

Increasing risks of apple tree frost damage under climate change

Peter Pfleiderer^{1,2,3,*}

Inga Menke¹

Carl-Friedrich Schleussner^{1,2,3}

(1) Climate Analytics, Berlin

(2) IRI THESys, Humboldt Universität Berlin, Berlin

(3) Potsdam Institute for Climate Impact Research, Potsdam

* corresponding author:

peter.pfleiderer@climateanalytics.org

Tel.: +49 (030) 2093 66378

ORCID: 0000-0002-1493-4598

Supplementary information

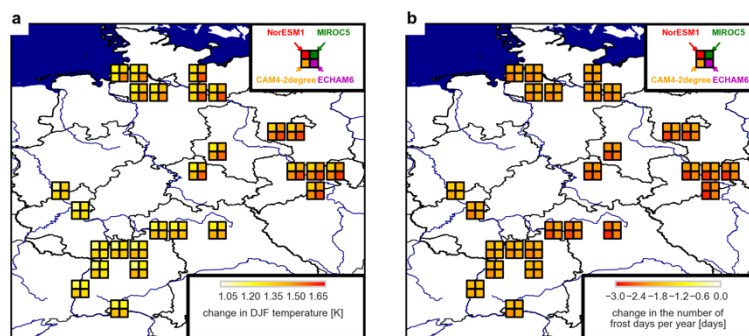


Fig. S1 Change in winter temperatures and the number of frost days per year between 2°C and the current climate scenario: a: Change in December – January – February (DJF) mean temperatures. b: change in the number of frost days per year. NorESM1 (top-left), MIROC5 (top-right), CAM4-2degree (bottom-left) and ECHAM6 (bottom right).

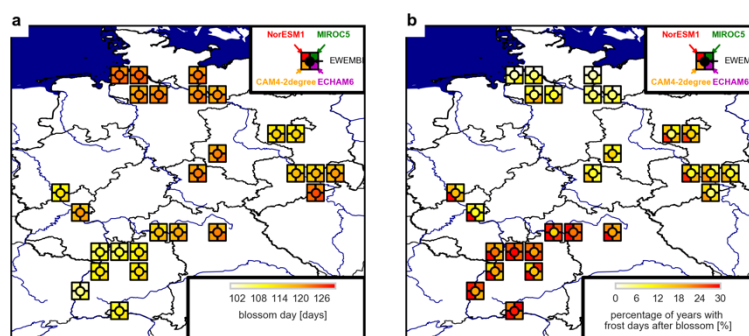


Fig. S2 Evaluation of the simple blossom model: a: Mean blossom day for the period 1979-2013 in EWEMBI (dot at each location) and for the historic scenario (2006-2015) in 4 HAPPI models: NorESM1 (top-left), MIROC5 (top-right), CAM4-2degree (bottom-left) and ECHAM6 (bottom right). b: percentage of years with frost days after blossom.

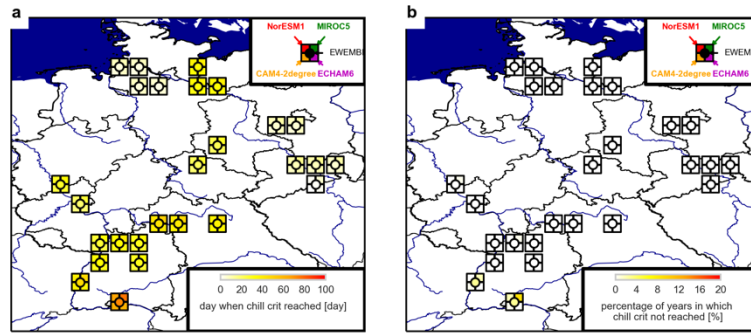


Fig. S13 **Evaluation of the chilling requirement**: a: Averaged day when the chilling requirement is fulfilled for the period 1979-2013 in EWEMBI (dot at each location) and for the historic scenario (2006-2015) in 4 HAPPI models: NorESM1 (top-left), MIRCO5 (top-right), CAM4-2degree (bottom-left) and ECHAM6 (bottom right). Years where the chilling criterion isn't reached are filled with May 1. b: percentage of years in which the chilling requirement isn't fulfilled.

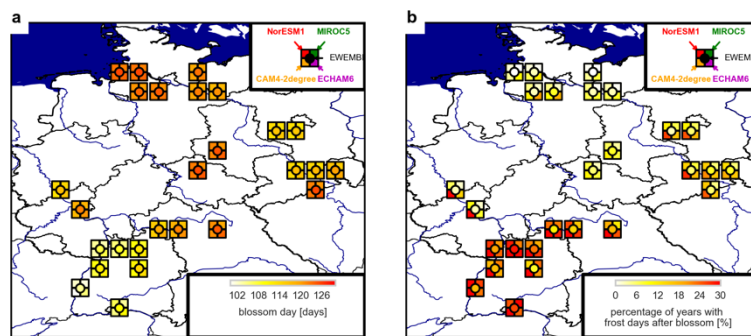


Fig. S14 **Evaluation of the parallel chilling-forcing blossom model**: a: Mean blossom day for the period 1979-2013 in EWEMBI (dot at each location) and for the historic scenario (2006-2015) in 4 HAPPI models: NorESM1 (top-left), MIRCO5 (top-right), CAM4-2degree (bottom-left) and ECHAM6 (bottom right). b: percentage of years with frost days after blossom.

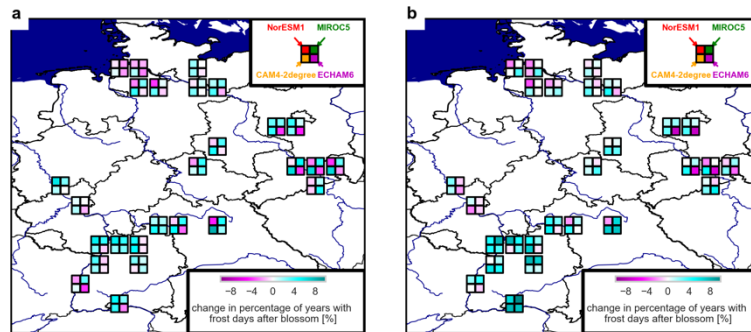


Fig. S15 **Difference in frost risk between the 2°C and the 1.5°C future climate scenarios**: a: Change in the percentage of years with frost days after blossom in the simple forcing model. b: Same as (a) but for the parallel chilling-forcing model. NorESM1 (top-left), MIRCO5 (top-right), CAM4-2degree (bottom-left) and ECHAM6 (bottom right).