

Supplementary Response to Reviewer #1 Comments

We sincerely thank you for the constructive comments. Following the editor's additional suggestions, we have further revised the manuscript and would like to provide the following supplementary responses.

Comment 1: Definition issue for anomaly

Reply: Thank you again for this valuable comment. We carefully reconsidered the issue regarding the definition of anomalies and fully acknowledge the concern raised by both the editor and reviewers regarding the interpretability and exceptionality of the anomaly metrics. Following your recommendation, all anomaly variables (including GPP, NDVI, and climatic variables) were reprocessed using z-score standardization.

This revision improves the interpretability of anomalies by expressing them as deviations from the climatological mean relative to the corresponding variability, while also enhancing comparability among variables with different magnitudes and units. Accordingly, we recalculated the related analyses and updated Figs. 2, 3, 5, 6, and 7 using the standardized anomalies. The corresponding sections in the manuscript have been revised as follows: *“The detrended anomalies were subsequently standardized using z-score normalization to enable comparisons across variables with different magnitudes and units.”*

For example, the revised Figure 2 is presented below.

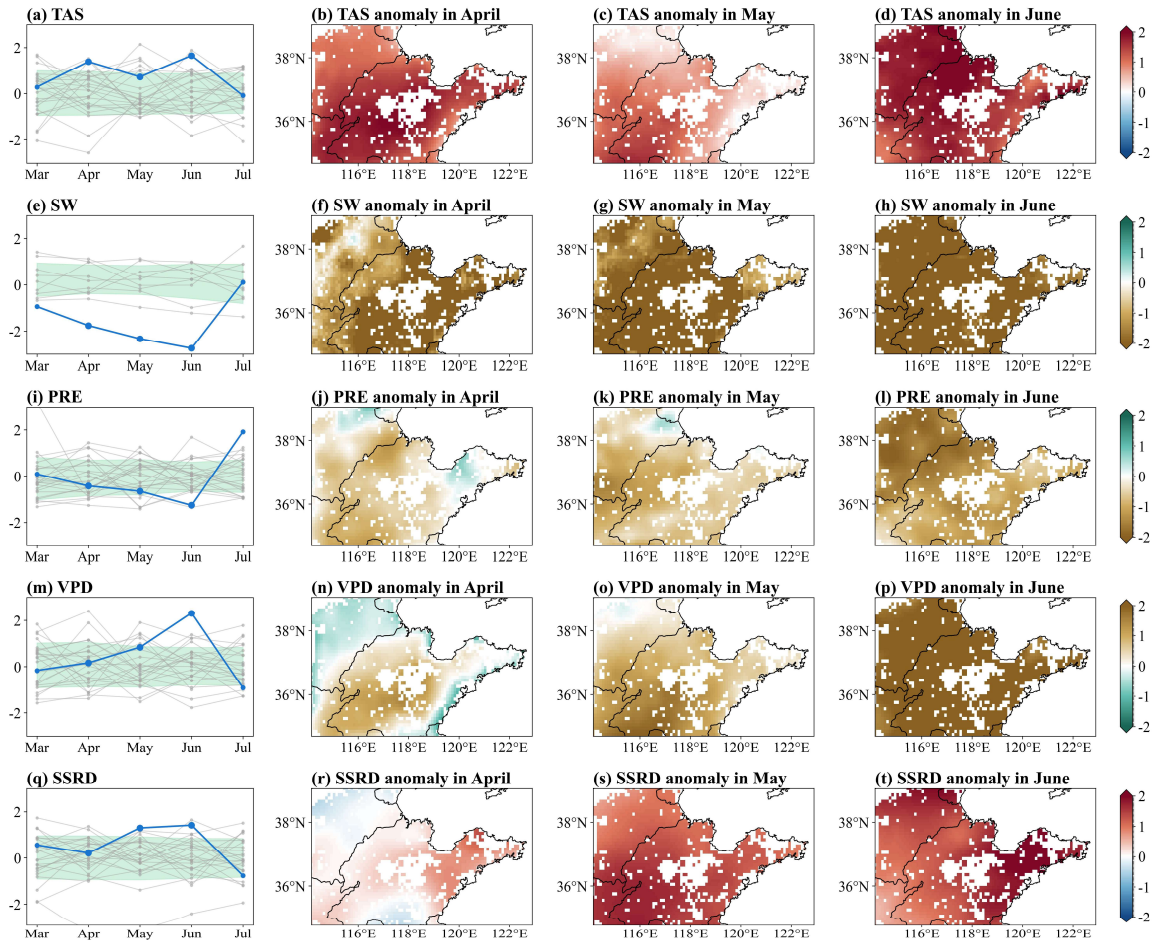


Figure 2. Standardized climate anomalies over the NCP from March to July, including (a) near-surface air temperature (TAS), (e) soil water (SW), (i) precipitation (PRE), (m) vapor pressure deficit (VPD), and (q) surface shortwave radiation downward (SSRD). The blue lines denote the anomalies for 2024, while the green shaded areas indicate the interannual variability represented by one standard deviation (1σ) during 2000-2023; for SW, however, the variability is calculated based on the 2015–2023 period. Panels (b-d), (f-h), (j-l), (n-p), and (r-t) show the spatial distributions of TAS, SW, PRE, VPD, and SSRD anomalies, respectively, from April to June 2024.

In addition, because all anomaly variables were standardized prior to the sensitivity analysis, we revised the definition of the sensitivity metric accordingly. Specifically, the regression coefficients in Eq. (3) were directly used as sensitivity indicators. Under this standardization framework, the coefficients are dimensionless and directly comparable across climatic factors. The corresponding description in the revised manuscript now reads: *“Because all anomaly variables were standardized using z-scores prior to analysis, the regression coefficients in Eq. (3) were directly used as*

sensitivity indicators. Under this standardization framework, the coefficients are dimensionless and directly comparable across climatic factors, thereby reflecting the relative sensitivity of NDVI and GPP to each variable.”

Comment 2: Moreover, multicollinearity assessment need to be done and show how this could affect the model explanation power under extreme conditions.

Reply: We would like to provide an additional clarification regarding this comment. First, we sincerely apologize for the confusion caused by the VIF values reported in our previous response. Upon re-examination, we found that an earlier and incorrect version of Table S3 was inadvertently included in the response document for Reviewer #1. The correct VIF values had already been provided in our response to Reviewer #2; however, these updates were not consistently incorporated throughout the entire response package, which resulted in the apparent inconsistency identified by the editor and reviewer.

We have now carefully checked and corrected all VIF values and related descriptions in both the manuscript and the response letter to ensure complete consistency. The results are presented in Table S3.

Table S3. VIF list of TAS, VPD, SW, PRE, SSRD, Pre_NDVI (Pre_GPP) in multiple linear regression model.

	Month	TAS	VPD	SW	PRE	SSRD	Pre_NDVI (Pre_GPP)
NDVI	April	2.70	4.21	1.26	1.79	1.79	1.32
	May	3.34	6.21	1.57	2.40	2.27	1.48
	June	7.00	8.57	2.45	2.64	1.76	1.27
GPP	April	2.49	4.31	1.22	1.87	1.84	1.26
	May	3.42	5.94	1.66	2.24	2.38	1.35
	June	6.87	8.34	2.29	2.38	1.82	1.37

The following statement has been added to the manuscript: *“We also calculated the Variance Inflation Factor (VIF) for all explanatory variables, and the results are presented in supplementary Table S3. Most variables showed VIF values below 5, indicating low multicollinearity. In June, however, TAS and VPD exhibited*

moderately higher VIF values (~6–9), likely due to their strong physical coupling under dry-hot conditions, where higher temperatures are commonly accompanied by increased atmospheric water demand and elevated VPD.”