

Land Surface Phenology Changes in Central Asia

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Land surface phenology metrics allow for the summarization of long image time series into a set of annual observations that describe the vegetated growing season. These metrics have been shown to respond to both climatic and anthropogenic impacts. In this study we assembled a time series (2001-2016) of Moderate Resolution Imaging Spectroradiometer (MODIS) Nadir BRDF-Adjusted Reflectance (NBAR) data at two spatial resolutions (0.05° and 500m) and land surface temperature data at two spatial resolutions (0.05° and 1000m). We then derived land surface phenology metrics focusing on the peak of the growing season by fitting convex quadratic regression models connecting the NDVI time series with the progression of Accumulated Growing Degree-Days (AGDD) derived from the land surface temperature data. We linked the annual information on (1) peak timing, (2) thermal time to peak and (3) peak magnitude with three important climate oscillations—the Atlantic Multidecadal Oscillation (AMO); the North Atlantic Oscillation (NAO); and the East Atlantic / West Russia pattern (EAWR)—and evaluated the effects of the different spatial resolutions. We discovered several significant correlations between the climate oscillations and the land surface phenology peak metrics for a range of different bioclimatic regions in the drylands of Central Asia, and we linked these correlation results to changes in ambient population modeled by LandScan.

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