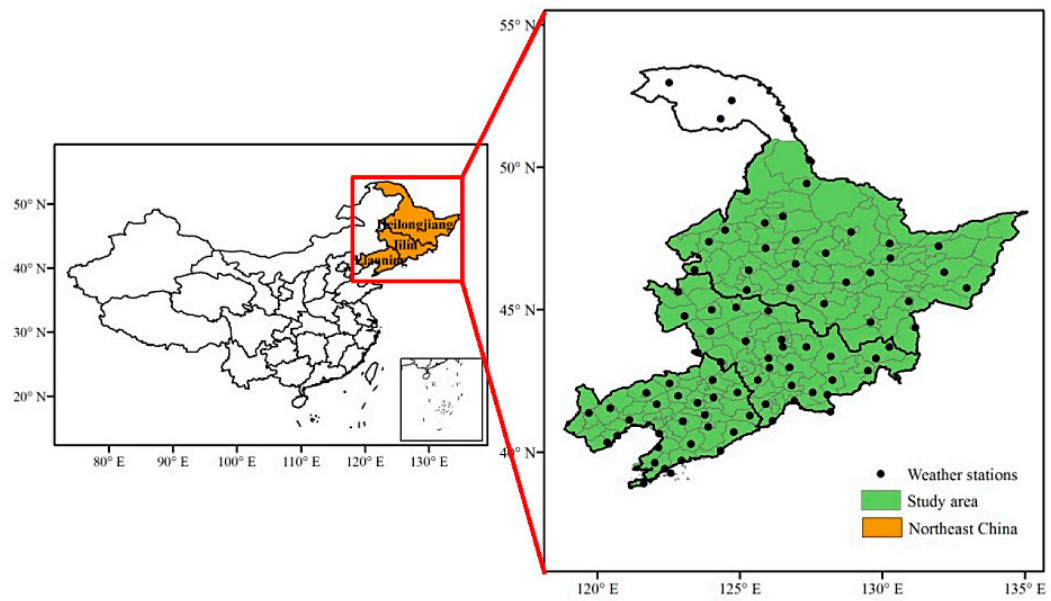
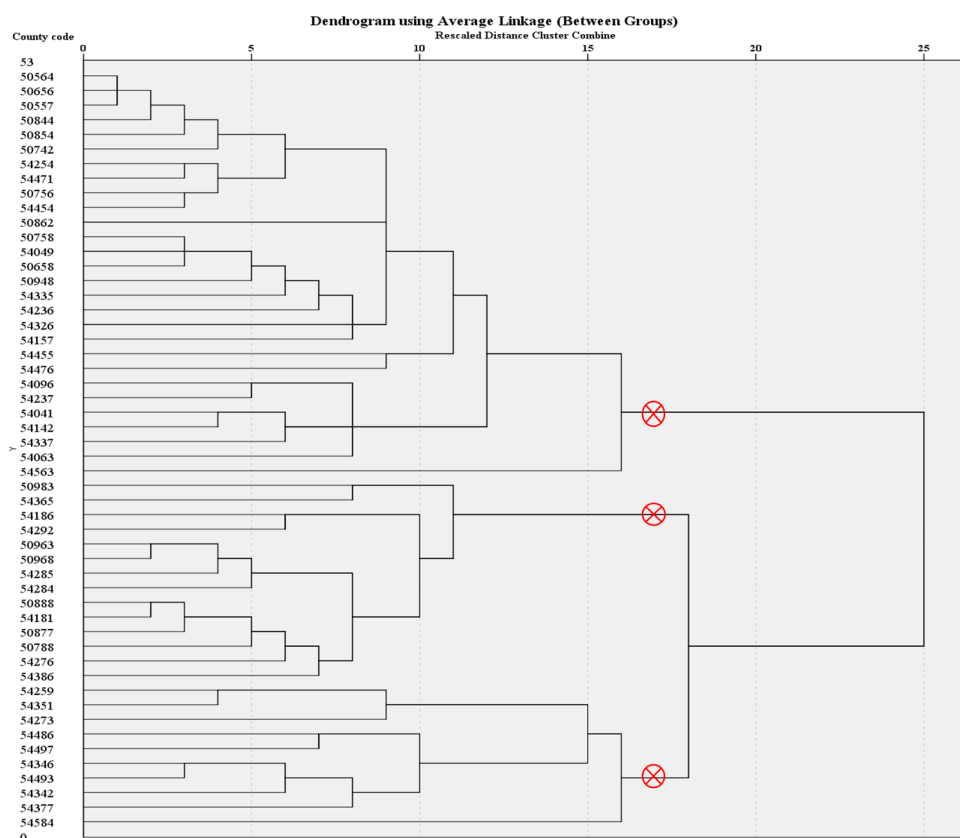


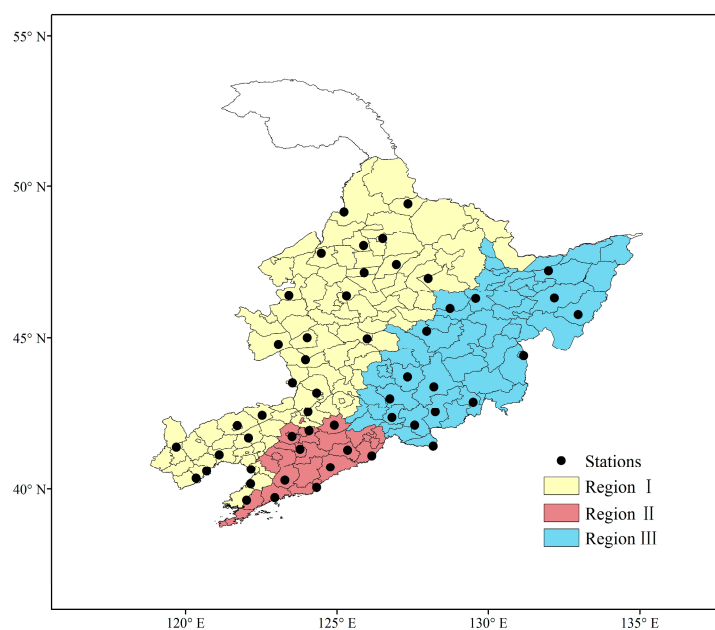
## Supplementary Figures and Tables



**Figure S1.** Geographical location of study area. Yellow area shows three provinces of Heilongjiang, Jilin and Liaoning in Northeast China. Green area shows the counties where maize was planted. Fine lines are county boundaries. Solid circles show the location of meteorological stations.



**Figure S2.** Dendrogram of hierarchical cluster analysis. x-axis is the rescaled distance cluster combine, and y-axis is the county code. The red marks show the three clusters. Variables using in the hierarchical cluster analysis are a set of correlation coefficients between the yield change ( $\Delta$ yield %) and the changes in climate variable ( $\Delta X$ ) for each county. The X includes Tmax, Tmin, Pre and SH during entire growing season, and Tmax\_v, Tmin\_v, Pre\_v, SH\_v, Tmax\_r, Tmin\_r, Pre\_r and SH\_r in the time window of V&R phases.



**Figure S3.** Three regions were oriented in light of the hierarchical cluster analysis in Figure A2.

**Phenological date of maize.** We obtained phenological data of maize from 12 Agro-meteorological Experimental Stations (AESs) located at NSC. These stations are operated by the Chinese Meteorological Administration. Table A1 shows the basic information about the 12 agrometeorological stations. Table A2 shows the descriptive statistics for the observed date (mm/dd) of sowing, tasseling and maturity at 12 AESs in NEC.

**Table S1.** Information about the period of observation and the number of cultivars planted at 12 agrometeorological stations in NEC.

Province	Station	Latitude	Longitude	Period of observation	Number of cultivars
Heilongjiang	Hailun	47°27'N	126°58'E	1981–2005	6
	Harbin	45°56'N	126°34'E	1984–2005	6
Jilin	Wuchang	44°54'N	127°09'E	1983–2005	11
	Meihekou	42°32'N	125°38'E	1981–2005	7
	Yushu	44°50'N	126°32'E	1985–2005	9
	Shulan	44°25'N	126°56'E	1990–2005	4
	Tonghua	41°40'N	125°45'E	1981–2005	3
	Yongji	43°42'N	126°31'E	1990–2005	8
Liaoning	Haicheng	40°53'N	122°43'E	1990–2005	7
	Benxi	41°18'N	124°17'E	1981–2005	10
	Changtu	42°47'N	124°07'E	1990–2005	11
	Dengta	41°25'N	123°12'E	1990–2005	10

**Table S2.** Descriptive statistics for the observed date (mm/dd) of sowing, tasseling and maturity at 12 agrometeorological stations in NEC.

Item	Sowing	Tasseling	Maturity
N of cases	146	245	241
Minimum	04/16	07/10	08/29
Maximum	05/19	08/05	10/11
<b>Median</b>	<b>04/28</b>	<b>07/23</b>	<b>09/18</b>
<b>Arithmetic Mean</b>	<b>04/28</b>	<b>07/22</b>	<b>09/18</b>
<b>95% LCL of Arithmetic Mean</b>	<b>04/27</b>	<b>07/21</b>	<b>09/17</b>
<b>95% UCL of Arithmetic Mean</b>	<b>04/29</b>	<b>07/22</b>	<b>09/19</b>