

Spatio-temporal analysis of the geographical centroids for three major crops in China from 1949 to 2014

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Abstract: Spatial distribution changes in major crops can reveal important information about cropping systems. Here, a new centroid method that applies physics and mathematics to spatial pattern analysis in agriculture is proposed to quantitatively describe the historical centroids of rice, maize and wheat in China from 1949 to 2014. The geographical centroids of the rice area moved 413.39 km in a 34.32° northeasterly (latitude 3.08°N, longitude 2.10°E) direction at a speed of 6.36 km/year from central Hunan province to Hubei province, while the geographical centroids of rice production moved 509.26 km in the direction of 45.44° northeasterly (latitude 3.22°N, longitude 3.27°E) at a speed of 7.83 km/year from central Hunan province to Henan province. The geographical centroids of the maize area and production moved 307.15 km in the direction of 34.33° northeasterly (latitude 2.29°N, longitude 1.56°E) and 308.16 km in the direction of 30.79° northeasterly (latitude 2.39°N, longitude 1.42°E), respectively. However, the geographical centroids of the wheat area and production were randomly distributed along the border of Shanxi and Henan provinces. We divided the wheat into spring wheat and winter wheat and found that the geographical centroids of the spring wheat area and production were distributed within Inner Mongolia, while the geographical centroids of winter wheat were distributed in Shanxi and Henan provinces. We found that the hotspots of crop cultivation area and production do not always change concordantly at a lar-

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