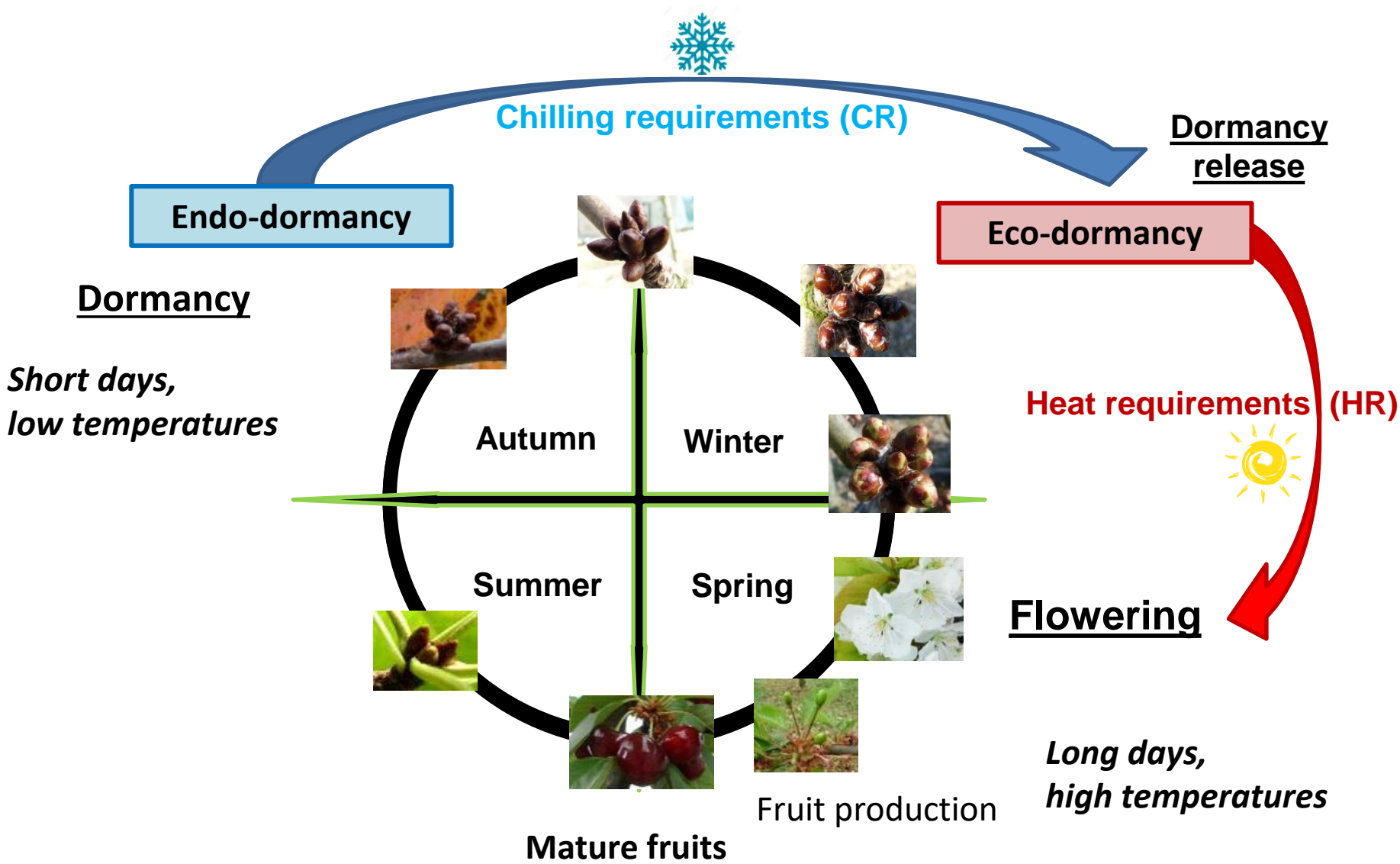


Camille Branchereau

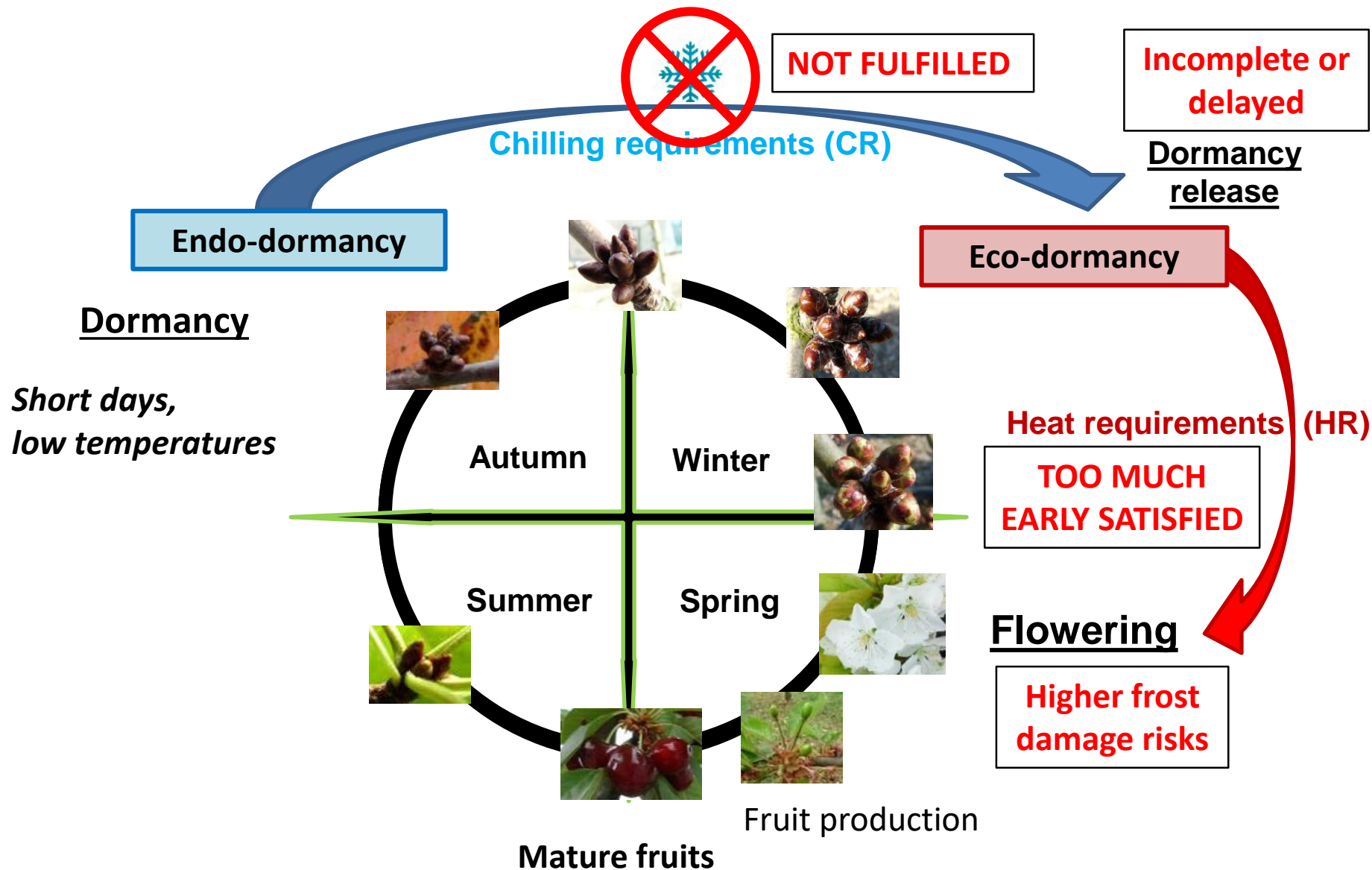
PhD student at INRAE, Bordeaux (France)

**QTL detection for
flowering date in sweet
cherry:
fine mapping and GxE
effects**

Prunus avium phenology cycle



Several issues due to climate change



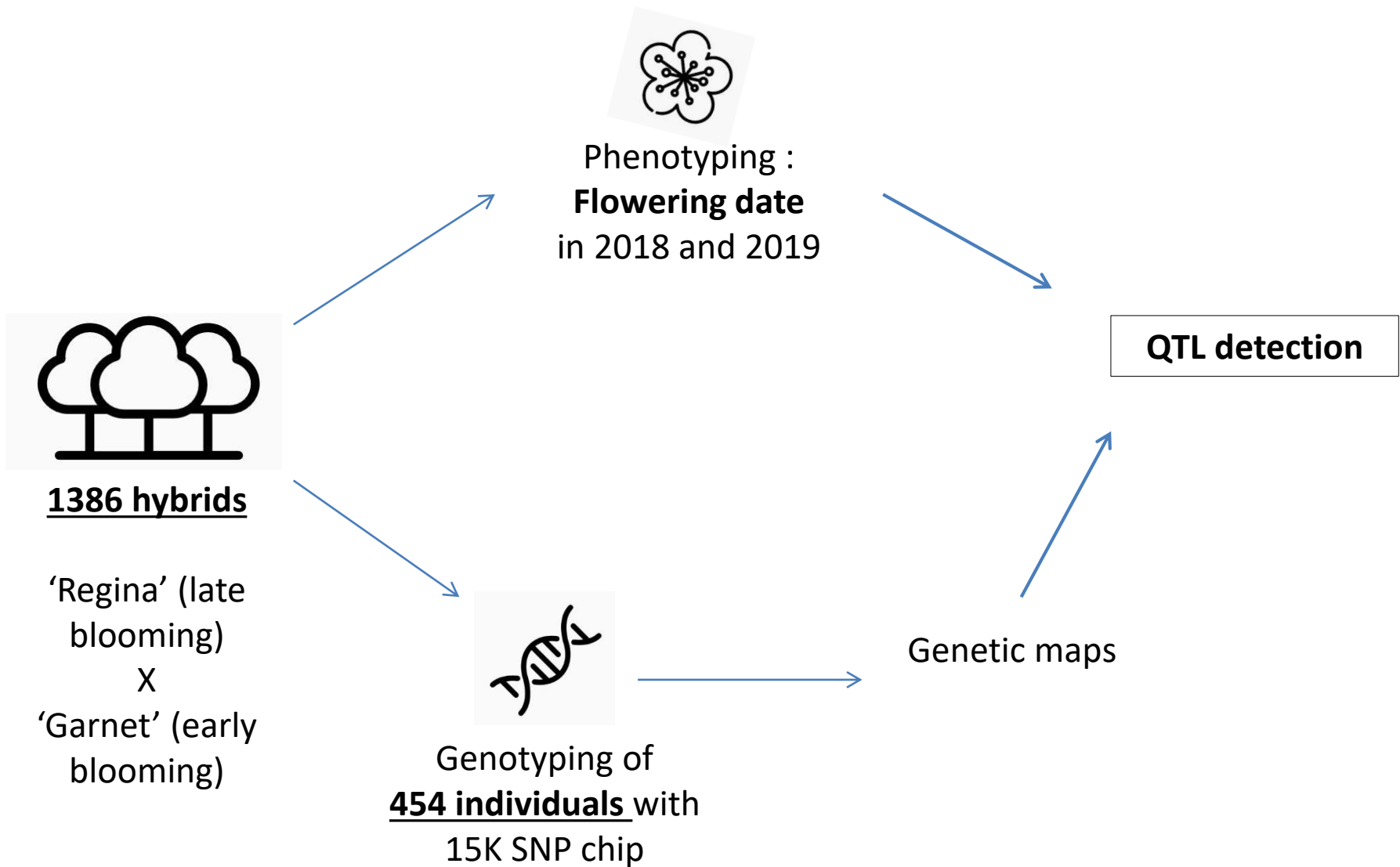
Fine-mapping of a major QTL and
identification of candidate genes

➔ ***'Regina' x 'Garnet' population.***

QTL stability across environments and
genotype x environment interactions (GEI)

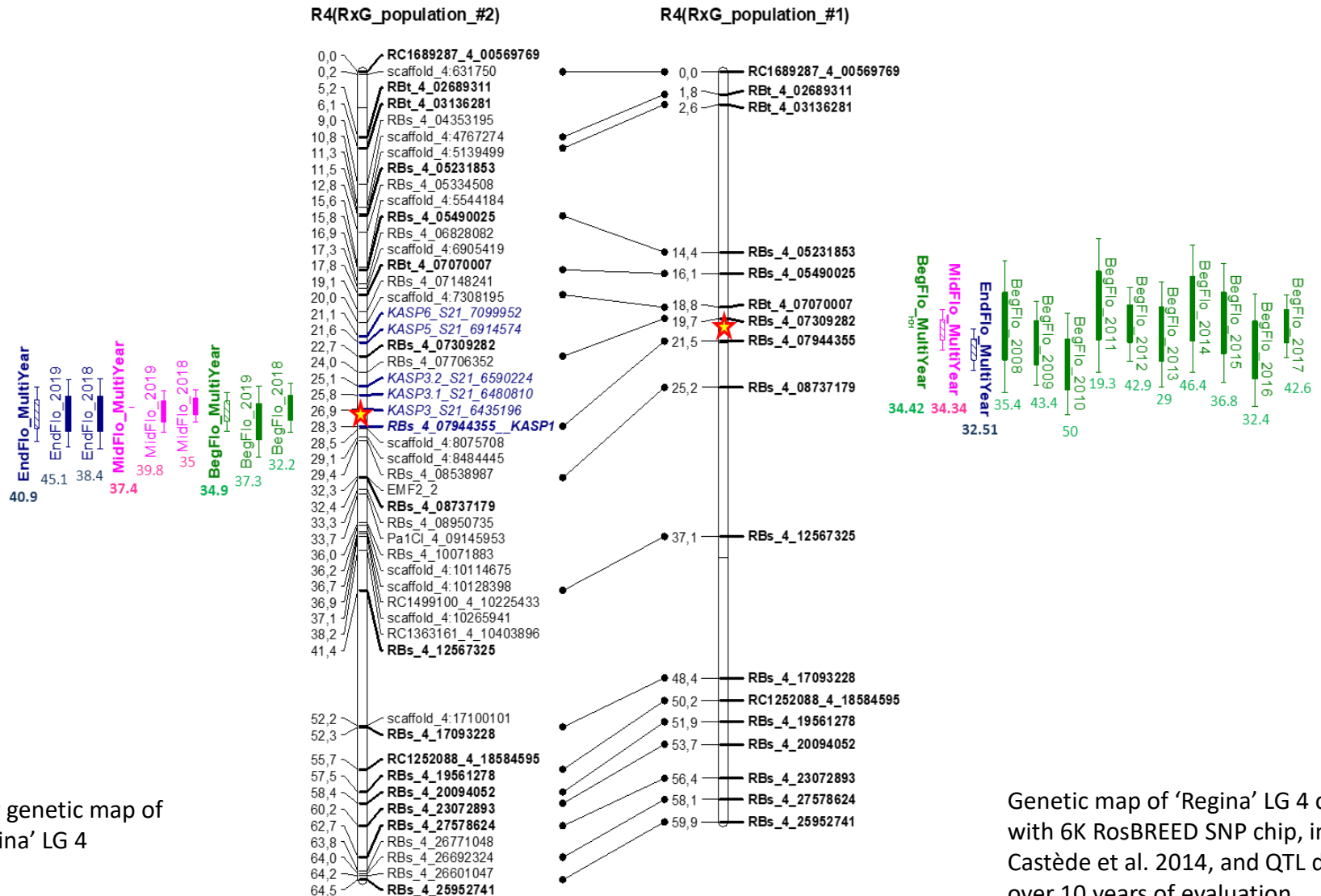
➔ ***'Regina' x 'Lapins' population, MET.***

'Regina' x 'Garnet'



QTL detection

- Major QTL on the **LG 4 of 'Regina'** :



New genetic map of 'Regina' LG 4

Genetic map of 'Regina' LG 4 obtained with 6K RosBREED SNP chip, in Castède et al. 2014, and QTL detection over 10 years of evaluation

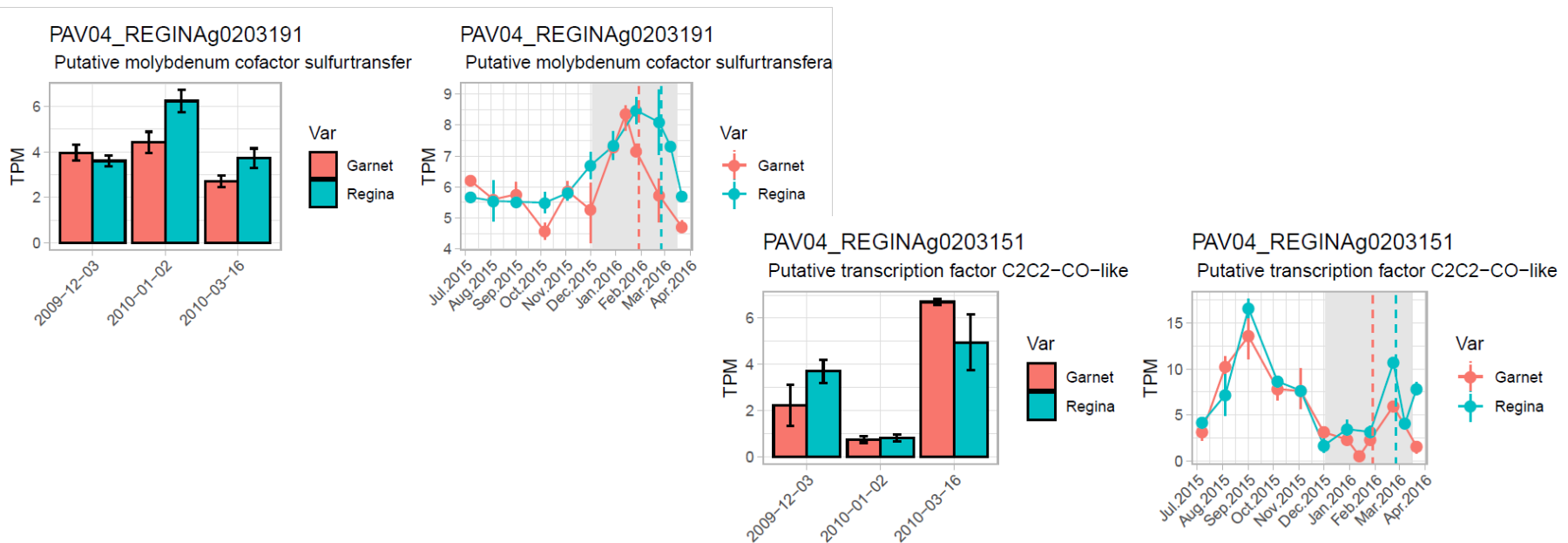
Fine mapping of the LG 4 QTL

- 9 KASP markers located in the QTL region, between 9,268,785 bp and 10,158,850 bp
- Regina is heterozygous / Garnet is homozygous
- 1386 individuals genotyped
 - 41 recombinant genotypes

KASP	Number of individuals	KASP 1	KASP 2	KASP 3	KASP 3.1	KASP 3.2	KASP 4	KASP 5	KASP 6	KASP 7	BF2018	BF2019
GARNET		A	A	A	A	A	A	A	A	A	94	79
REGINA		B	B	B	B	B	B	B	B	B	99	91
Hybrids with GARNET's genotype	641	A	A	A	A	A	A	A	A	A	93,1	82,0
Hybrids with REGINA's genotype	697	B	B	B	B	B	B	B	B	B	95,2	84,8
Recombinant genotype #1	2	A	A	A	A	A	A	A	B	B	94,0	83,0
Recombinant genotype #2	10	A	A	A	A	A	A	B	B	B	92,6	81,7
Recombinant genotype #3	4	A	A	A	A	B	B	B	B	B	93,0	82,5
Recombinant genotype #4	4	A	A	A	B	B	B	B	B	B	94,3	82,5
Recombinant genotype #5	2	A	A	B	B	B	B	B	B	B	96,5	84,5
Recombinant genotype #6	6	B	B	B	A	A	A	A	A	A	96,0	84,8
Recombinant genotype #7	5	B	B	B	B	A	A	A	A	A	93,8	82,8
Recombinant genotype #8	7	B	B	B	B	B	B	A	A	A	95,2	84,4
Recombinant genotype #9	1	B	B	B	B	B	B	B	A	A	94,0	83,0

Candidate genes

- 70 genes located in the interval of the QTL.
- RNAseq available -> expression information in parental cultivars
- ➔ 51 CGs are expressed
- Examples : CCT domain transcription factor, Molybdenum cofactor sulfurtransferase (ABA3), NAC domain transcription factor



'Regina' x 'Lapins'

- 122 individuals, 2 reps
- Flowering and quality related traits, from 2016 to 2019 depending on the location
- 6K RosBREED sweet cherry array
- Multi-environment trial : 5 locations across Europe:



QTL detection

- Main QTL on the LG 4 of 'Regina'

Location	Position (cM)	PEV 2016 (%)	PEV 2017 (%)	PEV 2018 (%)	PEV 2019 (%)
Forli	25,5-32,8	-	-	23,3	16,5
Maribor	21,2-34	-	41,1	-	40,1
Nîmes	26,6-31,1	-	28,2	26,1	22,1
Toulonne	24,4-33	20,8	20,5	19,8	25,7
Murcia	no significant QTL on R4				

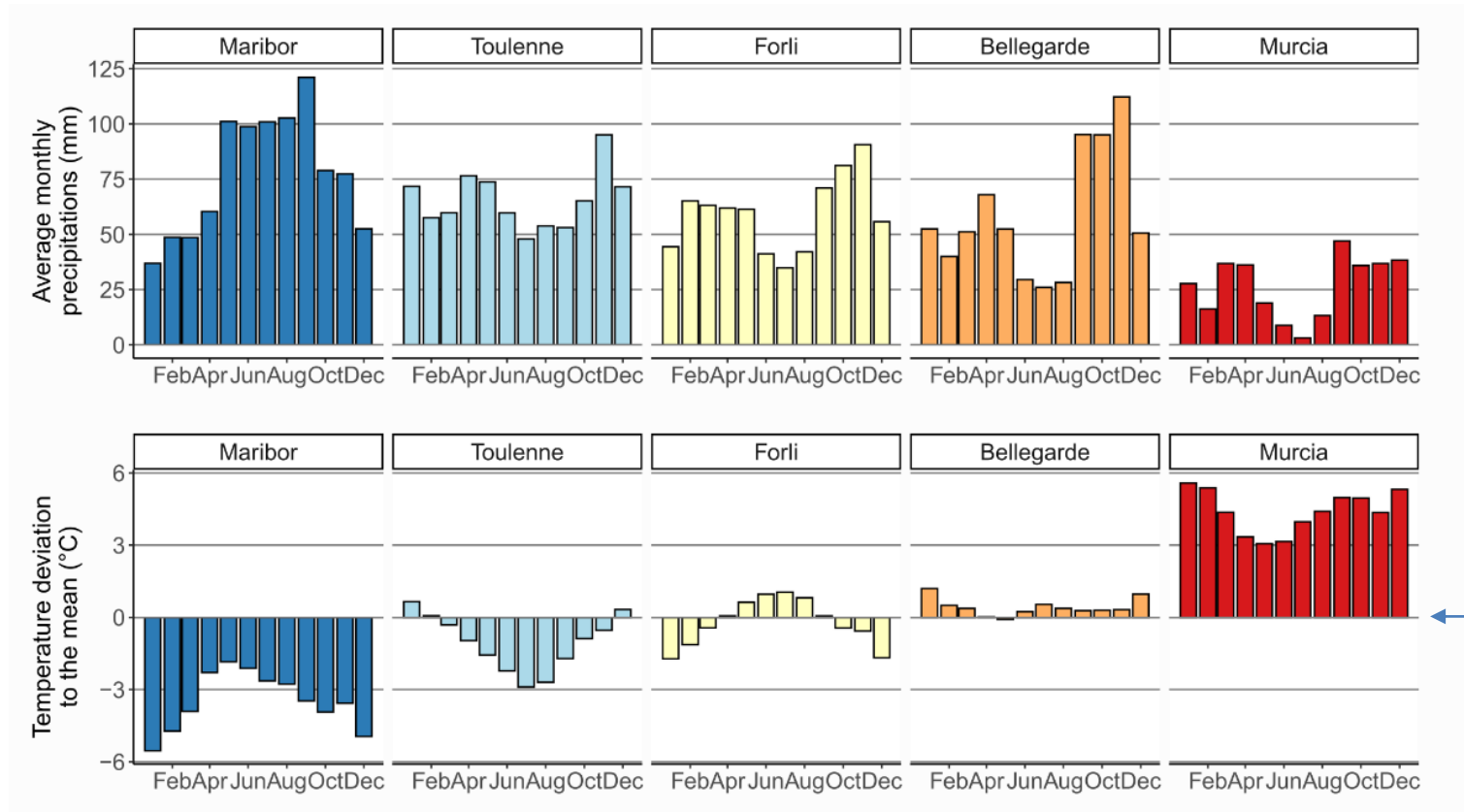
Lapins 1

PEV = 10-30%

QTL not found in other trials

Environment characterisation

1) Using weather data from 2000 to 2020 :

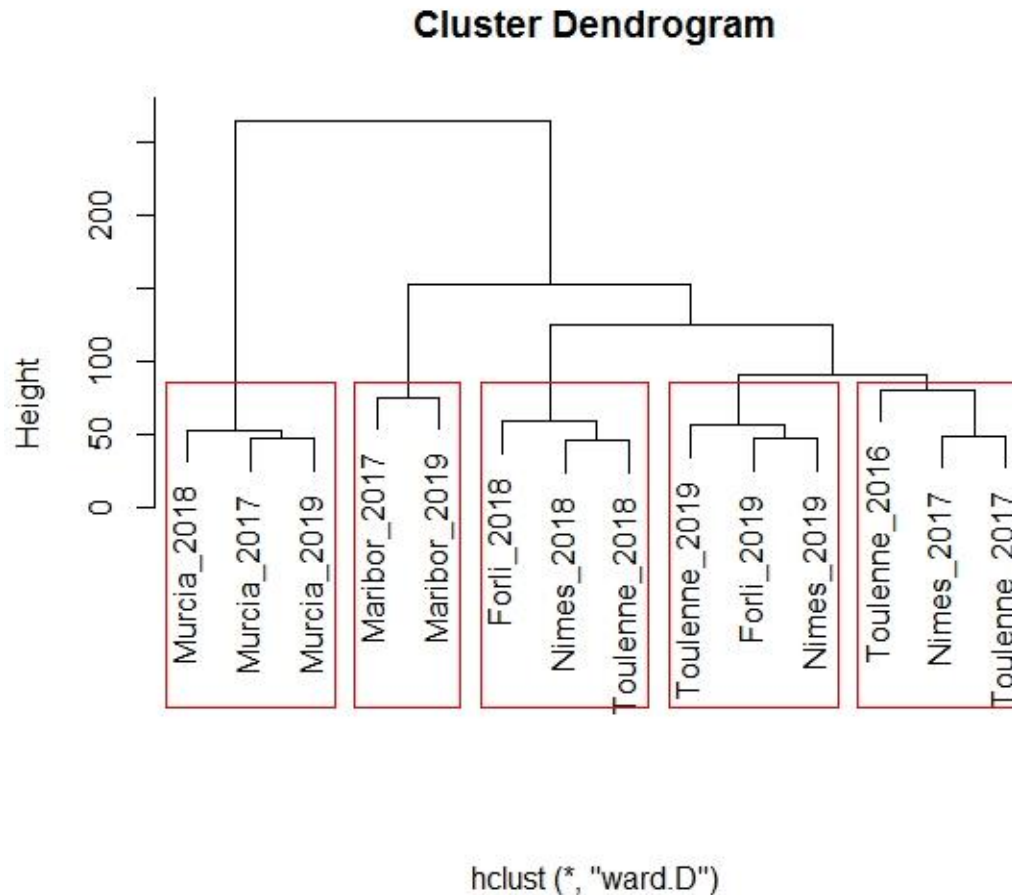


Overall mean of all 5 sites during 20 years, for each month

Maribor : the environment with the lowest temperatures.

Murcia : highest temperatures and driest conditions

2) Using weather data for the years of evaluation of flowering time

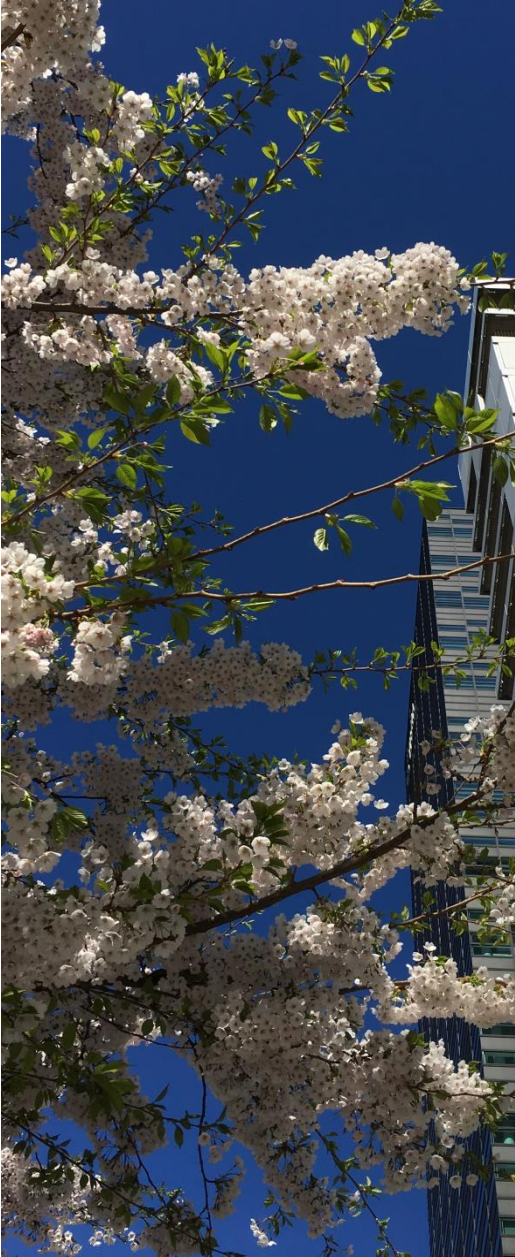


Groups : Murcia alone / Maribor alone / F+N+T 2018 / F+N+T 2019 / N+T 2017

G x E interactions

- ASReml R package
- Linear mixed models
- À continuer.





Many thanks
for your attention !

A3C team, INRAE Bordeaux

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