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Potential impacts of human-induced land cover change on East Asia monsoon

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Abstract

As one major performance of anthropogenic activities, human-induced land use and land cover changes in East Asia have been one of the largest regions in the world. In the past 3000 years, more than 60% of the region has been affected by conversion of various categories of natural vegetation into farmland, conversion of grassland into semidesert and widespread land degradation. Such human-induced land cover changes result in significant changes of surface dynamic parameters, such as albedo, surface roughness, leaf area index and fractional vegetation coverage, etc.

The results of a pair of numerical experiments in this paper have shown that by altering the complex exchanges of water and energy from surface to atmosphere, the changes in land cover have brought about significant changes to the East Asian monsoon. These include weakening of the summer monsoon and enhancement of winter monsoon over the region and a commensurate increase in anomalous northerly flow. These changes

the region and a commensurate increase in anomalous northerly flow. These changes result in the reduction of all components of surface water balance such as precipitation, runoff, and soil water content. The consequent diminution of northward and inland moisture transfer may be a significant factor in explaining the decreasing of atmospheric and soil humidity and thus the trend in aridification observed in many parts of the region, particularly over Northern China during last 3000 years.

The variation of East Asia monsoon presented here is the result of land cover changes only. It is very likely that the anthropogenic modification of monsoon system would have been occurred in the long history of civilization.

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Keywords

East Asia; Monsoon; Land cover change

A History of Asia: Instructor's Manual, gyrohorizon illustrates the rotational orthogonal determinant.
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