**Table S1.** The main content of Chinese references.

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| **Chinese reference 9** | **Title** | Distribution and Variation of China Agricultural Heat Resources in 1961-2010 |
| | **Author** | Hu Q.; Pan X.B.; Shao C.X.; Zhang D.; Wang X.X.; Wei X.Y. |
| | **Journal (Year)** | Chinese agricultural meteorology (2014) |
| | **Abstract** | Based on observed meteorological data from 508 stations in China, the distribution characteristics of heat resources were analyzed by using climatic trend rate and GIS methods in national scale in recent 50 years (1961-2010), and the change characteristics of heat resources between two periods (period I 1961- 1980, period Ⅱ 1981-2010) were compared. The results showed that the heat resources distributed unevenly, and more heat resources in southern China than that in northern China. The key influence factor in eastern China was latitude, while topography was key factor in western China. Counter lines of average daily temperature 0 °C, 10 °C and 15 °C in period Ⅱ moved northward comparing with period I, days of average daily temperature ≥ 0 °C and ≥ 10 °C increased 5. 5 d and 4. 7 d on average, respectively. The distribution and change of average daily temperature ≥ 0 °C was similar to that of accumulated temperature ≥ 10 °C. The areas of the accumulated temperature zone of 5500- 6100 °C·d (≥ 0 °C accumulated temperature) and 5300- 6500 °C·d (≥ 10 °C accumulated temperature) increased by 5.32 × 104 $km^2$ and 1.92 × 103 $km^2$, respectively. The climatic trend rate of average temperature was 0.27 °C/10a in 1961- 2010, and the climatic trend rate of maximum and minimum temperature was 0.37 °C/10a and 0. 21°C/10a in northern China. The accumulated temperature ≥ 0 °C and ≥ 10 °C increased 70 °C·d /10a. The heat resources(mean temperature, minimum and maximum temperature, accumulated temperature) in China showed an increasing tendency in recent 50 years, and minimum temperature played a major role on climate warming, whose variation degree was larger than that of maximum temperature. Climate warming might have some impacts on |
| **Chinese reference 10** | **Title** | Rice area change in Northeast China and its correlation with climate change |
| | **Author** | Chen H; Li Z.G. Tang P.Q; Hu Y.N; Tan J.Y, Liu Z.H.; You L.Z.; Yang P. |
| | **Journal (Year)** | Chinese Journal of Applied Ecology (2016) |
| | **Content** | The area of rice planting in Northeast China changed significantly during the period of 1980-2010, while the total |

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| | | planting area increased by nearly 80,000 $hm^2$ per year. Then the area had reached 3.2 million $hm^2$ by 2010, which was nearly 4 times higher than that in 1980. Rice planting area was mainly distributed in the southern part of the Liaohe Plain, and a small amount is distributed in the eastern part of the Songnen Plain in 1980. The distribution of the core latitude is 41 ° N. |
| **Chinese reference 11** | **Title** | Accumulated Temperature Variation and Accumulated Temperature Rezone in Heilongjiang Province |
| | **Author** | Cao M.M.; Li Q.; Zhang L.Y.; Gao J.; Li W.H.; Ding W.M.; Sun Y.K |
| | **Journal (Year)** | Chinese agricultural meteorology (2014) |
| | **Abstract** | Based on daily average temperature data from 78 meteorological stations in Heilongjiang province from 1981 to 2012，the temporal and spatial variation of accumulated temperature ≥ 10 °C was analyzed by using five-day running average and Kriging interpolation space method. The accumulated temperature zone in Heilongjiang province was rezoned by using of the 80% guaranteed rate of the accumulated temperature. The results showed that the annual average temperature increased obviously at the rate of 0.21 °C/10a，and the accumulated temperature ≥ 10 °C increased at the rate of 83. 95 °C·d per 10 years from 1980s. The average accumulated temperature was 2645.39 °C·d in 1981-2012. The accumulated temperature ≥ 10 °C increased significantly in decade, and the accumulated temperature ≥ 10 °C zone moved to north and east obviously. The accumulated temperature with 80% guaranteed rate was above 2300 °C·d in most regions, and all zones expanded to north and east. The results could provide references for planting division in Heilongjiang province. |
| **Chinese reference 22** | **Title** | Projection on Future Climate Change in China-Constructing High Resolution SRES Climate Scenarios Using PRECIS |
| | **Author** | Xu Y.L.; Pan J.; Feng Q. |
| | **Journal (Year)** | Science Press, Beijing, China (2016) |
| | **Content** | The author of this book transplanted PRECIS mode system to China in February 2003, and began to set up and run PRECIS mode system in China to generate high-resolution climate situation data. (page 18-19) |
| **Chinese reference 29** | **Title** | Characteristics of agricultural climate resources in the potential northward migration area of winter wheat under future climate scenarios |
| | **Author** | Zhang M.T.; Zhang Y.J.; Tong J.H.; Li K.; Pan J.; Xu Y.L. |
| | **Journal (Year)** | Climate Change Research (2017) |
| | **Abstract** | Analysis of RCP4.5 climate scenario data based on the regional climate model system PRECIS shows that the northern |

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| | | boundary of winter wheat planting will move an average of 147.8 km northward with area about 1.86 × 105 km$^2$ in 2071-2097 compared to 1981-2010. To explore the characteristics of agricultural climate resources in the potential northward area of winter wheat from 2021 to 2097 under the future scenario, 9 agricultural climate resources indices are selected including light, temperature and water resources. The results show that: (1) compared with the baseline period (1961–1990), the change of light resources in the potential northward area showed a decreasing trend in the future; the thermal resources showed a significant increase trend in the last 30 years in the end of the 21st century, while volatility increased; the overall increase trend of water resources was not obvious, but the volatility also showed an increasing trend. (2) In the future potential northward zone, the light resources decreased greatly in the northeastern part of the study area, but it were smaller in the southwest in 2030T (2021–2050), 2050T (2041—2070) and 2070T (2061–2090); the increase of thermal resources in the northern part of the study area is more obvious than in the south; the precipitation is mainly increased in the northeastern part of the study area. |
| **Chinese reference 31** | **Title** | Variation of Temperature and Frost-free Period in Different Time Scales in Northeast China |
| | **Author** | Hu Q.; Pan X.B.; Zhang.D.; Yang N.; Li Q.Y.; Shao C.X. |
| | **Journal (Year)** | Chinese Journal of Agro-meteorology (2015) |
| | **Content** | The frost-free period is closely related to the crop growth period and is an important thermal indicator in agriculture. The frost-free period is calculated according to the following definitions: the daily minimum temperature ≤ 2 °C as the meteorological indicator of the frost day, while the last occurrence day in spring and the first occurrence day in autumn were defined as the last or first frost day. The number of days between the last frost day and the first frost day is frost-free. |
| **Chinese reference 33** | **Title** | Analysis of Changes in the Maximum and Minimum Temperature and Diurnal Temperature Range from PRECIS Model under the SRES A1B Scenario for China |
| | **Author** | Liu C.B.; Ji X.X.; Xu Y.L.; Wang M.X.; Zhang L.; Pan J.; Hu Y.N.; Tong J.H. |
| | **Journal (Year)** | Climatic and Environmental Research (2015) |
| | **Abstract** | The outputs of PRECIS (Providing Regional Climates for Impacts Studies) were used to analyze the changes in the maximum (Tmax) and minimum temperature (Tmin) and diurnal temperature range (DTR) during 2011–2040, 2041–2070, and 2071–2100 relative to the baseline period (1961–1990) under the SRES A1B scenario for China. The results |

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| | | show a consistent increase in the Tmax and Tmin, annually and for the four seasons, during 2011–2040, 2041–2070, and 2071–2100; however, the DTR shows a consistent decrease. The annual warming amplitude (WA) of the Tmax and Tmin are 1.7, 3.2, 3.9 and 1.9, 3.6, 4.7 °C, during 2011–2040, 2041–2070, and 2071–2100, respectively, and the increase in the amplitude of the Tmin is more than 1.1 times that of the Tmax. The WA of the Tmax and Tmin are projected to be largest in winter and smallest in spring, and the decreasing amplitude of the DTR is projected to be largest in winter and smallest in summer. The spatial distribution of the change of the Tmax, Tmin, and DTR over China shows that the Tmax will have its largest WA in Northeast China, a large WA in Northwest China, the Loess Plateau, and the Sichuan Basin, but a small WA in the northern Qinghai−Tibet Plateau and South China. On the contrary, the Tmin will have its largest WA in Northwest China, a large WA in Northeast China and the Northern Qinghai−Tibet Plateau, and a small WA in the Sichuan Basin and the eastern Yunnan−Guizhou Plateau. The DTR shows a decreased trend for northern China, especially in the northern Qinghai−Tibet Plateau, but an increase in the Sichuan Basin and the eastern Yunnan-Guizhou Plateau. |
| **Chinese reference 39** | **Title** | Impacts of Climate Change on Agro-Climatic Resources in China |
| | **Author** | Tang X.; Yang X.C.; Tian Z.; Günter F.; Sun L.X.; Pan J. |
| | **Journal (Year)** | Resources Science (2011) |
| | **Content** | The length of growing season is defined as the number of days during the period of mean temperature stably via 5°C in this study. As the Fig.6 a and b shown, the crop potential growing season for a mean temperature above 5 °C would increase by about 20 d under the SRES A2 scenario. |
| **Chinese reference 40** | **Title** | Spatio-temporal distribution of maize chilling damage intensity in the Three Provinces of Northeast China During 1961 to 2013 |
| | **Author** | Yang R.Z.; Zhou G.S. |
| | **Journal (Year)** | Acta Ecologica Sinica (2016) |
| | **Abstract** | The classification and spatio-temporal distribution of maize chilling damage intensity in the three provinces of Northeast China were studied using the daily meteorological data from 1961 to 2013, the chilling damage data presented in the Industry Standard: Technical Specification of Northern Spring Maize Chilling Damage Assessment (QX/T167-2012) as well as by empirical orthogonal function (EOF) and rotated EOF method. The results showed that the maize chilling |

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| | | damage intensity in the three provinces of Northeast China showed significant spatial difference, which could be divided in three categories: the regional consistency type, the anti-phase distribution type between northern and southern parts, and the anti-phase distribution type between eastern and western parts. The maize chilling damage intensity in the three provinces of Northeast China showed a consistent fluctuating pattern and a decreasing trend from 1961 to 2013. The maize chilling damage intensity displayed a significant regional difference, separating three sub-regions based on maize chilling damage intensity, i.e., the sub-region with the strongest chilling damage intensity including Heilongjiang Province and the northern part of Jilin Province(I sub-region), the sub-region with the intermediate chilling damage intensity including the southern part of Jilin Province and the northern part of Liaoning Province(Ⅲ sub-region), and the sub-region with the lowest chilling damage intensity in the southern part of Liaoning Province(Ⅱ sub-region). The results presented herein will provide the scientific reference for maize chilling damage division and help establish countermeasures for coping with the negative effects of the maize chilling damage. |
| **Chinese reference 41** | **Title** | A Numerical Simulation of the Impacts of Climate Change on Water and Thermal Resourced in Northeast China |
| | **Author** | Wu J.D.; Wang S.L.; Zhang J.M. |
| | **Journal (Year)** | Resources Science (2000) |
| | **Content** | Northeast China is affected by future warming, and the thermal conditions would be sufficient compare to present. The growing season would prolong and the accumulated temperature would increase. As one of the main limiting factors of current high yield and stable yield of crops, the cold damage would be alleviated with the increase of the minimum temperature. |