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ADAPTtoCLIMATE
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http://conference.adapt2clima.eu

Future projections of climatic indices relevant to agriculture for Crete, Cyprus and Sicily in the framework of ADAPT2CLIMA project

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Adaptation to Climate change Impacts on the Mediterranean islands' Agriculture

LIFE Ref. No: LIFE14 CCA/GR/000928

Project Partners

- **Coordinator:** National Observatory of Athens-Greece

- **Partners:**
  - National Technical University of Athens - Greece
  - Agricultural Research Institute - Cyprus
  - Institute of Biometeorology (IBIMET-CNR) - Italy
  - Region of Crete - Greece
  - Department of Agriculture, Rural Development and Mediterranean Fisheries, Region of Sicily, Italy

LIFE ADAPT2CLIMA Project

The overall aim of the LIFE ADAPT2CLIMA (LIFE14 CCA/GR/000928) project is to increase knowledge on the vulnerability of EU Mediterranean agriculture to climate change and to support decision making for adaptation planning

- **Duration: 53 months** (1 Oct. 2015 – 29 Feb. 2020)
- **Implementation Areas**: Crete (Greece), Cyprus, Sicily (Italy)

The islands were selected for two reasons :

- they figure among the most important cultivation areas at national level
- they exhibit similarities in terms of location (climate), size, climate change threats faced (coastal agriculture, own water resources), agricultural practices and policy relevance

Methodology: Climatic information

- **Regional Climate Models (EURO-CORDEX):**
  - MPI-ESM-LR/RCA4
  - HadGEM2-ES/RCA4
  - CNRM-CM5/RCA4
  - CNRM-CM5/ALADIN (v5.2)
- **Resolution:** ~12x12 km
- **Control period:** 1971-2000
- **Future period:** 2031-2060 (after consultation with project's stakeholders)
- **RCPs:** 4.5 and 8.5 scenarios

Methodology: Evaluation of RCMS

We also performed an evaluation of the Regional Climate Simulations against E-OBS v13 (resolution 0.22◦) for the period **1971-2000** and for the **Essential Climate Variables (Temperature and Precipitation).** The advantage of E-OBS is its spatial (entire European land surface) and temporal (1950-2012) coverage, which makes it ideal for an approximate evaluation of RCM-simulated temperature and precipitation characteristics over Europe.

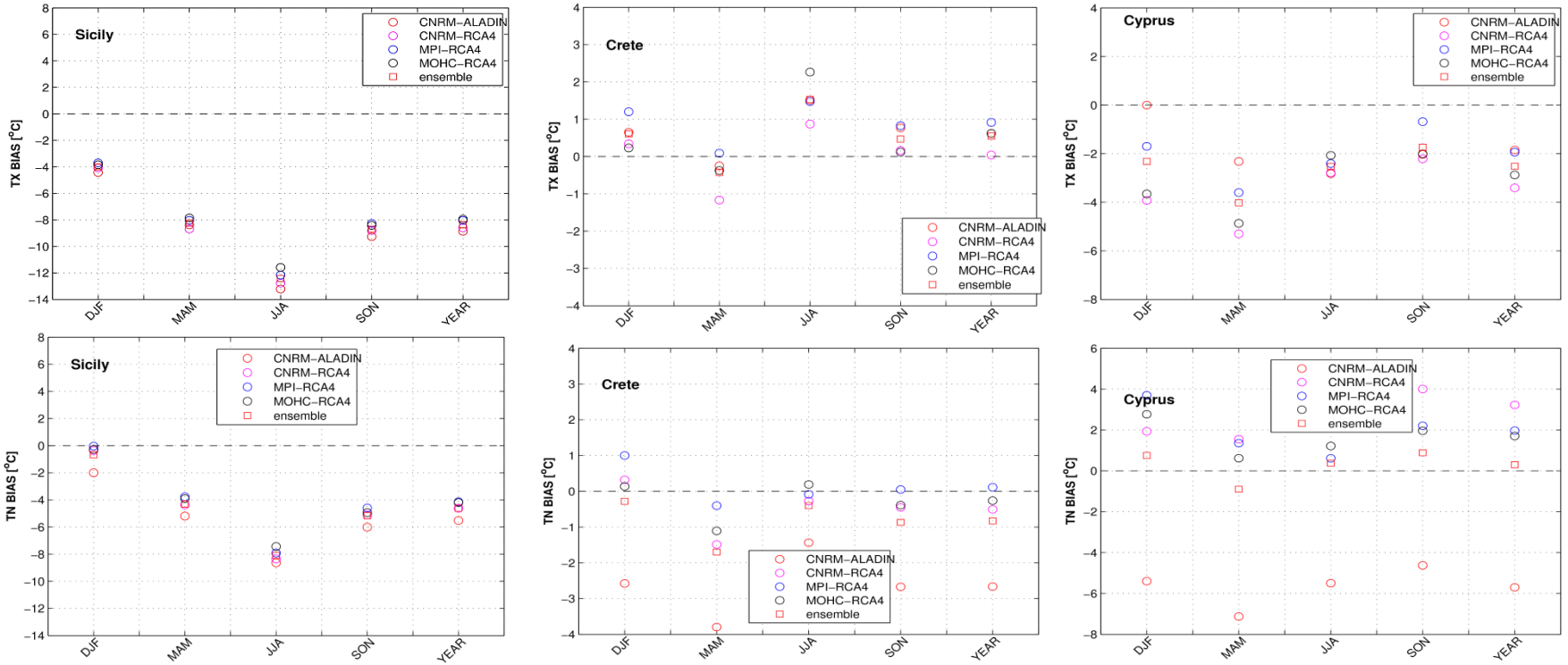
Methodology: Evaluation of RCMS

Three evaluation metrics to seasonal (**winter: DJF, spring: MAM, summer: JJA, autumn: SON**) and annual mean values of temperature (daily maximum (**TX**), daily minimum (**TN**) and **precipitation** for all experiments.

- **BIAS:** the difference (model − reference) of spatially averaged climatological annual or seasonal mean values for Sicily, Crete and Cyprus (relative difference for precipitation).
- **TCOIAV:** temporal correlation of interannual variability between model and reference time series of spatially averaged annual or seasonal mean values of a selected subregion.
- **RIAV:** ratio (model over reference) of temporal standard deviations of interannual time series of spatially averaged annual or seasonal mean values of a selected subregion.

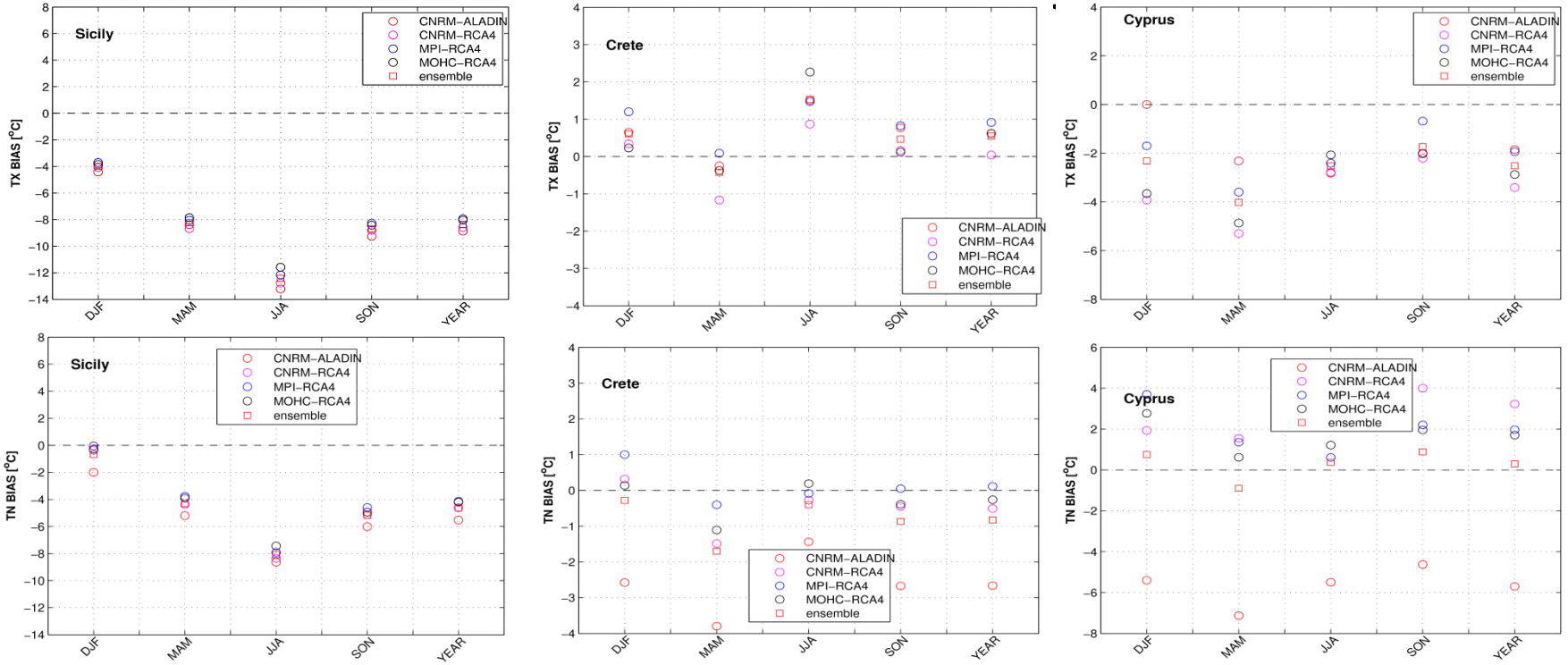
Methodology: Evaluation of RCMS (TX ,TN)

Spatial and temporal means



Sicily (left column): a cold bias for all models and all seasons is revealed for **TX**, (top row) and **TN** (bottom row) temperatures. The coldest bias is pronounced in summer (JJA) reaching about **-12 to -14 ºC** for all models while in winter (DJF) the lowest cold bias is calculated for **TX (-2 to -4 ºC)** . For **TN** the cold bias is lower for all models and is less than -2 ºC. It should be noted that the **CNRM** global climate model driven simulations are mostly located at the cold end of the model range for the examined temperatures.

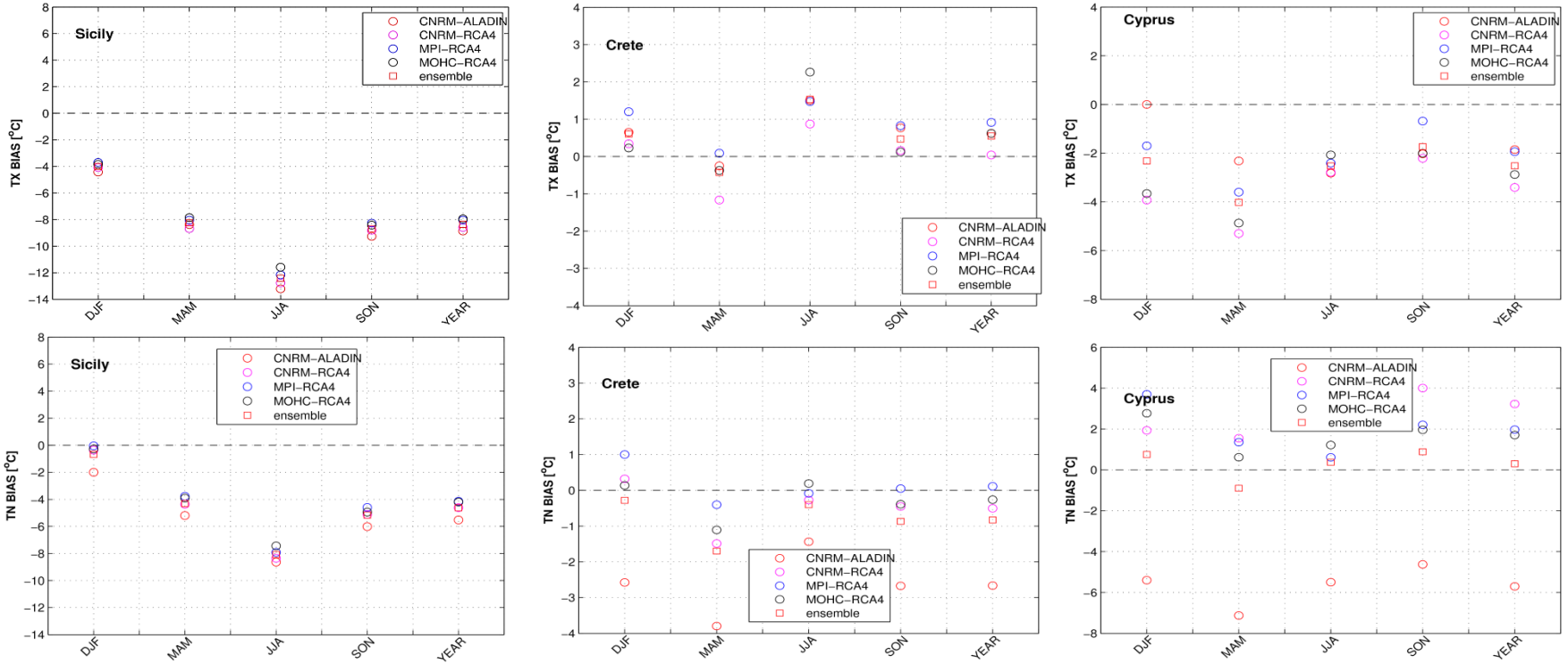
Methodology: Evaluation of RCMS (TX, TN)



Crete (middle column): The models exhibit a variable behavior with no clear pattern of a warm or a cold bias. Regarding **TX**, all models in most of seasons exhibit a warm bias less than **2 ºC** while for **TN** a cold bias is mostly pronounced for most of the models. Nevertheless, two models the **MPI-SMHI** and the **MPI-MOHC** exhibit the lowest bias whereas the **CNRM** driven simulations are the coldest in the range of the models.

Methodology: Evaluation of RCMS

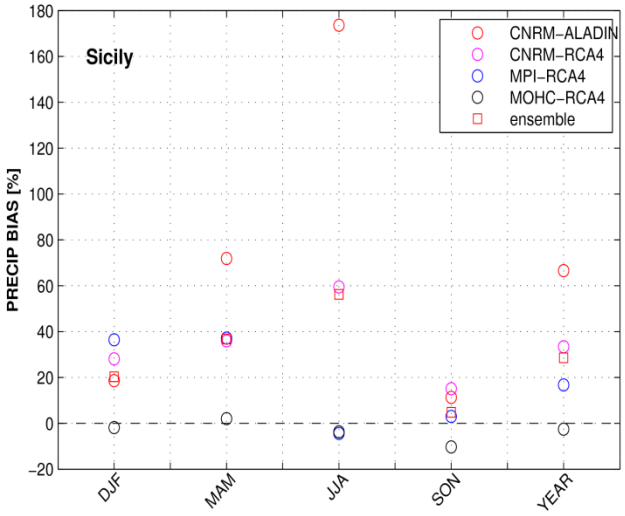
Spatial and temporal means

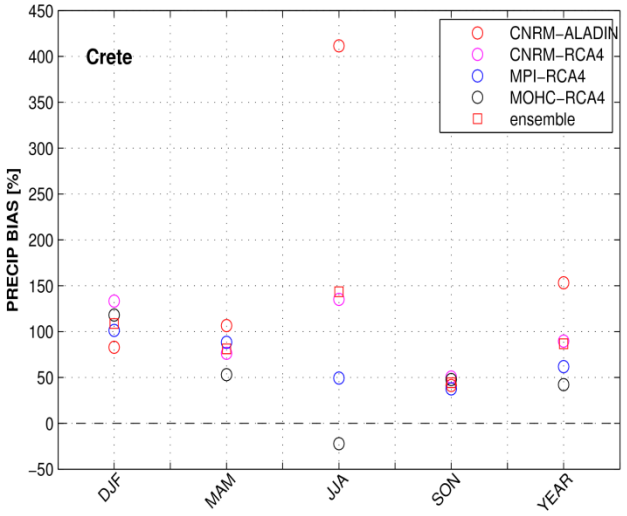


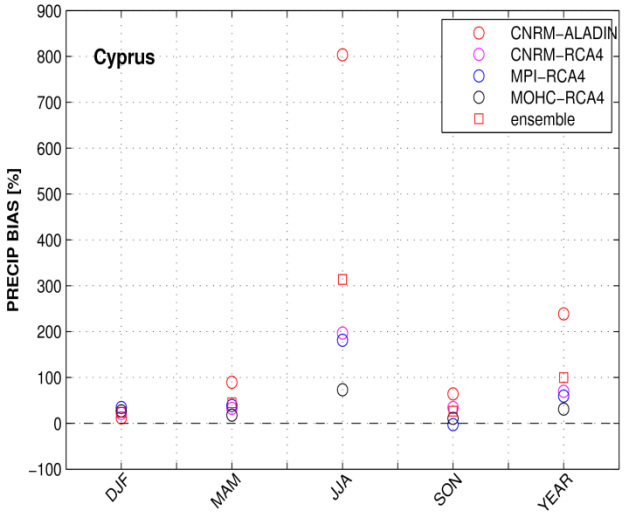
Cyprus (right) column): with the exception of the CNRM-ALADIN the rest of the models exhibit a warm bias for **TN** in the range of **0.6- 6 ºC.** The highest warm bias for **TN** in DJF and SON. As far as **TX** is concerned the models mostly exhibit a cold bias in the range of about **-1 to -5 ºC.** It should be noted again the behavior of **CNRM-ALADIN** which for all variables and for all seasons shows a systematic underestimation of the observations.

Methodology: Evaluation of RCMS (PRECIP)

Spatial and temporal means







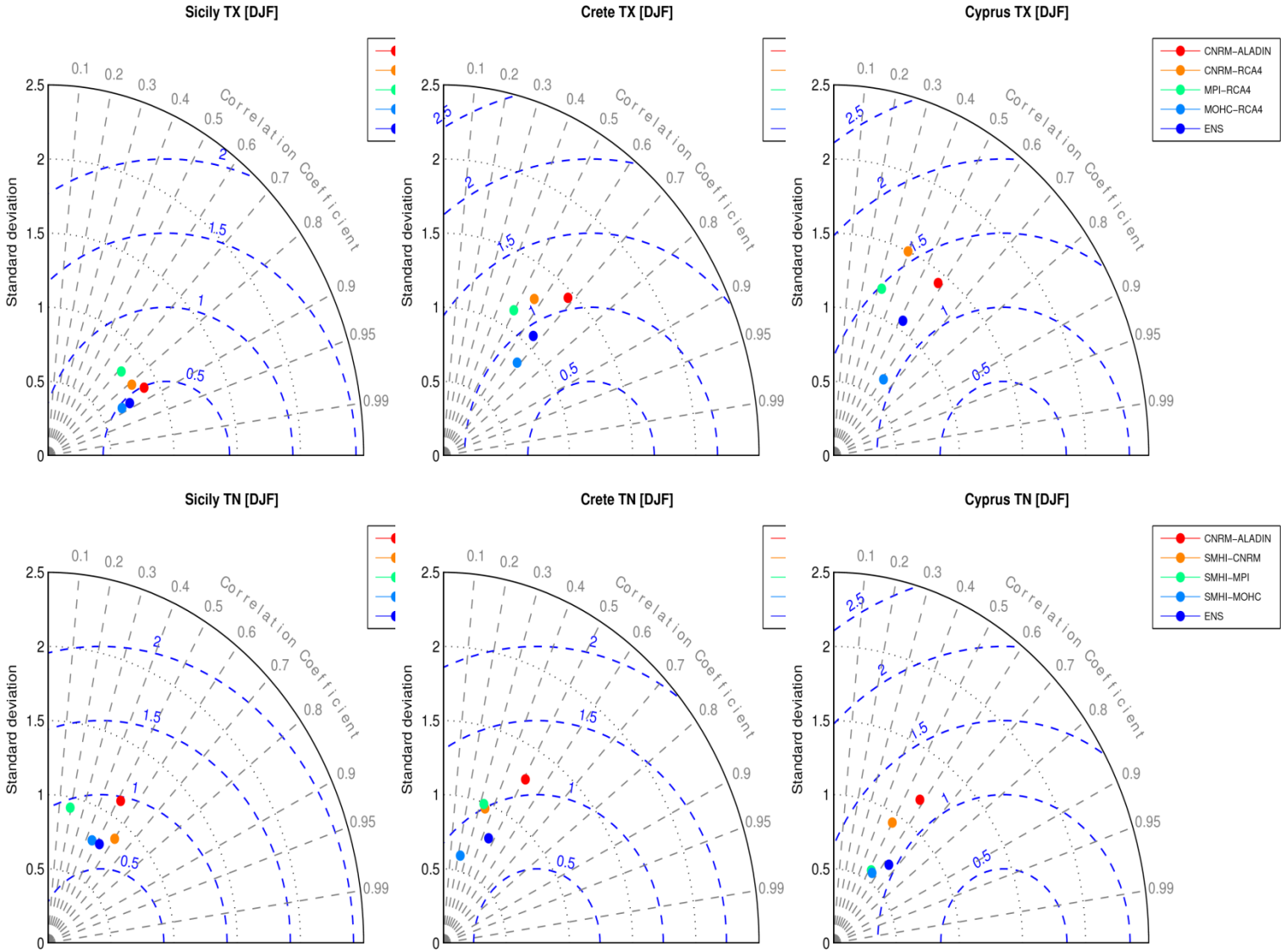
Sicily: the maximum bias for all seasons and for most of the models is less than 100% Special cases are the **CNRM-ALADIN** with an extreme positive bias in JJA and the **MOHC-RCA4** which shows the lowest biases when compared to the observed precipitation.

Crete: the bias is less 150% for most of the seasons with the models exhibiting a low spread of biases. Special case is JJA where a wider spread of bias is shown with the highest deviation from observations calculated for the **CNRM-ALADIN**.

Cyprus: the bias is less 100% for most of the seasons with the models

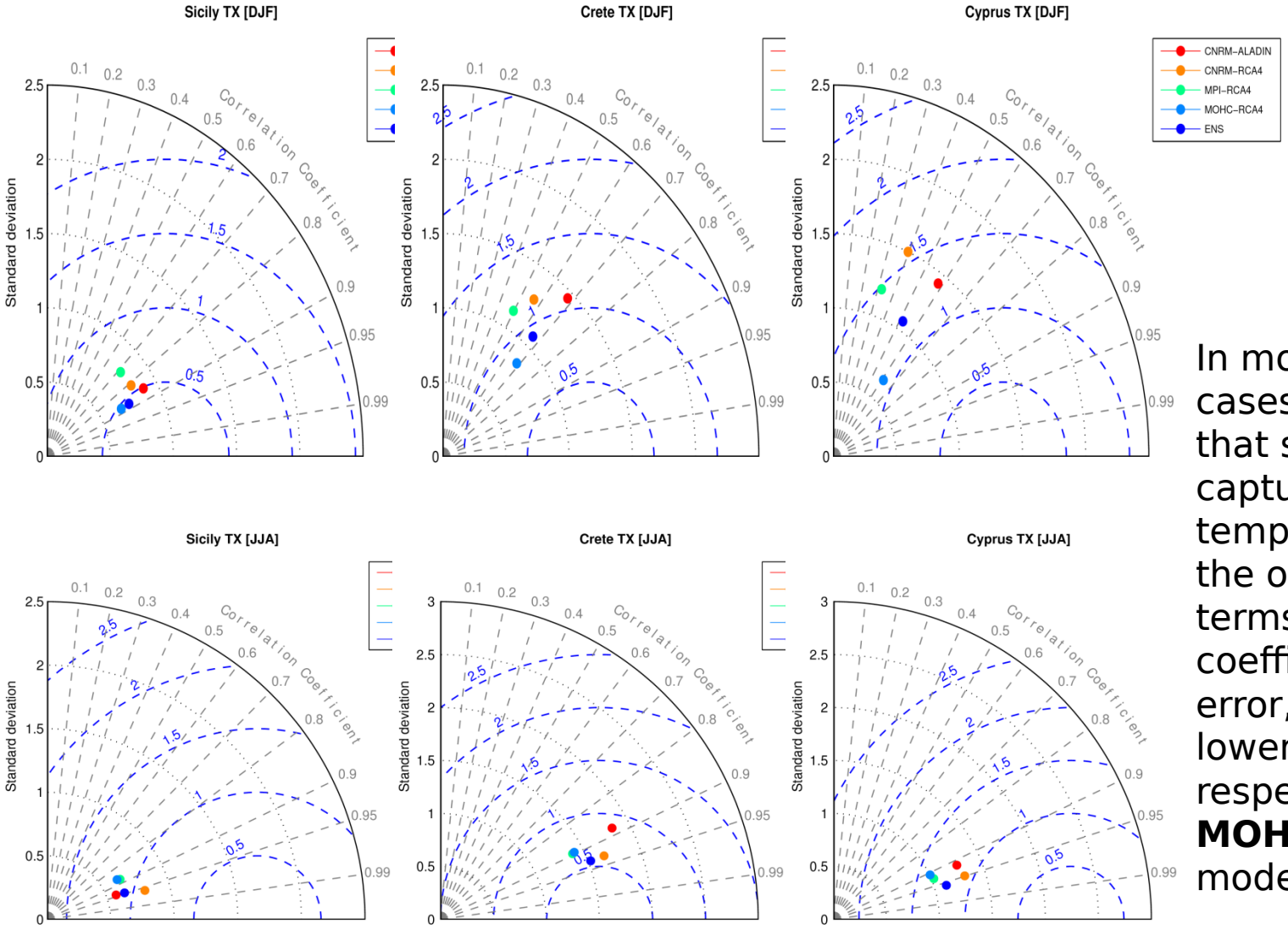
Methodology: Evaluation of RCMS (PRECIP)

Interannual variability



Methodology: Evaluation of RCMS (TX)

Interannual variability



In most of the cases the model that seems to capture better the temporal pattern of the observations in terms of correlation coefficient and RMS error, higher and lower values respectively, is the **MOHC-SMHI** model.

Climatic indicators

Maximum temperature (TX) / Minimum temperature (TN)

- Annual/seasonal TX,TN
- Monthly count of days when TX, TN
  - Wheat: TX>30°C (flowering); TN<3°C (late frost); TN<13°C (grain development)
  - Barley: TX>30°C; TN<8°C
  - Olive tree: TX>40°C; TN< -8°C, -3°C
  - Olive tree: TX>30°C (for May)
  - Grapevine: TX>30°C; TN< 0°C; TX>35°C
  - Potato: TX>25°C; TN<8°C
  - Tomato: TX>25°C; TN<8°C

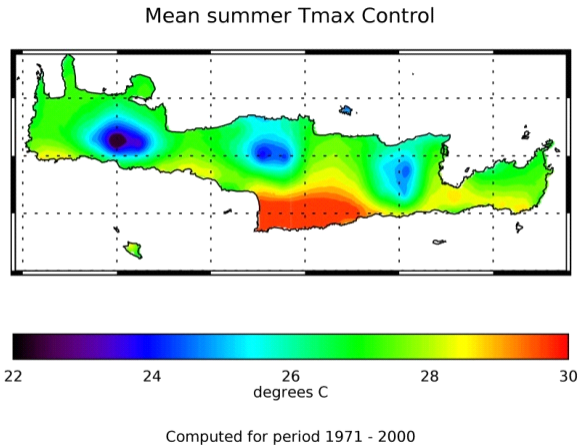
Thresholds defined in collaboration with the stakeholders

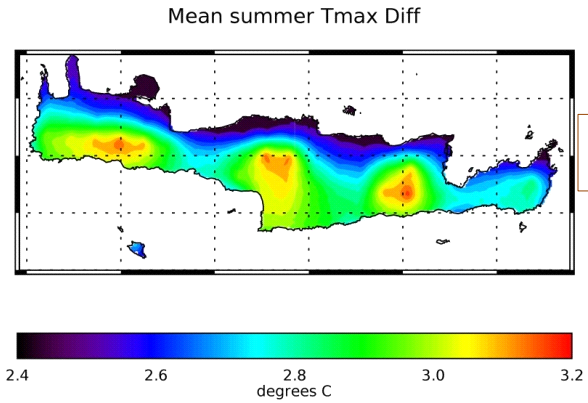
Precipitation

- Annual/seasonal total precipitation
- No of dry days

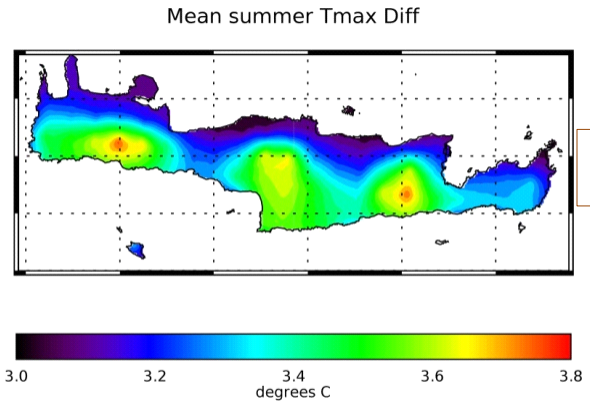
Projections for Crete

MOHC- RCA4





RCP4.5

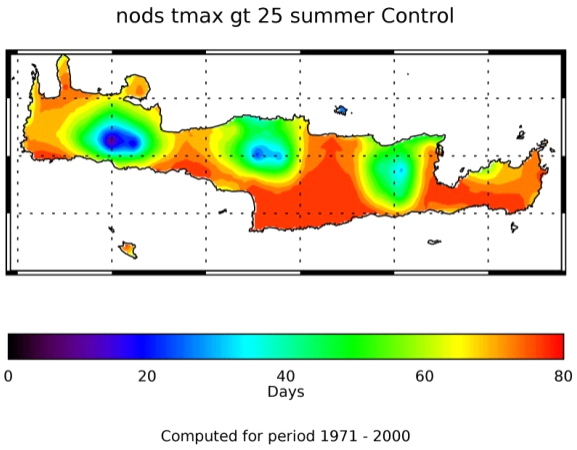


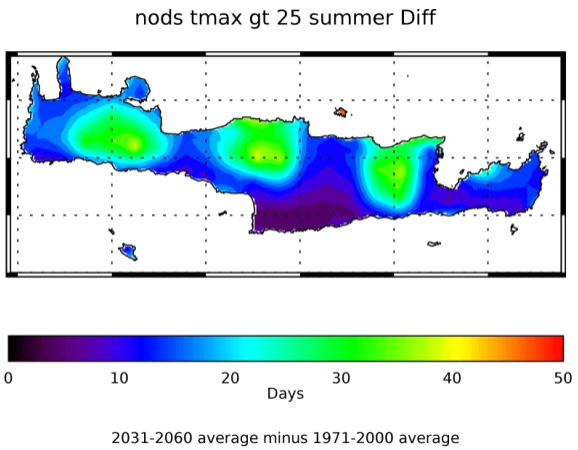
RCP8.5

Changes from 2.4-3.1°C in the northern part of the island and 2.8-3.7°C in the southern part and high elevation areas.

Projections for Crete

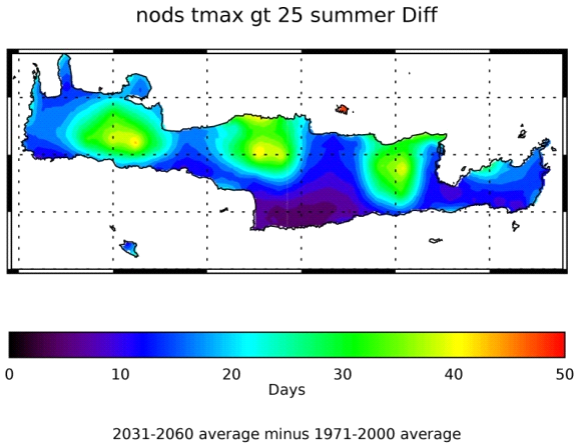
MOHC- RCA4





RCP4.5

In the future climate, high elevation areas in both future scenarios show changes up to 6 days/yr while in low elevation areas up to 15 days /year.

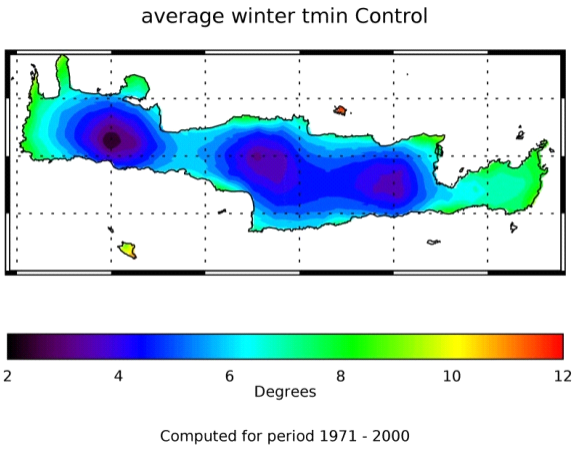


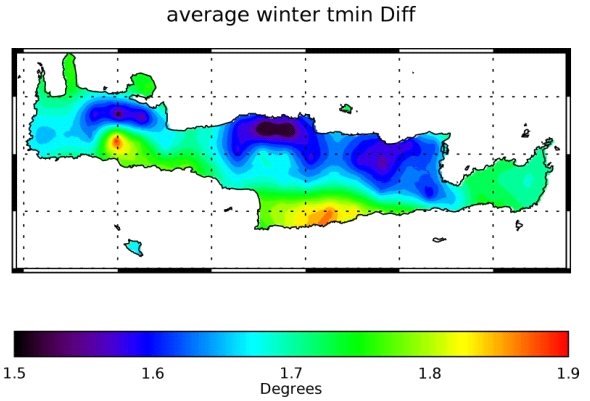
RCP8.5

Number of days with Tmax>25^{o}C related to fruit development

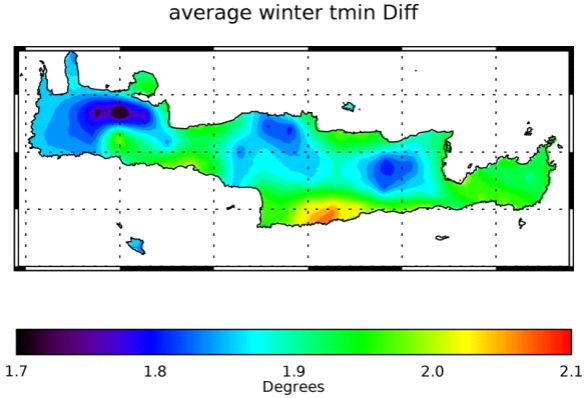
Projections for Crete

MOHC- RCA4





RCP4.5



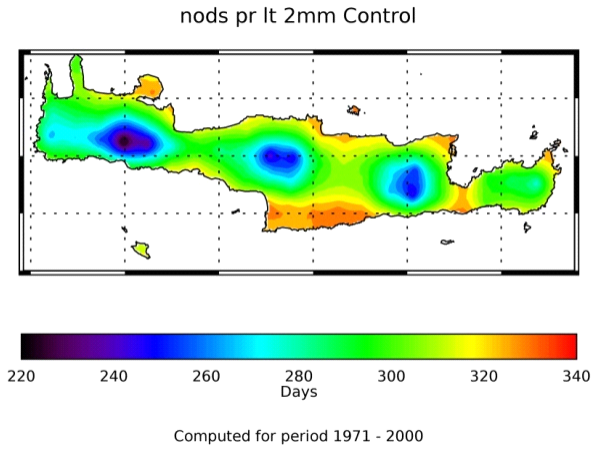
RCP8.5

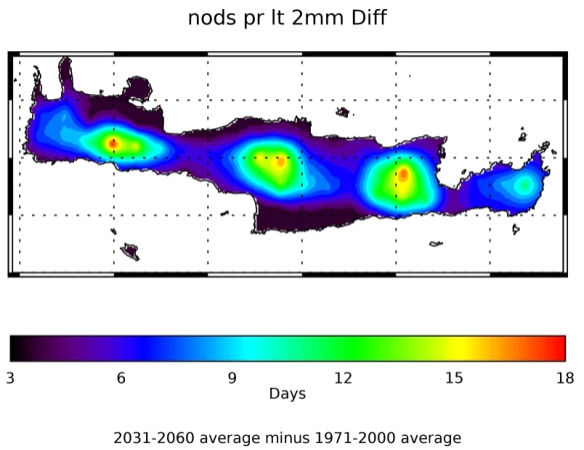
changes ranging between 1.5-1.9°C under RCP4.5 (top right) while under RCP8.5 slightly higher increases up to 2.1°C (bottom right) are predicted.

Average Winter Tmin related to plant treatment and harvest

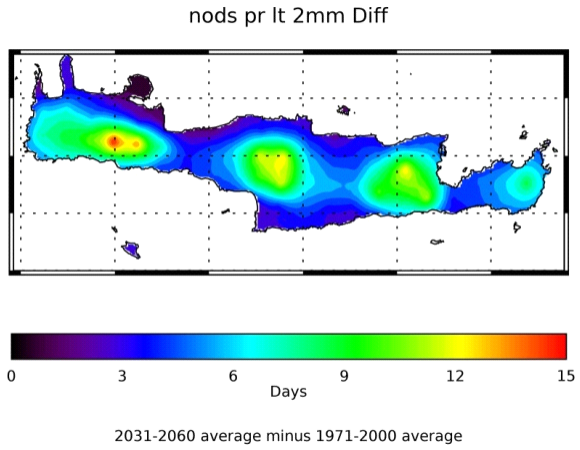
Projections for Crete

MOHC- RCA4





RCP4.5



RCP8.5

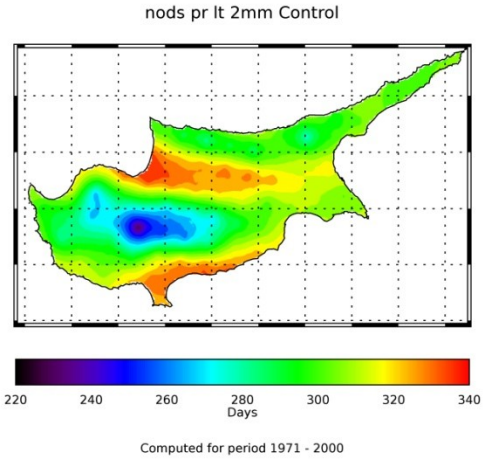
increase of 3 to 10 days/yr is shown for the RCP4.5 in low elevation areas, while higher increases between 12 to 20 days/yr are expected in high elevation areas.

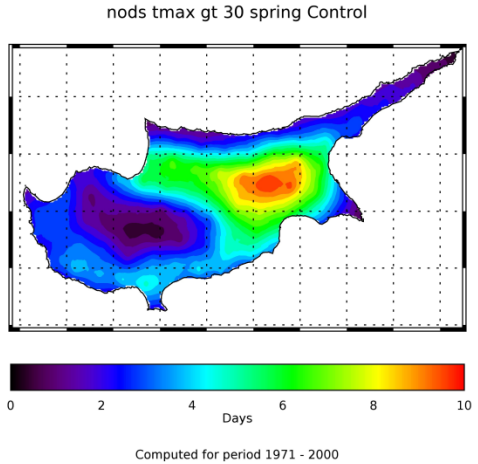
Regarding RCP8.5, the increases range from 3 to 10 days/yr in lowlands and from 8 to 24 in high elevation areas.

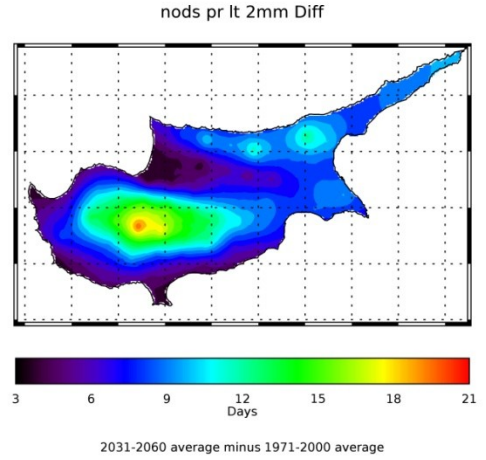
Number of dry days related to plant treatment and crop management

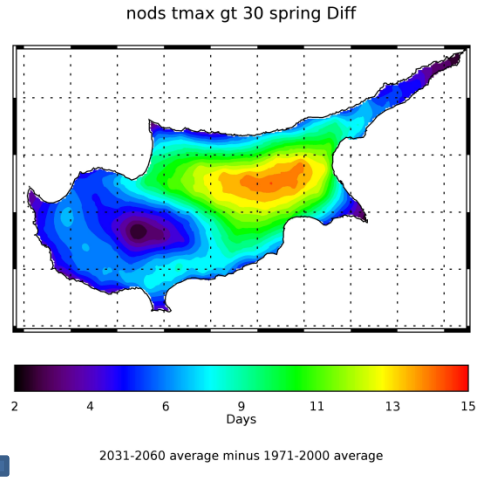
Projections for Cyprus

MOHC- RCA4 (RCP8.5)









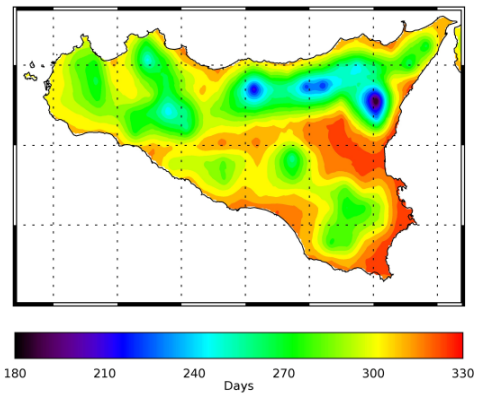
Application of plant treatments and crop management

related to fruit development (potato)

Projections for Sicily

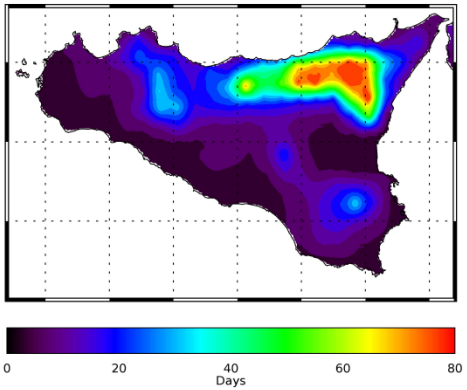
MOHC- RCA4 (RCP8.5)

nods pr lt 2mm Control



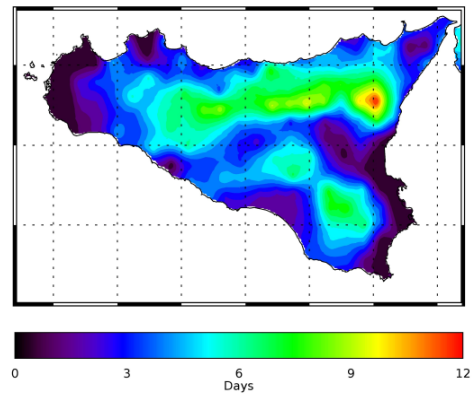
Computed for period 1971 - 2000

nods tmin lt 13 summer Control



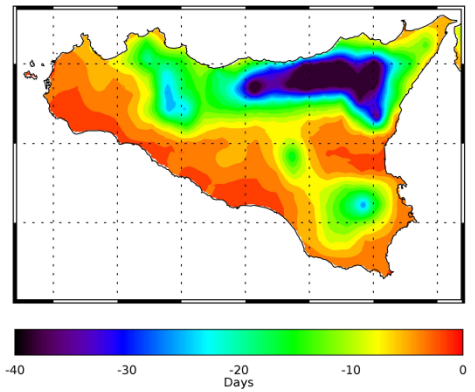
Computed for period 1971 - 2000

nods pr lt 2mm Diff



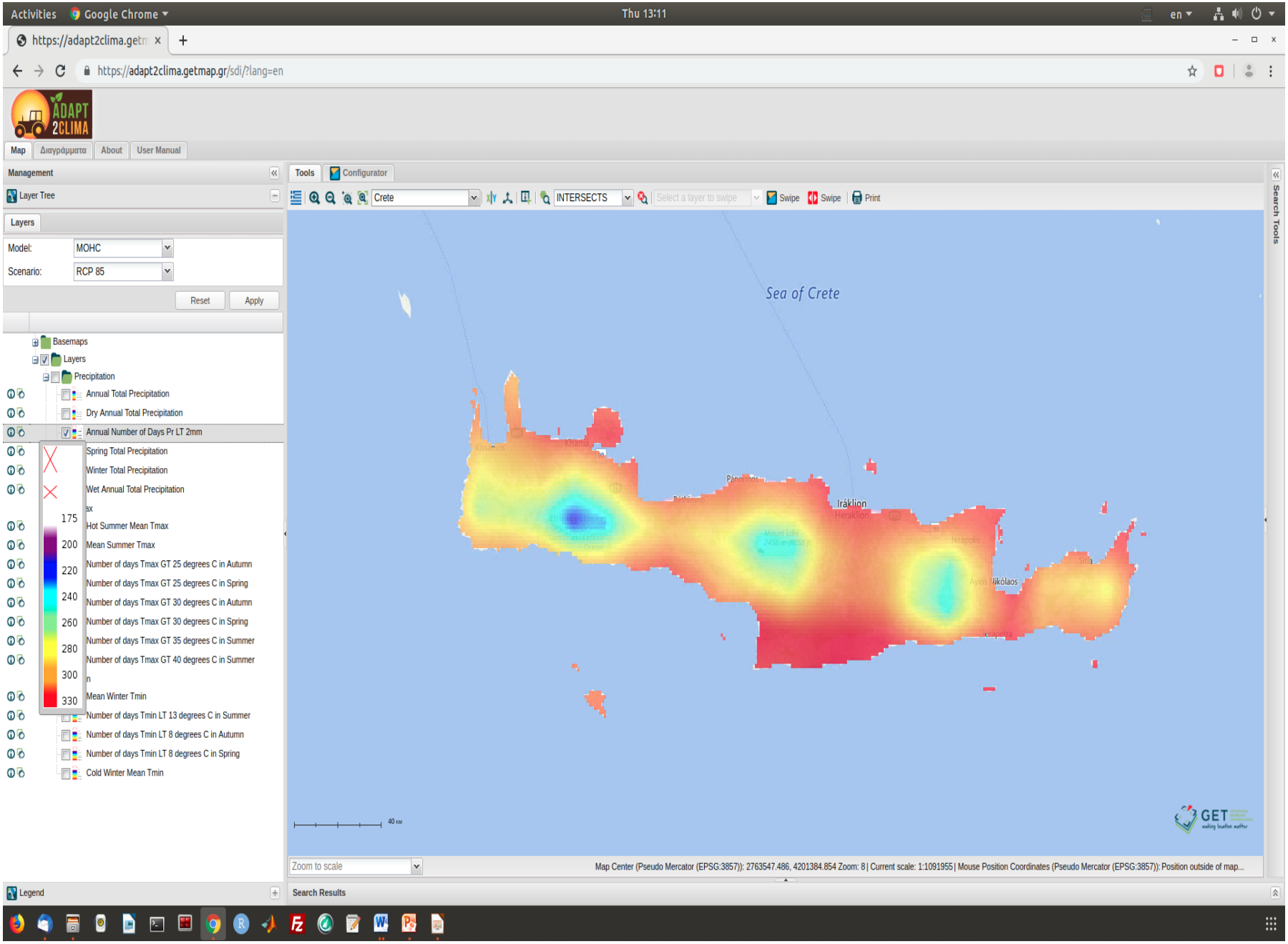
2031-2060 average minus 1971-2000 average

nods tmin lt 13 summer Diff



2031-2060 average minus 1971-2000 average

- Application of plant treatments and crop management
- related to grain development (wheat)


Activities
Google Chrome
Thu 13:11
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https://adapt2clima.getm
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ADAPT 2CLIMA
Map
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About
User Manual
Management
Layer Tree
Layers
Model:
MOHC
Scenario:
RCP 85
Reset
Apply
Basemaps
Layers
Precipitation
Annual Total Precipitation
Dry Annual Total Precipitation
Annual Number of Days Pr LT 2mm
Spring Total Precipitation
Winter Total Precipitation
Wet Annual Total Precipitation
175
200
220
240
260
280
300
330
Hot Summer Mean Tmax
Mean Summer Tmax
Number of days Tmax GT 25 degrees C in Autumn
Number of days Tmax GT 25 degrees C in Spring
Number of days Tmax GT 30 degrees C in Autumn
Number of days Tmax GT 30 degrees C in Spring
Number of days Tmax GT 35 degrees C in Summer
Number of days Tmax GT 40 degrees C in Summer
Mean Winter Tmin
Number of days Tmin LT 13 degrees C in Summer
Number of days Tmin LT 8 degrees C in Autumn
Number of days Tmin LT 8 degrees C in Spring
Cold Winter Mean Tmin
Legend
Tools
Configurator
Crete
INTERSECTS
Select a layer to swipe
Swipe
Swipe
Print
Search Tools
Sea of Crete
Khania
Iráklion
Heraklion
Neápolis
Ayios Nikólaos
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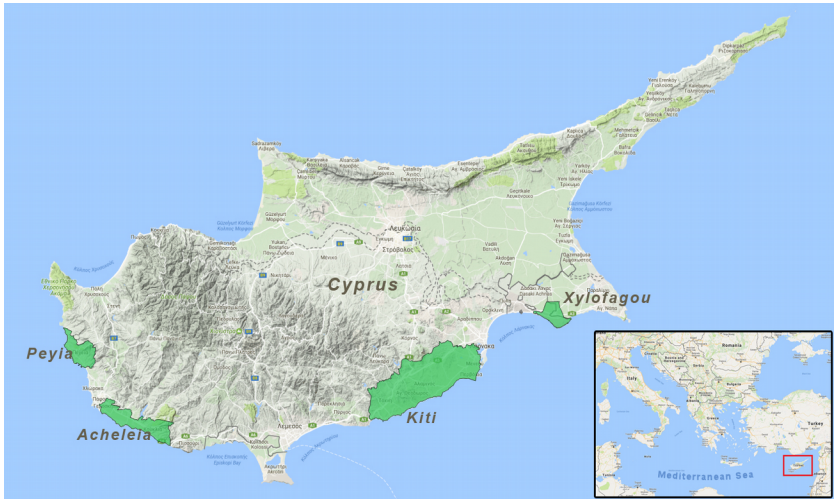
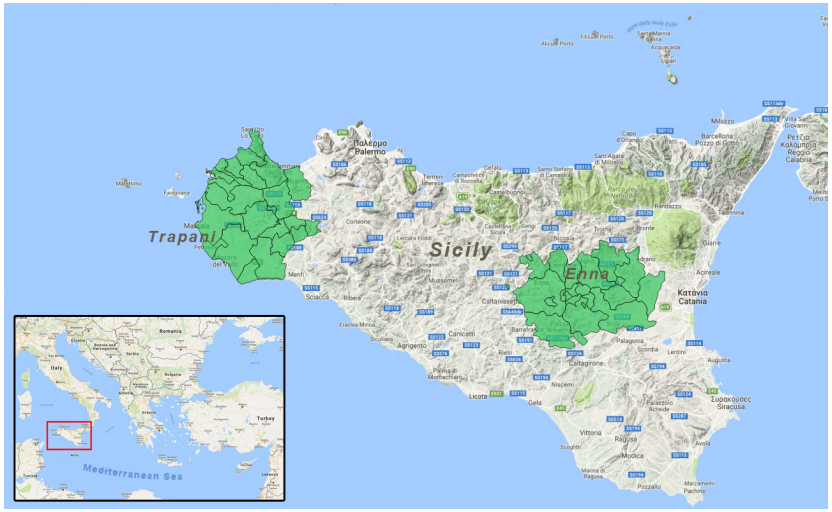
Zoom to scale
Map Center (Pseudo Mercator (EPSG:3857)): 2763547.486, 4201384.854 Zoom: 8 | Current scale: 1:1091955 | Mouse Position Coordinates (Pseudo Mercator (EPSG:3857)): Position outside of map...
Search Results

Pilot Areas



Crops
- olive trees
- vineyards
- wheat/barley
- potatoes



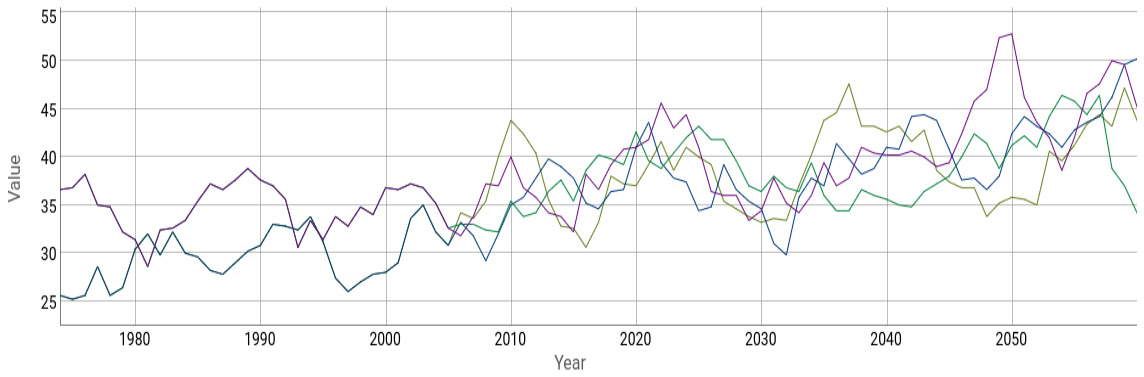
Crops
- vineyards
- wheat

Crops
- olive trees
- vineyards
- tomatoes

ADAPT 2CLIMA

Please select the following parameters for an interactive representation of the climatic variable.

Select Region:	Select Area:	Select Parameter Category:	Select Parameter:	
Crete	Messara	TMAX	number of days Tmax GT 25 degree...	Submit



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1	2059	47.2	49.6	37	49.6
2	2058	43.2	46.2	38.8	50
3	2057	44.4	44.2	46.4	47.6
4	2056	43.4	43.6	44.4	46.6
5	2055	41.2	42.8	45.8	42
6	2054	39.6	41	46.4	38.6
7	2053	40.6	42.4	44.2	42