

Land Use/Land Cover Changes and Regional Climate over the Loess Plateau during 2001–2009. Part II: Interrelationship from Observations

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Abstract

Afforestation efforts in China resulted in significant changes in vegetation coverage over the Loess Plateau during 2001-2009. While regional climate conditions dominate the distribution of major vegetation types, human activities, primarily afforestation/reforestation and the resultant land-use land-cover changes (LULCC) and their impacts, are the focus of this study. A new attribution method was developed and applied to observed data for investigating the interrelationships between climate variation and LULCC. Regional climate (temperature and precipitation) changes are attributed to climate variation and LULCC; LULCC is attributed to climate variation and human activities. Climate attribution analysis indicated a larger contribution ratio (based on comparison of standard deviations of each contributing factor-induced climate changes and that of total change) from climate variation than from LULCC (0.95 from climate variation vs. 0.35 from LULCC) for variations in temperature. Impacts on precipitation indicated more spatial variations than those on temperature. The spatial variation of LULCC impacts on precipitation implied that human activities might have larger impacts on precipitation in the region's arid north than in its humid south. Using both leaf area index (LAI) and areal coverage of each of the major land types, LULCC attribution analysis suggested that LULCC observed in the 2000s resulted primarily from human activities rather than climate variations (0.99 contribution ratio from human activities vs. 0.26 from climate variation).

Key Words: *Regional climate variation; Land-use land-cover change; Loess Plateau; Afforestation/reforestation; Attribution method*