***Supplemental material***

**Effects of environment factors on the carbon fluxes of semi-fixed sandy land recovering from degradation**

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**Fig. S1.** Relationships between the 30-min turbulent heat flux, which equaled the latent heat flux (*LE*) + the sensible heat flux (*H*), and the available energy, which equaled net radiation (*R*n) – the soil heat flux (*G*). The red lines represent the regression equation.



**Fig. S2.** Plots of the relationships between the observed carbon fluxes (*NEE*, net ecosystem exchange; *R*eco, ecosystem respiration; *GPP*, gross primary productivity) and the carbon fluxes predicted by the Random Forest model during the growing season on a daily basis from 2017 to 2021. The black dashed line is the *y*=*x* line and the red line is the regression line.



**Fig. S3.** Changes in (a) the deep soil water content (*SWC*80) at a depth of 80 cm and (b) the shallow *SWC* at depths of 10 cm (*SWC*10) and 30 cm (*SWC*30) that resulted from precipitation events during the growing seasons from 2017 to 2021.



**Table S1 Annual mean soil water content (*SWC*) and soil temperature (*T*s) at depths of 10, 30, 50, and 80 cm from 2017 to 2021 in the semi-fixed sandy ecosystem. Values of a variable labeled with the same letter did not differ significantly among the years (ANOVA followed by LSD tests).** **The difference among the years was calculated using the daily-average values of the environment variables.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | *SWC*10 | *SWC*30 | *SWC*50 | *SWC*80 | *T*s10 | *T*s30 | *T*s50 | *T*s80 |
| 2017 | 0.014a | 0.015b | 0.016c | 0.016b | 8.79a | 9.16a | 9.68a | 10.28a |
| 2018 | 0.028b | 0.009a | 0.009a | 0.013b | 9.08a | 9.61a | 10.32a | 10.88a |
| 2019 | 0.036c | 0.015b | 0.015b | 0.016b | 9.67a | 10.11a | 10.71a | 11.04a |
| 2020 | 0.034c | 0.009a | 0.009b | 0.011a | 10.83a | 11.02a | 11.11a | 11.20a |
| 2021 | 0.034c | 0.015b | 0.015c | 0.019c | 11.34a | 11.40a | 11.33a | 11.45a |
| Mean | 0.029 | 0.013 | 0.011 | 0.015 | 9.94 | 10.26 | 10.63 | 10.97 |