

EGU2020-4423

<https://doi.org/10.5194/egusphere-egu2020-4423>

EGU General Assembly 2020

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## Coupling model of ecohydrology and simulation of typical shrub ecosystems on the Loess Plateau

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Shrub is the main vegetation type for vegetation restoration in the Loess Plateau, which plays an important role in the regional ecosystem restoration. Study on the relationships between vegetation and soil water of typical shrub ecosystems are significant for the restoration and reconstruction of ecosystems in the Loess Plateau. Three typical shrub (*Hippophae rhamnoides* Linn., *Spiraea pubescens* Turcz., and *Caragana korshinskii* Kom.) ecosystems were chosen in the Loess Plateau. Field experiments were conducted to investigate the factors that influencing the processes of rainfall interception and root uptake of typical shrubs. S-Biome-BGC model was established based on the Biome-BGC model by developing the rainfall interception and soil water movement sub-models. The model was calibrated and verified using field data. The calibrated S-Biome-BGC model was used to simulate the characteristics of leaf area index (*LAI*), net primary productivity (*NPP*), soil water content and the interactions among them for the shrub ecosystems along the precipitation gradients in the Loess Plateau, respectively. The results showed that the predictions of the S-Biome-BGC model for soil water content and *LAI* of typical shrub ecosystems in Loess Plateau were significantly more accurate than that of Biome-BGC model. The simulated *RMSE* of soil water content decreased from 0.040~0.130 cm<sup>3</sup> cm<sup>-3</sup> to 0.026~0.035 cm<sup>3</sup> cm<sup>-3</sup>, and the simulated *RMSE* of *LAI* decreased from 0.37~0.70 m<sup>2</sup> m<sup>-2</sup> to 0.35~0.37 m<sup>2</sup> m<sup>-2</sup>. Therefore, the S-Biome-BGC model can reflect the interaction between plant growth and soil water content in the shrub ecosystems of the Loess Plateau. The S-Biome-BGC model simulation for *LAI*, *NPP* and soil water content of the three typical shrubs were significantly different along the precipitation gradients, and increased with annual precipitation together. However, different *LAI*, *NPP* and soil water correlations were found under different precipitation gradients. *LAI* and *NPP* have significant positive correlations with soil water content in the areas where the annual precipitation is above 460~500 mm that could afford the shrubs growth. The results of the study provide a re-vegetation threshold to guide future re-vegetation activities in the Loess Plateau.