

# Effect of future climatic variation on vegetation stability in Central Asia

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## Abstract

Vegetation stability is vulnerable to climate change in Central Asia. However, how future climate variations and extremes influence the vegetation stability in Central Asia has not been well understood. In this study, we investigated future vegetation stability quantified by the variability of vegetation productivity and attribution to climatic variation and negative extremes in Central Asia under four Shared Socioeconomic Pathways scenarios (SSPs) during 2021-2100, using Coupled Model Intercomparison Project phase 6 simulations. We found that the interannual variability (IAV) of Net Primary Production (NPP) would be larger under higher anthropogenic emissions scenarios. The standard deviation of NPP IAV increases from 64.55 Tg C yr<sup>-1</sup> under SSP1-2.6 to 78.01 Tg C y r<sup>-1</sup> under SSP5-8.5. The north of Central Asia accounts for the largest contribution (48% -53%) to Central Asia's NPP IAV under SSP1-2.6 to SSP5-8.5. Compared to temperature IAV, precipitation IAV exerts a larger contribution to NPP IAV in Central Asia, due to the higher sensitivity of NPP IAV to precipitation IAV. Dry conditions are the main climate extremes causing negative NPP extremes in Central Asia, especially in the north and southeast of Central Asia. Our findings identify the northern and southeastern regions with higher instability posed by future climate changes in Central Asia, and provide scientific guidance for regional water management to mitigate ecosystem instability.

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