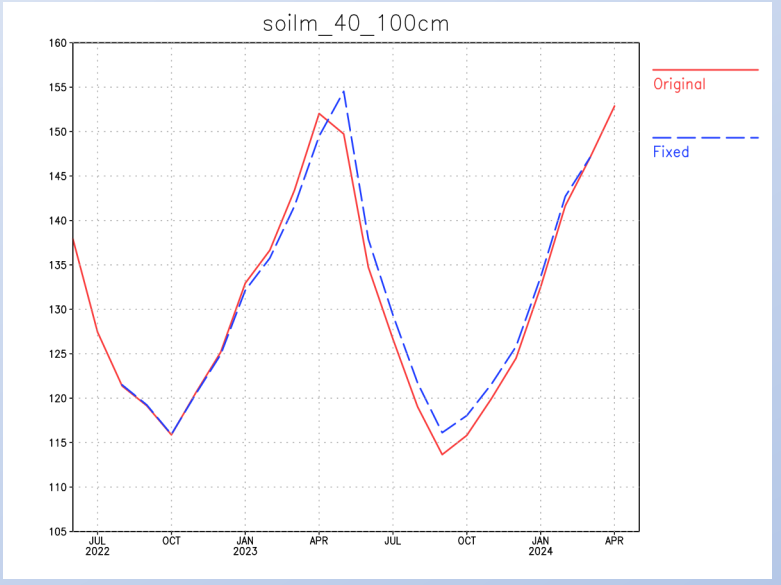
The original data is in red, while the “fixed” or “re-run” data is in blue. This data is only available Aug 2022 to Mar 2024.

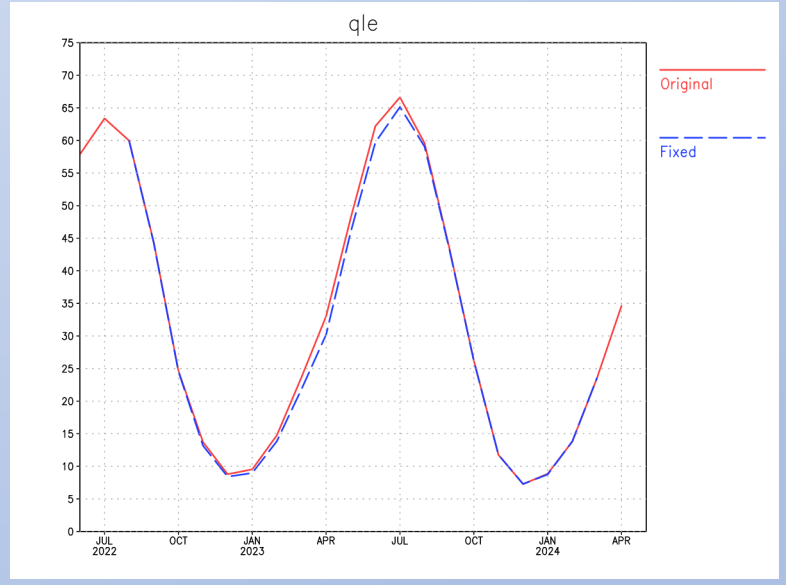
Note how the two curves are nearly identical by Aug 2023.

NLDAS-2 monthly time series







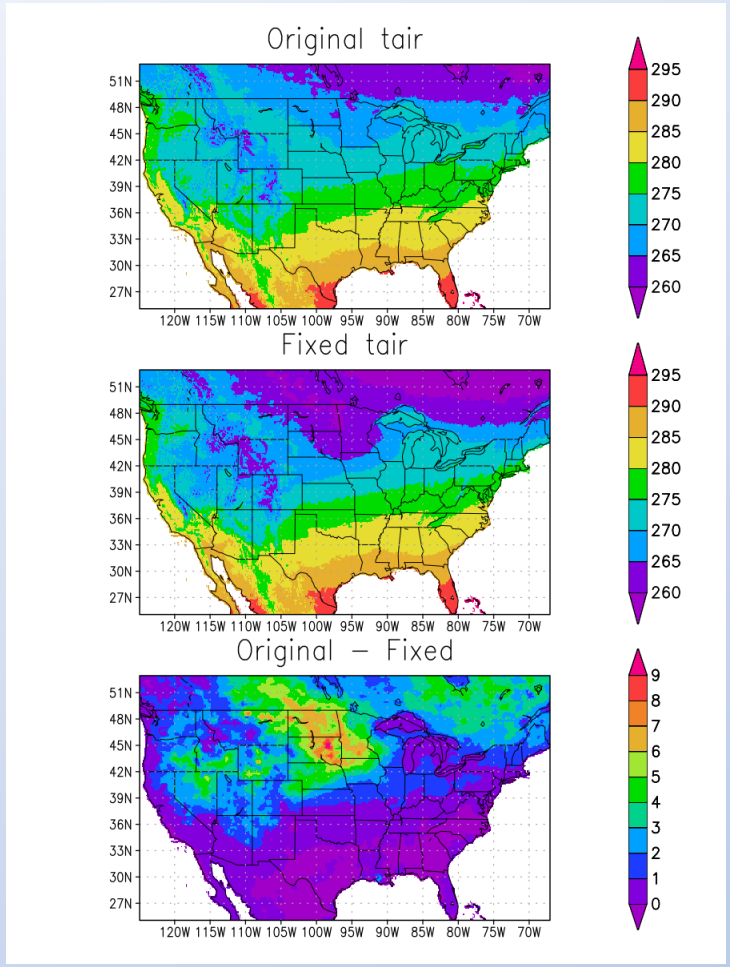


Shown is the NLDAS-2 area-average “NOAH” monthly-average collection.

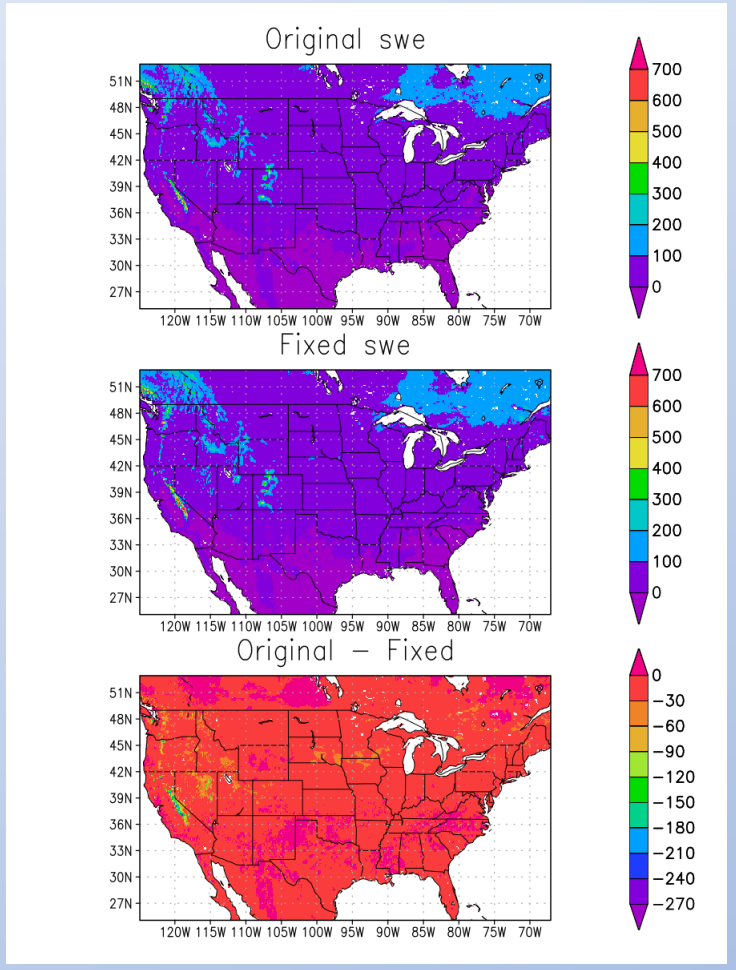
The blue “fixed” SWE has a deeper snow in the winter of 2022-2023, resulting in higher surface runoff (qs), later peak in 40-100cm soil moisture (soilm), and changes to the latent heat flux (qle).

Mosaic/VIC show similar figs.

NLDAS-2 monthly average (Jan 2023)

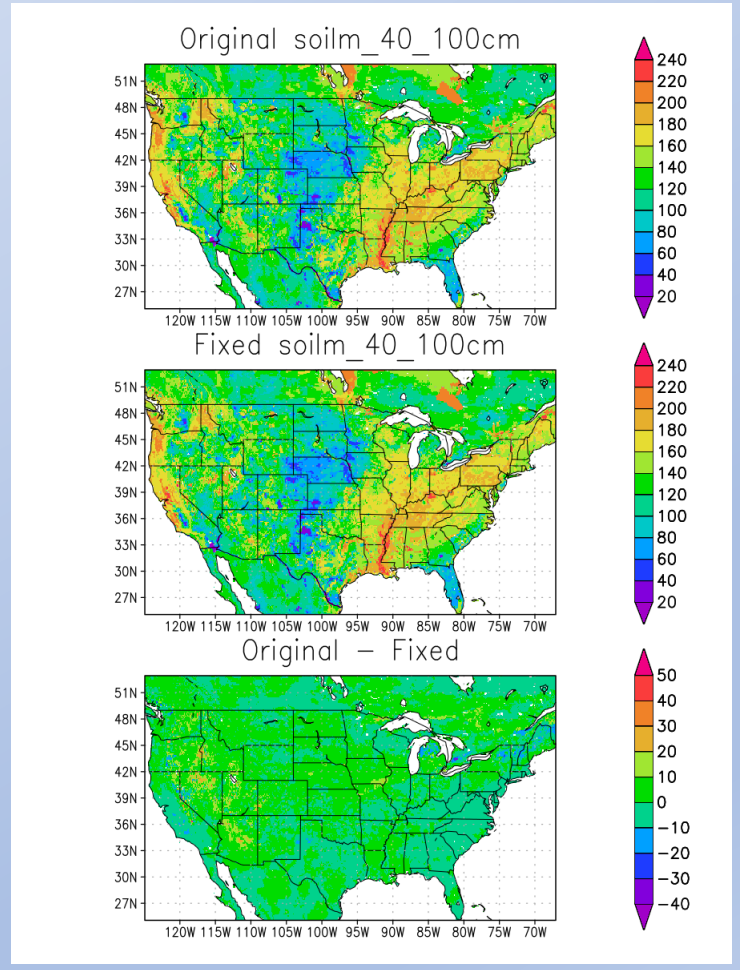


FORA 2-m Air temp. (K)



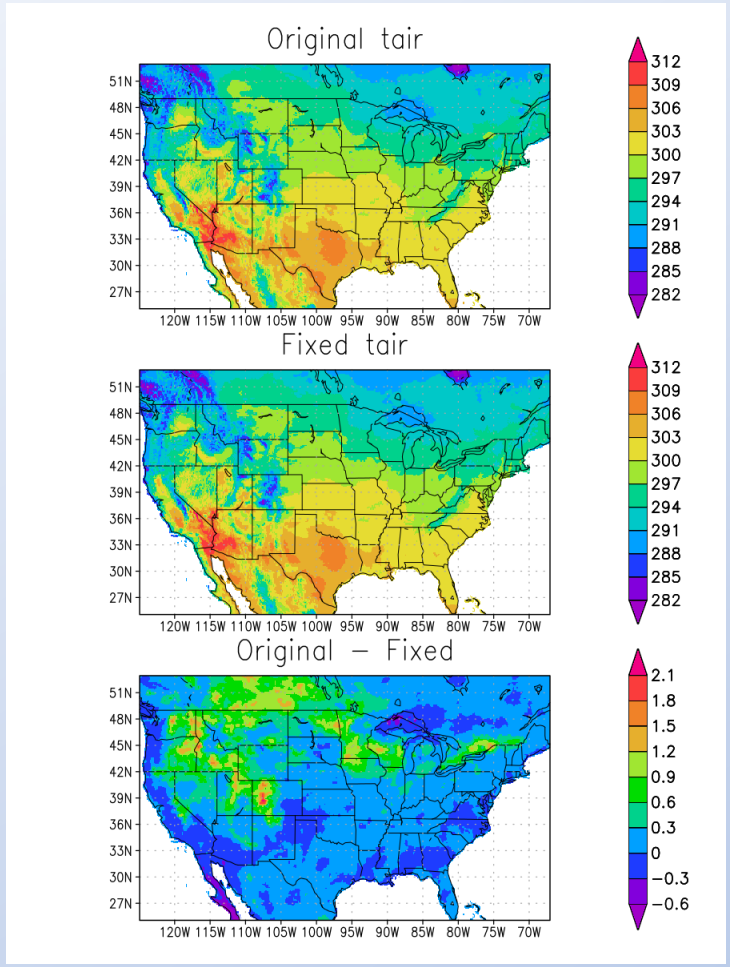
NOAH SWE (mm)

January 2023

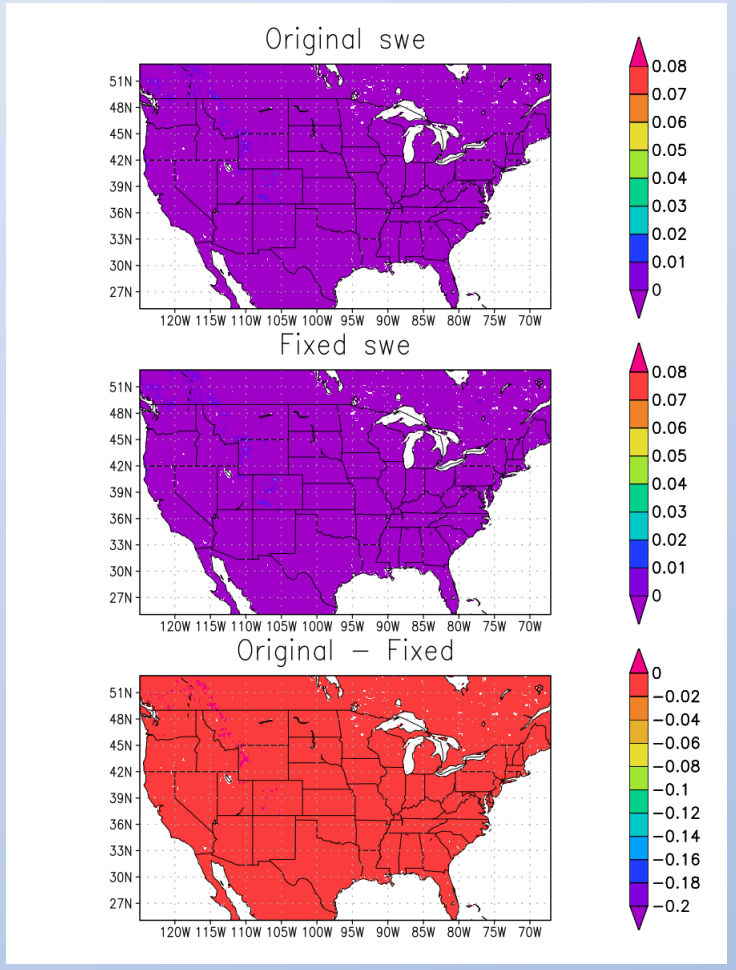


NOAH 40-100 soilm (mm)

NLDAS-2 monthly average (Jul 2023)

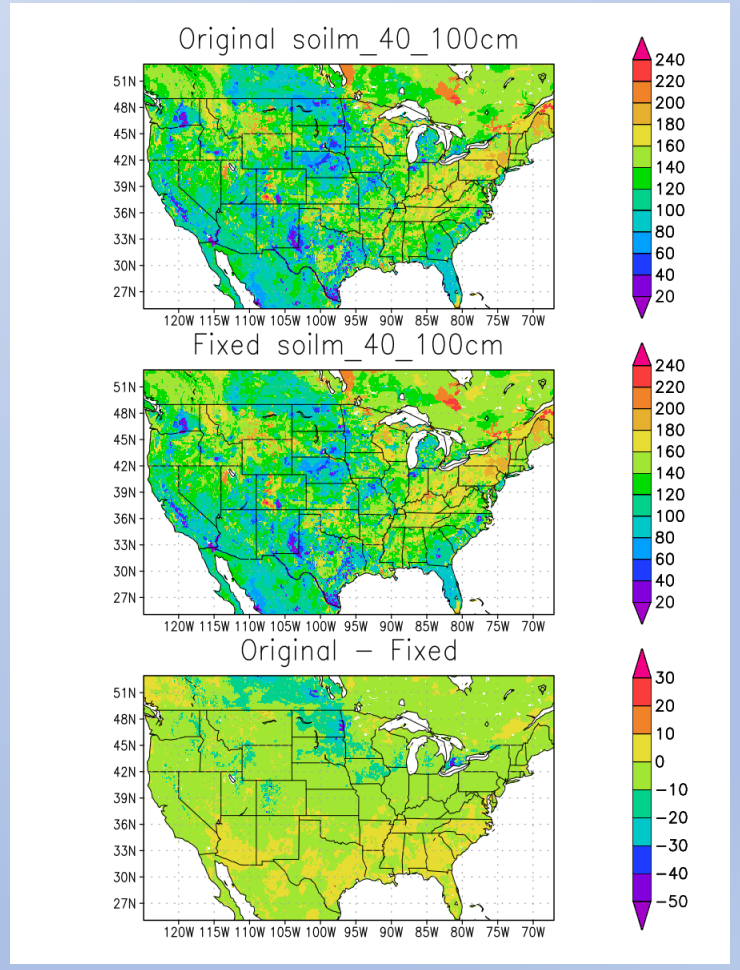


FORA 2-m Air temp. (K)



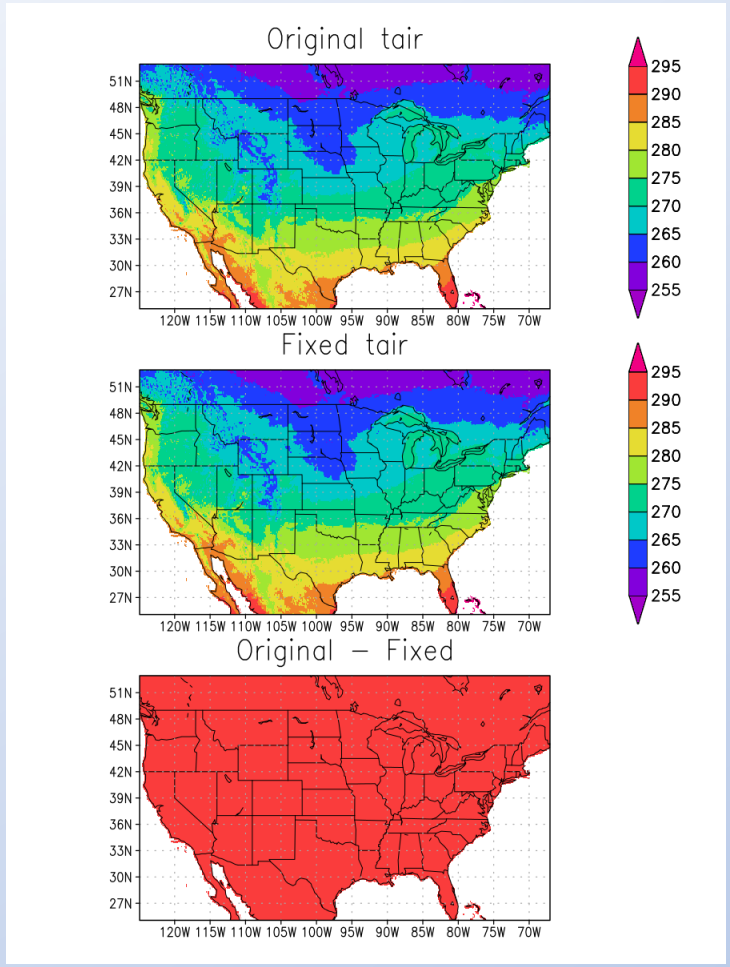
NOAH SWE (mm)

July 2023

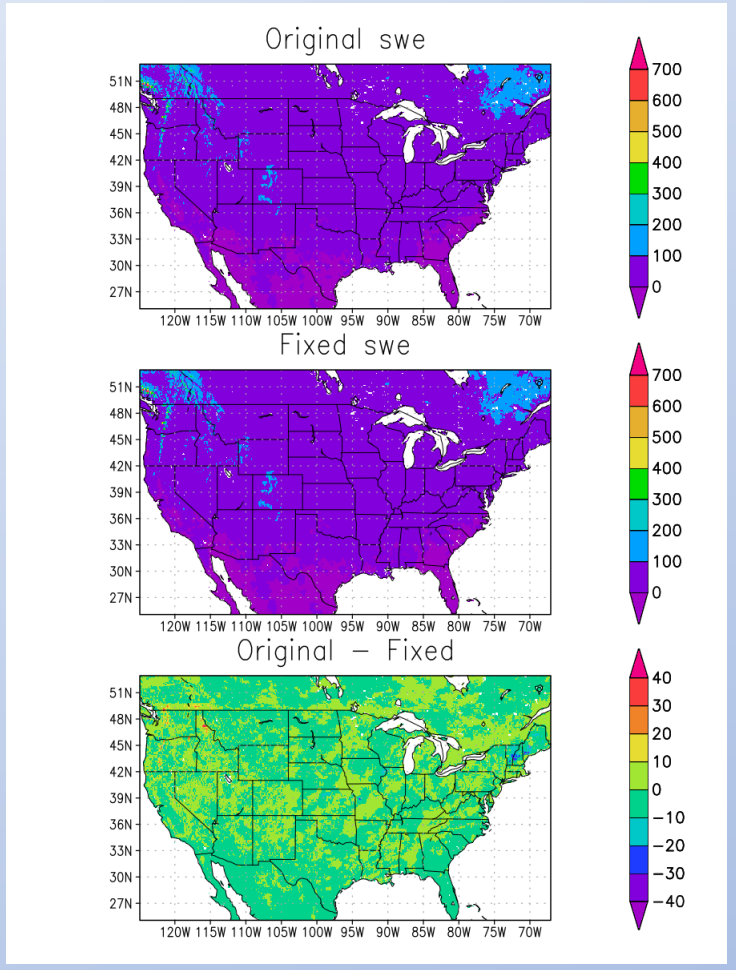


NOAH 40-100 soilm (mm)

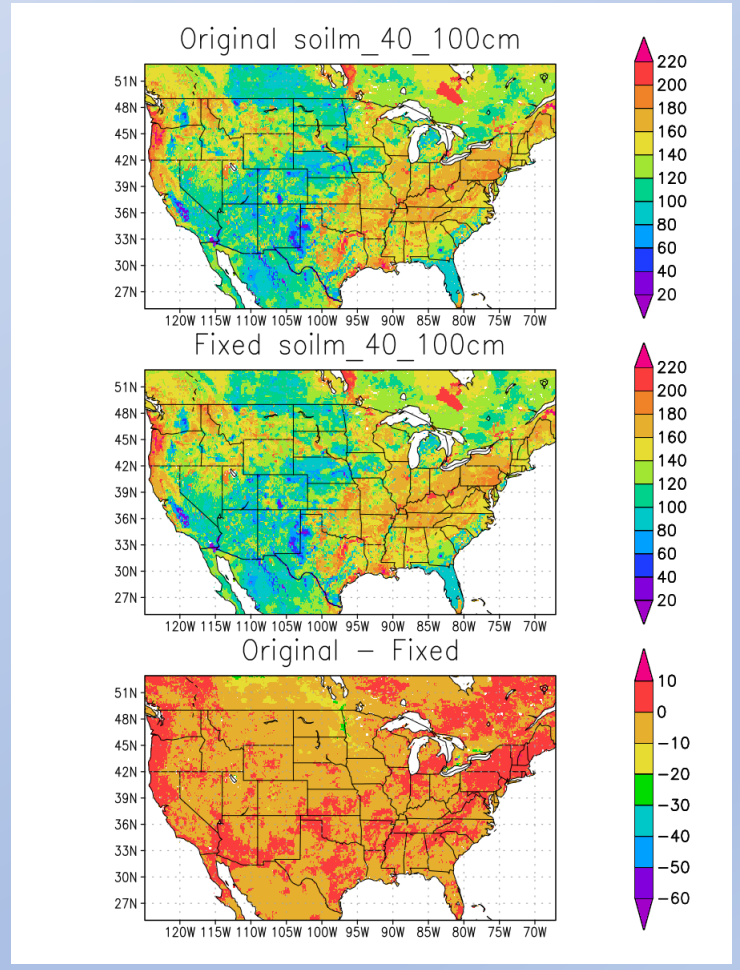
NLDAS-2 monthly average (Jan 2024)



FORA 2-m Air temp. (K)



NOAH SWE (mm)



NOAH 40-100 soilm (mm)

January 2024