ADAPTACLIMA - Adaptation to the effects from climate change in the AVE

António Bento Gonçalves[a]*, António Vieira[a], Flora Leite[b], José Martins[c], Domingos Silva[c], Vera Soares[c]

[a] Centro de Estudos em Geografia e Ordenamento do Território (CEGOT), Núcleo de Investigação em Geografia e Planeamento (NIGP), Departamento de Geografia, Minho University, Campus de Azurém, 4800-058 Guimarães (Portugal);
[b] Centro de Estudos em Geografia e Ordenamento do Território (CEGOT), Núcleo de Investigação em Geografia e Planeamento (NIGP), Departamento de Geografia (Ph.D. Student), Minho University, Campus de Azurém, 4800-058 Guimarães (Portugal);
[c] AMAVE Associação de Municípios do Vale do Ave.
* bento@geografia.uminho.pt

Key-words: Ave, Forest fires, climate change, temperature, rain.

Introduction and objectives

There is a wide array of studies and evidence that climate is changing and these changes will manifest themselves very differently in different areas of the planet.

The project "ADAPTACLIMA - Adaptation to the effects from climate change" (InterReg Sudoe) is based on the preparation of a series of studies on forecasting and analysing the vulnerabilities and potentialities in Southeast European territories, with the aim of creating a collaborative network of stable institutions permitting both the transmission of knowledge and exchange of experiences among members of the partnership as well as mutual learning and co-generation of new knowledge. The fundamental task of the network will be the preparation of a Plan for Adaptation to Climate Change in Space SUDOE, that can be implemented in the participating areas. Among the challenges facing SUDOE to combat climate change, two of them represent the strategic objectives of the project ADAPTACLIMA: on the one hand, the alert the populations of the SUDOE space to the real consequences of climate change; and, secondly, to promote and develop measures which will help adapt society to future scenarios derived from these changes.

In the northwest of Portugal and in particular in AVE region, one of the main impacts expected from climate change is an increase in number and size of fires and their recurrence.

As a consequence, an increase of the erosion of the top soil layer, where the only nutrients available are located in most Portuguese soils, is expected (Bento Gonçalves et al., 2008).

Methodology

Under the project ADAPTACLIMA, we proceeded assess the magnitude of climate change on various regions of South-western Europe, including the AVE and use the results of project PRUDENCE (http://prudence.dmi.dk) containing a series of climate change projections for Europe with a horizontal resolution of about 50 km.

These projections were made by different institutions using different meteorological European regional climate models based on global model HadAM3H, which is one of the global models used in IPCC (Intergovernmental Panel on Climate Change) and one that offers better results for the current climate.

Thus, for each of the regional model we obtained a projection for the period 2071-2100 and a control simulation for the period 1961-1990, which served as the basis for the simulation.

Following this preliminary analysis, a more detailed analysis for the region of AVE was carried out, taking into account the meteorological stations deployed in the north-western Portuguese territory.

With no weather stations in AVE, we chose the three closest: Porto (Pedras Rubras), Braga and Montalegre, having analyzed the series of maximum, minimum and average temperature, and precipitation (total) of the three stations mentioned above, located in Northwest Portugal (figure 1, TABLE I, II), during a 39 year period (1970-2009), in order to identify and quantify the major trends.

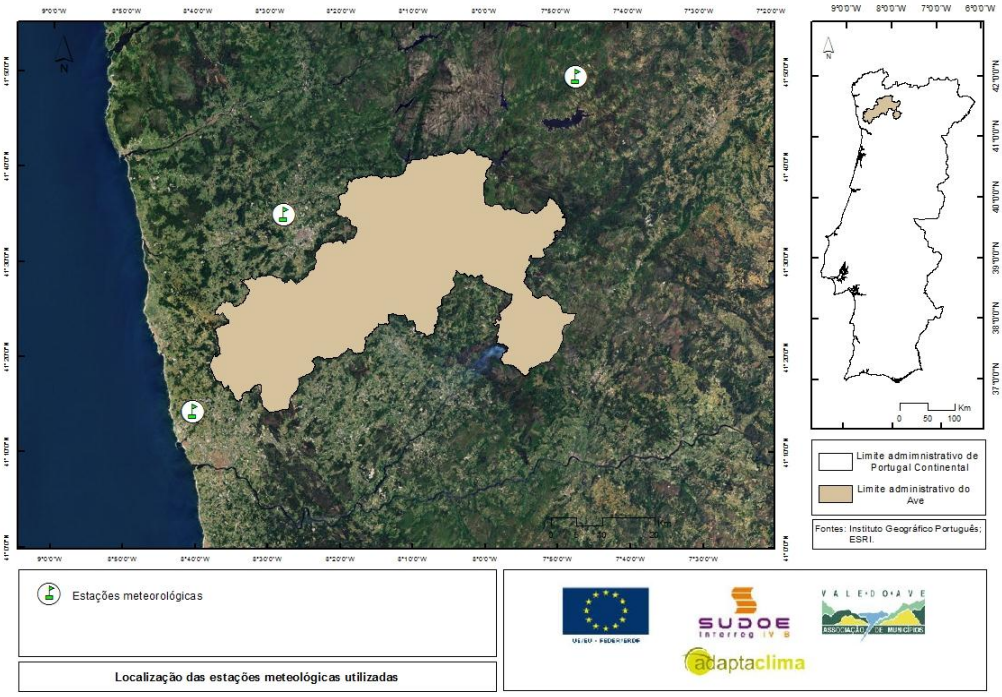


Figure 1. Weather stations

Table I. Weather stations used for temperature

	Station	Inicial year	Final year	Type of station
1	Braga (Posto Agrário)	1970	2006	Manual
1	Braga (Merelim)	2007	2009	Automatic
2	Montalegre	1970	1999	Manual
2	Montalegre	2000	2009	Automatic
3	Porto/Pedras Rubras	1970	1998	Manual
3	Pedras Rubras	1999	2009	Automática

Source: Consellería de Medio Ambiente Territorio e Infraestruturas. MeteoGalicia.

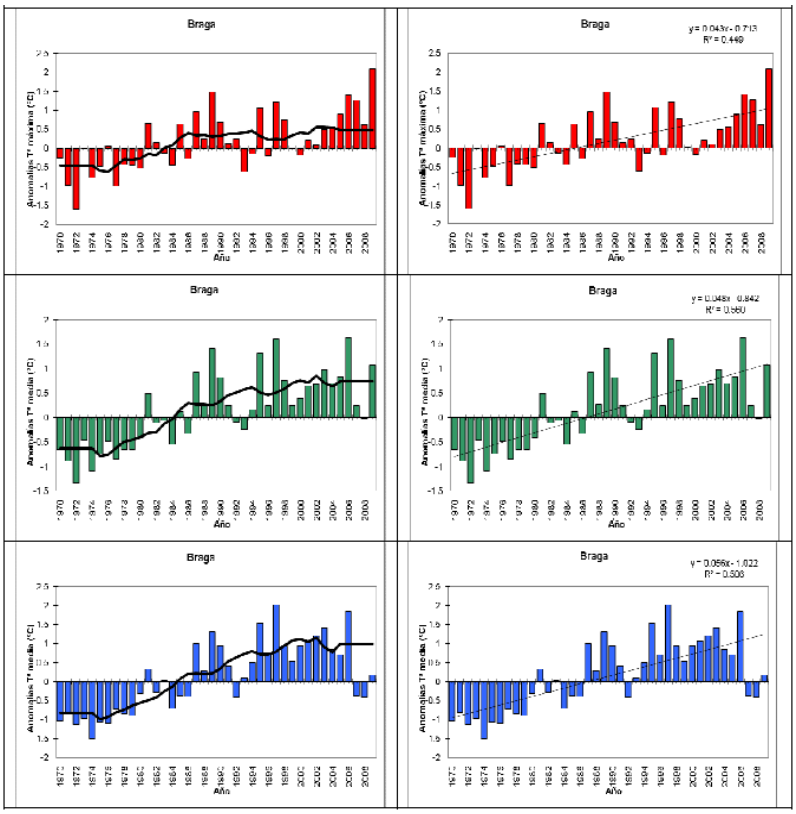
Table II. Weather stations used for rainfall

	Station	Inicial year	Final year	Type of station
1	Braga (Posto Agrário)	1970	2006	Manual
1	Braga (Merelim)	2007	2009	Automatic
2	Montalegre	1970	2009	Manual
3	Porto/Pedras Rubras	1970	2009	Manual

Source: Consellería de Medio Ambiente Territorio e Infraestruturas. MeteoGalicia.

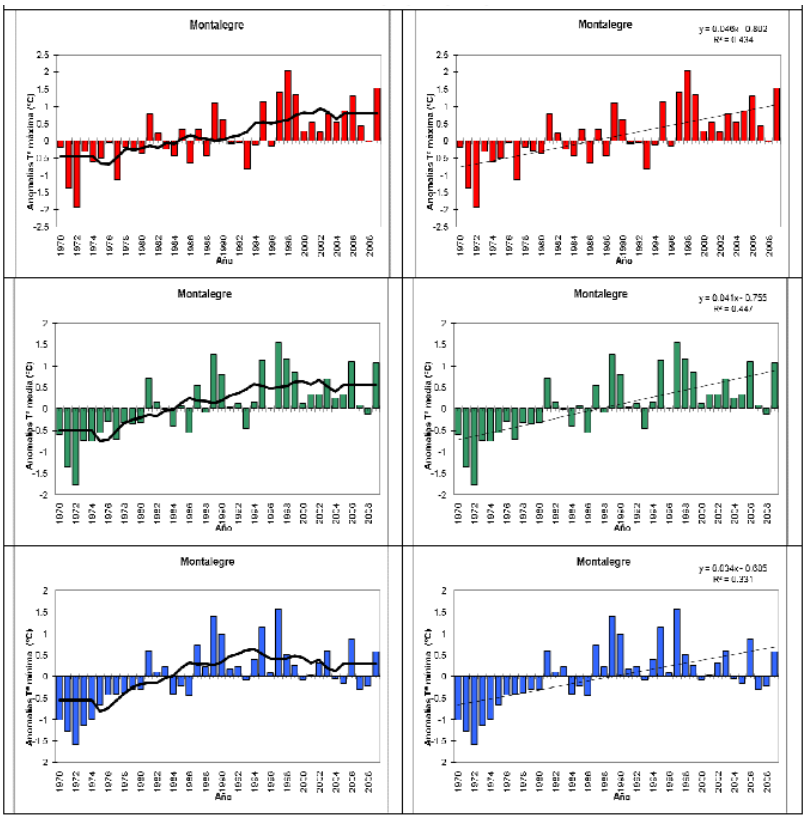
Results and conclusions

Annually, an increase of maximum temperature, minimum and average of around 0.5 º C/decade is observed for the series of Braga and Montalegre (Figure 2, 3). For the series of P. Rubras, there is an increase of 0.5º C/decade in average and minimum temperature, and 0.2ºC/decade for the maximum temperature (Figure 4).

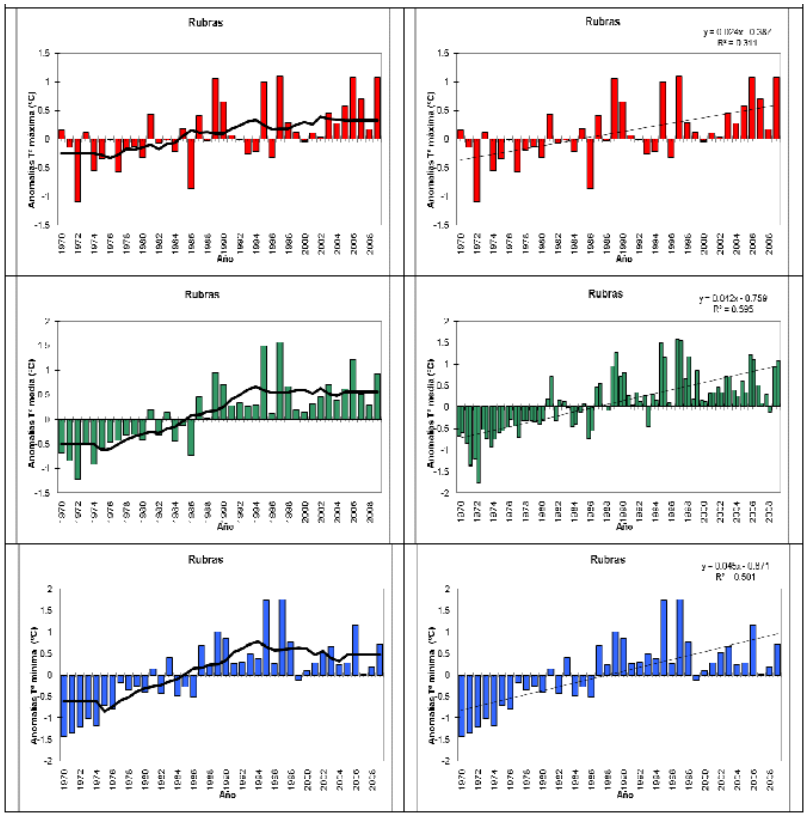


Source: Consellería de Medio Ambiente Territorio e Infraestruturas. MeteoGalicia.

Figure 2. Temperature annual trend (Braga weather station).

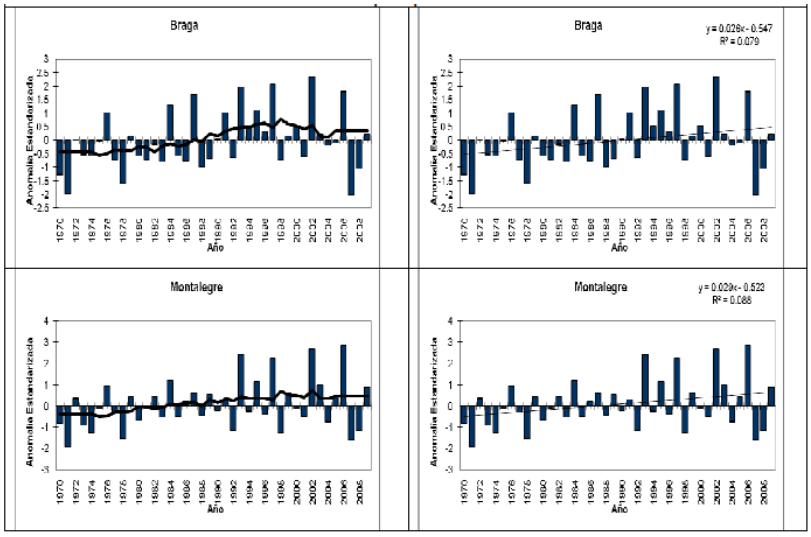


Source: Consellería de Medio Ambiente Territorio e Infraestruturas. MeteoGalicia.
Figure 3. Temperature annual trend (Montalegre weather station).



Source: Consellería de Medio Ambiente Territorio e Infraestruturas. MeteoGalicia.
Figure 4. Temperature annual trend (P. Rubras weather station).

The increase in temperature is more significant from the mid 1970's as seen in the sharp change of outstanding temperature anomalies (Figure 2, 3. 4). The highest increase (0.7ºC/decade) is observed in the spring series and for all temperatures considered. On a monthly bases we highlight the month of March, with an increase of close to 1ºC/decade for the series of Braga and Montalegre and 0.6 ºC/decade for P. Rubras. There is also a decrease in the frequency of cold days and nights, especially in the spring and summer. In general, it is possible to identify a significant increase in the number of hot days in the spring and summer seasons (about 1.5 days per decade in spring and 2.5 days per decade in summer). In the analysis of the frequency of warm nights, there is also an increase in October for the series of Braga and in all seasons for the series of P. Rubras.
Regarding the results of the trends observed for rain, it is possible to observe an increase in the rainfall in autumn (1.58%/decade for Braga, 1.97%/decade for Montalegre) (Figure 5).



Source: Consellería de Medio Ambiente Territorio e Infraestruturas. MeteoGalicia.
Figure 5. Rainfall annual trend (Braga and Montalegre weather station)

The weather conditions that occur in Portugal, especially during the summer, are favourable to fires. However, the ignition and spread of a fire depends on the interaction of several factors besides the weather, including the presence of fuel and the rugged terrain.
It is expected that the fire regimes immediately respond to climate change, and may even outweigh the direct effects of global warming in the patterns of specie distribution and productivity.
In terms of plant life, those better adapted to fire will dominate, generating monospecific formations or small variations at the same age
Climate change may cause a substantial increase in risk fire. In addition, in any of the scenarios described, the period of fire occurrence will extend throughout the year, implying a larger fire-fighting organizational structure, which will maintain higher levels of alert for longer periods each year.

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