Geophysical Research Abstracts
Vol. 21, EGU2019-16807, 2019
EGU General Assembly 2019

Implications of northward expansion of climate zones in Europe for agriculture

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Our study focuses on the northward shift of climatic homogeneous zones in Europe under observed past and projected future climate conditions, temporally confined to +2 °C of global warming with respect to 1981-2010. We identify the main agro-climatic homogeneous zones in Europe using agro-climatic indicators of active temperature sums and thermal growing season length. The northward movement of homogeneous agro-climatic regions is analyzed together with the change of vulnerability of crops to temperature related climate extremes during the growing season. Large parts of Europe have already experienced gradual warming with more frequent occurrence of warm extremes, contributing to lengthening of growing season and increased active temperature accumulation. Climate zones in eastern Europe are projected to move northward with even larger velocity than the one recorded during the period between 1975 and 2016. Several regions of the Mediterranean might loose suitability in favour of northern European regions. The potential advantages of the lengthening of the thermal growing season is often outbalance by increased risk of late frost in northern and eastern Europe and to increased risk of late spring and summer heat waves in major part of Europe, with will have important implications for agricultural production.