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Thierry Castel, Christophe Lecomte, Y. Richard, Annabelle Larmure

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# Modelling the regional evolution of frost damage on a winter crop with warming in a temperate climate

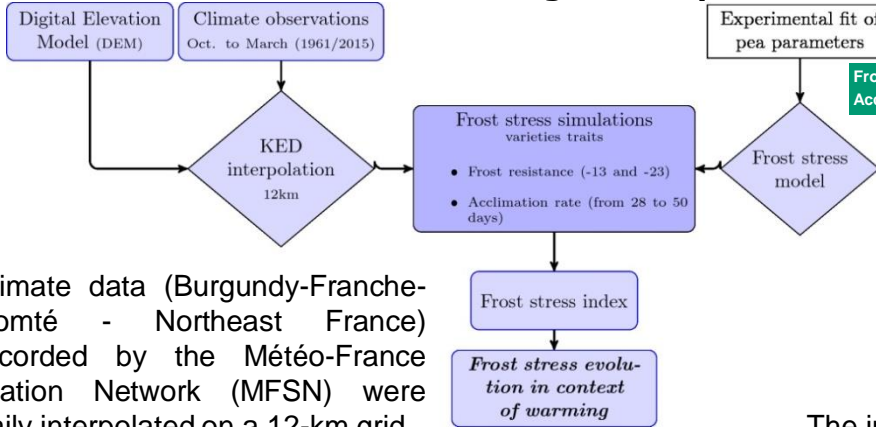
Thierry CASTEL<sup>1</sup>, Christophe LECOMTE<sup>2</sup>, Yves RICHARD<sup>1</sup> & Annabelle LARMURE<sup>2</sup>  
<sup>1</sup>Centre de Recherches de Climatologie, UMR Biogéosciences 6282 CNRS-Université de Bourgogne  
<sup>2</sup>UMR Agroécologie1347, AgroSup-INRA-Université de Bourgogne,  
 21000 Dijon . France



**Context :** The modalities of climate warming over Europe and France allow to distinguish two temperature periods: before and after 1987/1988 (Brulebois *et al.* 2015 *J. Hydrol.*). It offers the opportunity to assess climate warming on agrosystems.

## Objectives & Methods

### Impact of autumn and winter surface temperature warming on frost stress for an annual legume crop



Winter Pea (*Pisum sativum* L)

	Victor	Enduro	Lucy	Terese
Frost resistance (°C)	-14.5	-14.5	-13.5	-8
Acclimation rate (days)	39	45	49	42

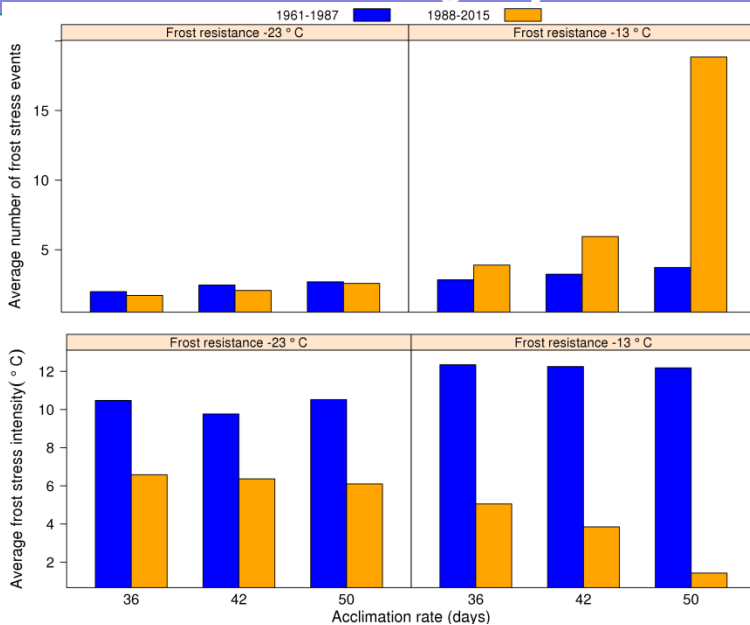
Four winter pea varieties  
 Dufayet V., Chau-des-Prés (France), February 2017

Climate data (Burgundy-Franche-Comté - Northeast France) recorded by the Météo-France Station Network (MFSN) were daily interpolated on a 12-km grid.

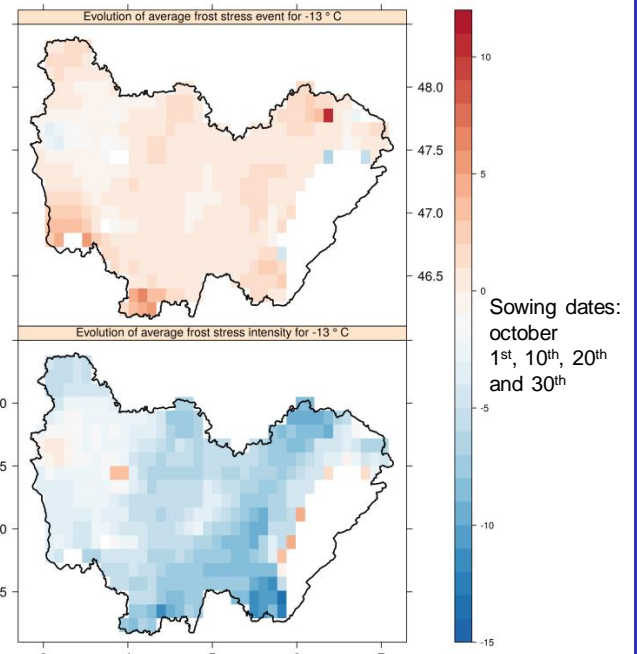
An automated mapping based on a kriging with external drift (KED) method has been used to interpolate maximum and minimum temperatures.

The interpolated climate data were used to feed a frost stress crop model validated for pea (Lecomte *et al.* 2003 *Agronomie*; Castel *et al.* 2017 *OCL*).

## Simulation results in Burgundy-Franche-Comté



Average frost stress evolution Sowing date: october 30<sup>th</sup>



Regional frost stress evolution

In average, the number and the intensity of frost stress events evolve in opposition between both periods (1961-1987 and 1988-2015): the number of events increases, while their intensity decreases, especially for variety with a weak frost resistance and a prolonged acclimation rate. The resulting evolution of frost stress (number of events x intensity) is a decrease (Castel *et al.* 2017 *OCL*).

## Perspectives

The results show that the account of the winter crop traits and the modalities of warming jointly matter to better understand how winter climate warming affects changes in the frost risk evolution. This is of primary importance to define new winter crop ideotypes.