# EGU2017-950: ASSESSMENT OF FUTURE EXTREME CLIMATE EVENTS OVER THE PORTO WINE REGION


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## BACKGROUND

The Douro Demarcated Region (DDR) is a wine region, in the northern Portugal, recognized for the Port wine, which is responsible for more than 60% of the total value of national wine exportations.

Since the viticulture is highly dependent on weather/climate patterns, the global warming is expected to affect the areas suitable to the growth of a certain variety of grape, its production and quality. The climatology of the DDR region determines the more suitable wine variety to be produced while climate variability affects the annual productivity and quality of the grape harvest.

## GOALS

Our study investigates changes in the extreme climate events in the future model runs, through a set of climate change indicators defined by the WRCP's Expert Team in Climate Change Detection and Indices. We also explore heatwaves and their properties (duration, intensity and recovery factor).


## ACKNOWLEDGMENTS

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## 1. MODEL SET-UP

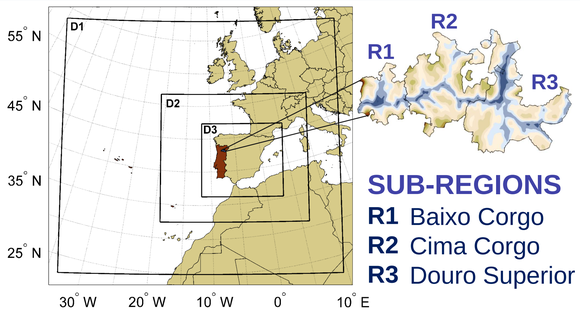
### MODEL SET-UP CONFIGURATION

| | |
|---|---|
| **Model** | WRF v3.5.1 model |
| **Forcing model** | MPI-ESM-LR |
| **Nested domains** | 3 |
| **Spatial resolution** | 81 km > 27 km > 9 km |
| **Temporal resolution** | 3 h |
| **Emission scenario** | RCP8.5 |

### MODELING PERIOD

| | |
|---|---|
| **Reference** | 1986-2005 |
| **Mid-future** | 2046-2065 |
| **Long-future** | 2081-2100 |

## 2. DOURO REGION




**SUB-REGIONS**

**R1** Baixo Corgo
**R2** Cima Corgo
**R3** Douro Superior

**Figure 1.** Location of Douro Demarcated region (DDR) and its sub-regions.

## 3. METHODOLOGY

### CLIMATE CHANGE INDICES (ETCCDI)

| | |
|---|---|
| **FD** | Number of frost days (Tmin<0ºC) |
| **SU25** | Number of summer days (Tmax>25ºC) |
| **CDD** | Maximum length of dry spell (precip<1mm) |
| **CWD** | Maximum length of wet spell (precip≥1mm) |

### HEAT WAVES AND COLD SPELLS

| | |
|---|---|
| **Daily threshold** | Climatological 90$^{th}$ (10$^{th}$) percentile of daily Tmax (Tmin) |
| **Duration** | ≥3 days |
| **Intensity** | HW=\|Daily threshold-Tmax\| & CS=\|Daily threshold-Tmin\| |
| **Recovery Factor** | Tmax-Tmin |

## 4. RESULTS AND DISCUSSION

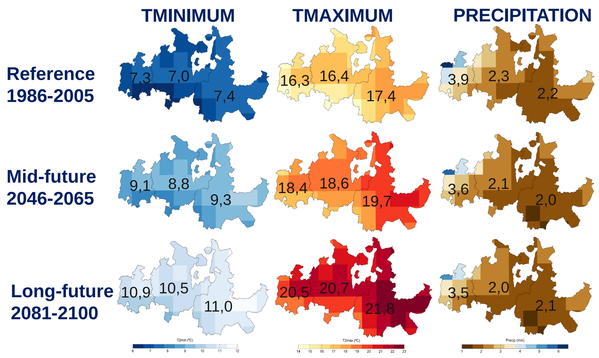



**Figure 2.** Daily mean minimum and maximum temperature (ºC), and precipitation (mm) for the reference, mid- and long-future periods for the DDR and the sub-regions.

| | | FD | SU25 | CWD | CDD |
|---|---|---|---|---|---|
| **Growing Season** | | | | | |
| Baixo Corgo | 1986-2005 | 4 | 56 | 8 | 30 |
| | 2046-2065 | -83 | 49 | -8 | 28 |
| | 2081-2100 | -95 | 88 | 0 | 52 |
| Cima Corgo | 1986-2005 | 7 | 60 | 7 | 33 |
| | 2046-2065 | -73 | 48 | -19 | 20 |
| | 2081-2100 | -87 | 82 | -6 | 48 |
| Douro Superior | 1986-2005 | 6 | 74 | 7 | 31 |
| | 2046-2065 | -71 | 39 | -19 | 18 |
| | 2081-2100 | -88 | 60 | -11 | 43 |
| **Dormancy Season** | | | | | |
| Baixo Corgo | 1986-2005 | 16 | 2 | 15 | 17 |
| | 2046-2065 | -65 | 110 | -10 | -1 |
| | 2081-2100 | -91 | 499 | -9 | 20 |
| Cima Corgo | 1986-2005 | 21 | 2 | 10 | 18 |
| | 2046-2065 | -58 | 100 | -1 | -1 |
| | 2081-2100 | -84 | 527 | 7 | 17 |
| Douro Superior | 1986-2005 | 23 | 2 | 11 | 18 |
| | 2046-2065 | -57 | 122 | -10 | 1 |
| | 2081-2100 | -82 | 445 | -2 | 12 |

**Figure 3.** Climate change indicators for the reference (days), mid- and long-future periods (%) for the sub-regions of DDR for the growing (1$^{st}$ March to 30$^{th}$ September) and dormancy season (1$^{st}$ October to 28$^{th}$ February).

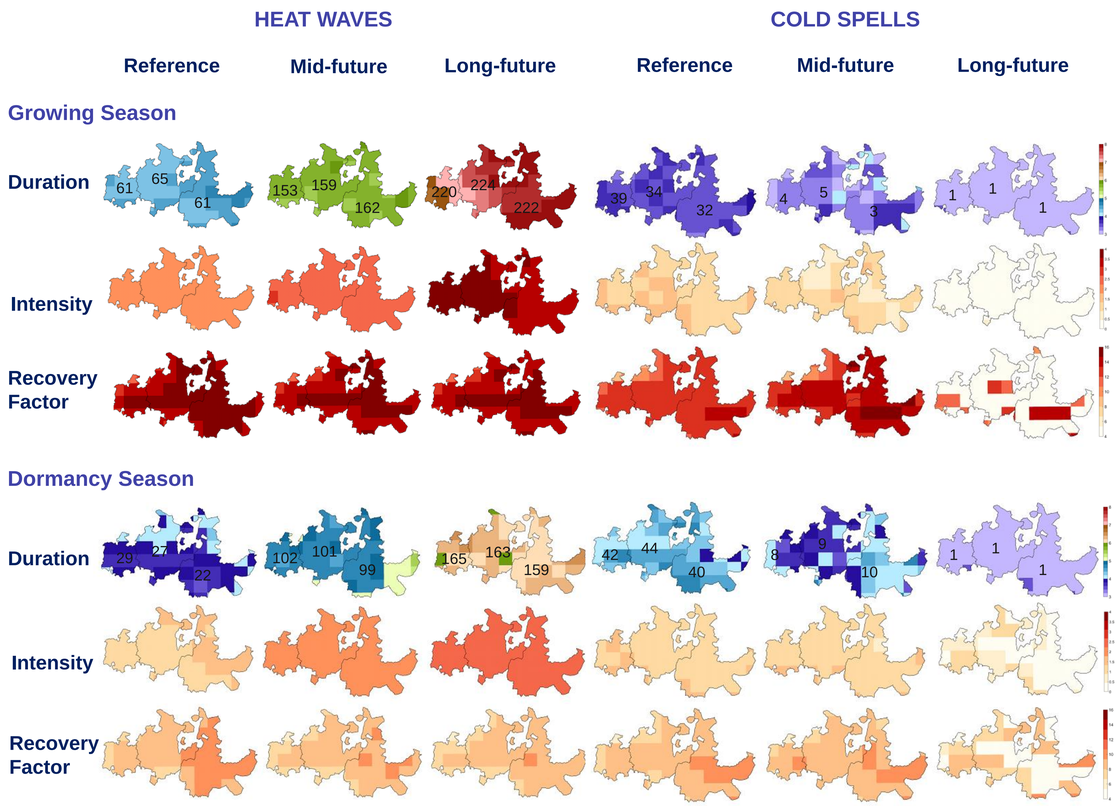



**Figure 4.** Mean duration, intensity and recovery factor (coloured) and number of heat waves and cold spells for the reference, mid- and long-future periods for the DDR for the growing (1$^{st}$ March to 30$^{th}$ September) and dormancy season (1$^{st}$ October to 28$^{th}$ February).

### CLIMATOLOGY

**Background:**

- Increase of Tmaximum from R1 to R3
- Decrease of precipitation from R1 to R3

**Future climate change:**

- Increase of Tminimum
- Increase of Tmaximum
- Decrease precipitation

### EXTREME EVENTS

**Climate change indices:**

- Decrease of FD
- Increase of SU25
- Decrease of CWD
- Increase of CDD

**Heat Waves:**

- Increase of duration
- Increase of intensity
- Similar recovery factor

**Cold Spells:**

- Decrease of duration
- Decrease of intensity
- Decrease of recovery factor

The DDR will have increased climatic stress and vulnerability of wine varieties and production.

## 5. REFERENCES


Russo, S *et al.* 2014. Magnitude of extreme heat waves in present climate and their projection in a warming world. *J. Geophys. Res. Atmos.* 119(22): 500-512. doi:10.1002/2014JD022098

www.ecad.eu/indicesextremes/indicesdictionary.php