Geophysical Research Abstracts
Vol. 20, EGU2018-3426-3, 2018
EGU General Assembly 2018

Soil moisture and temperature effects on Taraxacum mongolicum autumn phenology from 1992 to 2012 in the eastern China's tempearate zone

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Water availability is one of the most important environmental controls on vegetation phenology. Clearly, relatively soil moisture is the more appropriate indicator for root water uptake and vegetation phenology. However, most studies were focus on response of grass land phenology to meteorological factors: precipitation and temperature at large scale rather than the direct relationship between relatively soil moisture and temperature and autumn phenology at individual station. This study uses phenological and meteorological data from 1992 to 2012 in 50 stations scatter in eastern China's temperature zone, Theil-Sen and Mann-Kendall nonparametric test, and LP phenology model to examine trends in end date of the growing season and the direct response of autumn phenology to relatively soil moisture. A widely distributed herbaceous species, Taracun mongolicum was selected for determining the end date of the growing season. Here, the end date of the growing season is identified by the common leaf coloration.

Results indicate that average end of green season (EOS) significantly delayed at a rate of 4.4days per decade across the research region from 1992 to 2012. At individual station, significant positive trends ($p<0.05$) are detected in EOS at 19 stations (38%), and negative trends at 6 stations (12%). Significant positive correlation between EOS and the monthly relatively soil moisture appeared at 13 stations (26%), whereas a significantly negative correlation between EOS and monthly relatively soil moisture occurred only at 4 stations (8%). The effect of relatively soil moisture on EOS is much more obvious and more direct than that of precipitation. As the response of precipitation to EOS was much lower than that of temperature and soil relatively humidity, as 6 stations with upward trend and 4 stations with downward trend. As for relationship between temperature and EOS, 13 stations experienced positive trends while 4 stations experienced negative ones. Higher autumn temperature and relatively soil moisture triggered the delay of EOS. Overall, relatively soil moisture plays a more much significant role in autumn phenology trigger than precipitation and the regional warming and increase relatively soil moisture may delay the EOS in eastern China's temperate zone.