

Evaluating Present And Future Fire Risk In Greece

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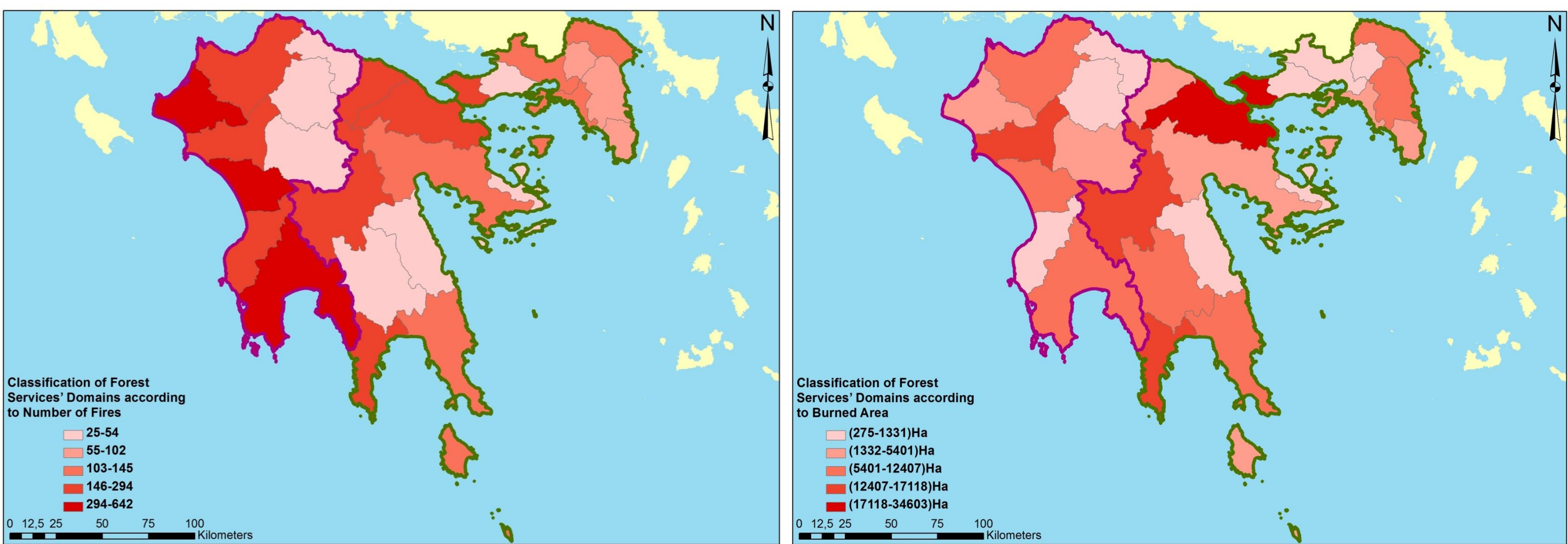
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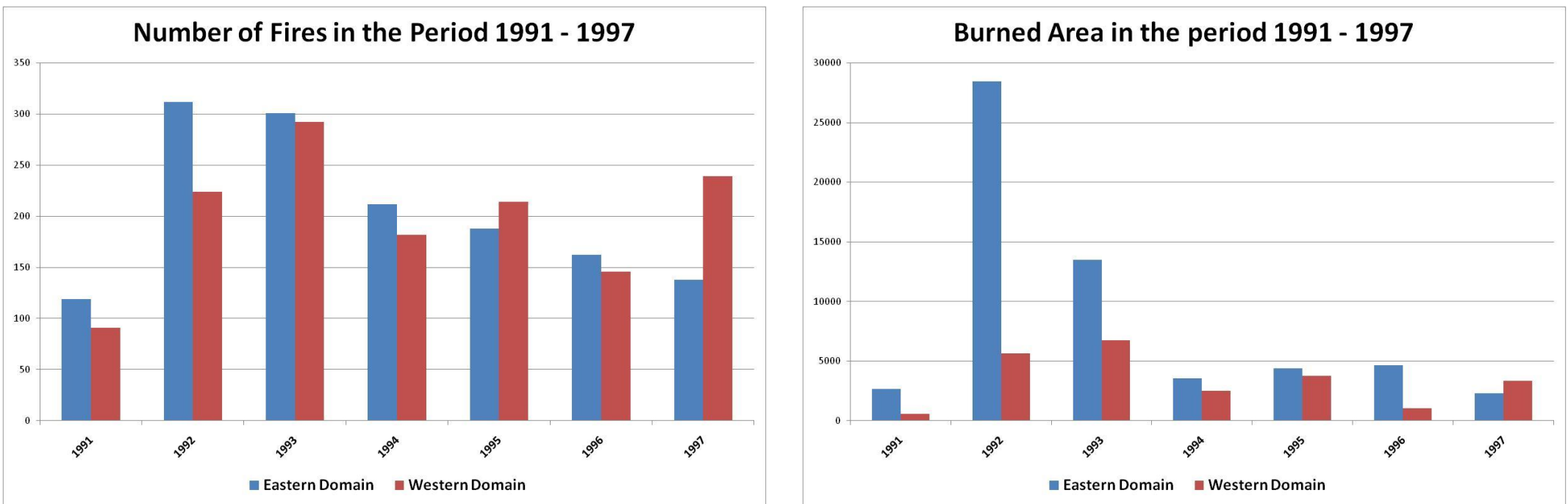
1. Aim and Data

In this study, an evaluation of the index applied to current fire data for Greece is performed with particular emphasis on the most vulnerable region of southern Greece. The study aims to establish whether FWI values can adequately reflect fire risk as judged by actual fire occurrence and to estimate the potential projected changes in fire risk. The fire data used, were provided by the Forest Special Secretariat of the Ministry of Environment, Energy & Climate Change. Fire data concern inventory of forest fires that occurred in the period 1991-1997 throughout Greece. Meteorological data covering the 7-year period (1991-1997) were obtained from the Hellenic National Meteorological Service. Mean daily values from two stations (Elliniko-37° 44' N. 23° 44' E, Kalamata-37° 04' N. 22° 10' E) were used in order to compute daily values of FWI.

Forest Fire Records

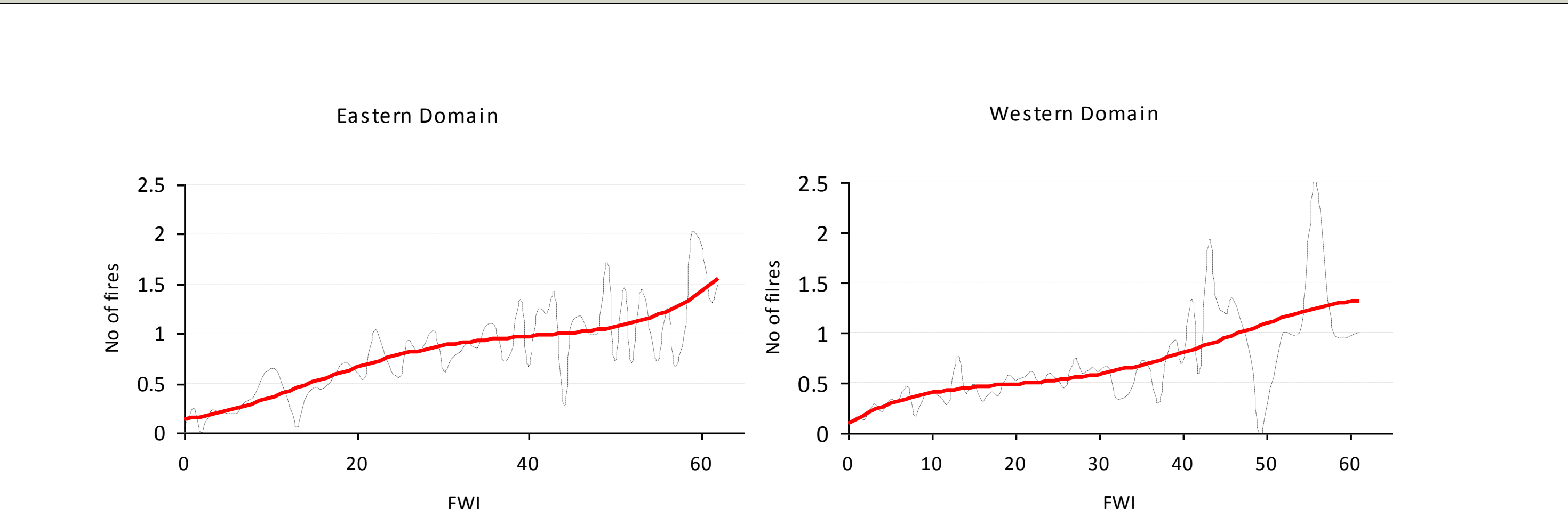


Classification of Forest Services' Domains according to the number of fires that occurred and the total area burned in each domain, throughout the period 1991 – 1997. In red, the domains that suffered the largest number of fires and the burned area, respectively.



The charts concern cumulative data on the number of fires occurred and the burned area (Ha) in the eastern and western domain respectively on each year in the period 1991-1997. The data depict an almost total predominance in burnt area and the number of fires, in several years, of the Eastern Domain. That is due to several factors, such as the larger extent of the Eastern Domain, population, the density of infrastructure and the climate. Most fires are caused by human activities, deliberately or by negligence (Pausas & Vallejo, 1999), and in this way it is expected to have more fire events on a highly populated area.

3. FWI Validation



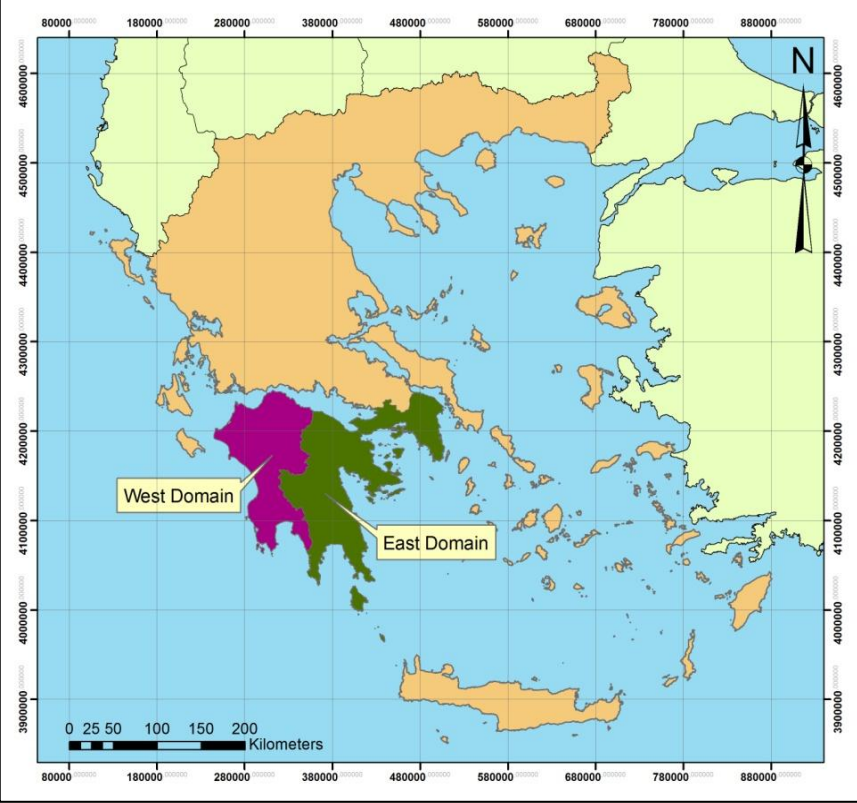
Mean number of fires per day against FWI (black line) and the respective polynomial fit (red line) for the Eastern (left) and the Western Domain (right) for 1991-1997 period.

The FWI was classified in categories of bin with size 1 and the average value of the number of fires that occurred at each category was calculated for both domains. It should be noted that the increased variability in high FWI values results from the decrease in the frequency of occurrence of high index values. The best estimated polynomial fit was applied on the data. The turning points of both fitted equations were calculated at $FWI \approx 15$ and $FWI \approx 45$. This implies that at $FWI \approx 15$ the fire risk is starting to increase and one fire in two days occurs when $FWI \approx 15$. The $FWI \approx 45$ value indicates extreme fire risk, while one fire occurs in each day with $FWI \approx 45$. These values are in accordance with Moriondo et al. (2006) and Good et al. (2008) that resulted at the same threshold values with different methodologies. Therefore, $FWI \approx 15$ and $FWI \approx 45$ are set as thresholds for elevated and extreme fire risk, respectively.

5. Conclusions

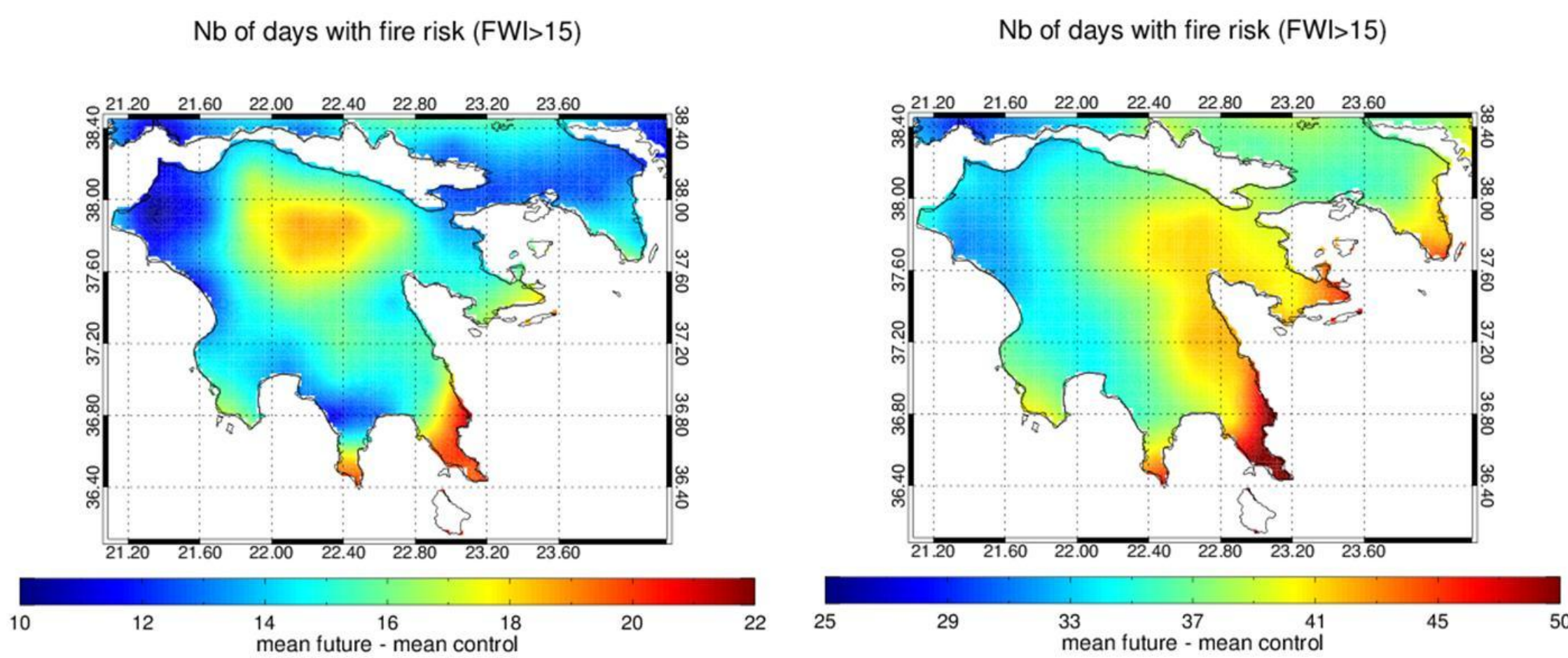
FWI was confirmed to be skillful in predicting fire occurrence for the vulnerable area of southern Greece. The resulted thresholds $FWI \approx 15$ and $FWI \approx 45$ for elevated and extreme fire risk, respectively, are in accordance with Moriondo et al. (2006) and Good et al. (2008). The future projections suggest a general increase in fire risk over the domain of interest with a very strong impact in the eastern Peloponnese and Attica. For the near-future period 2021-2050, the number of days with elevated fire risk ($FWI > 15$) increases up to 19 more days per year in the northern part of Peloponnese, while extreme fire risk ($FWI > 45$) increases up to 10 more days per year in the eastern domain. By the end of the century (2071-2100), the most considerable increases are estimated in the eastern domain with up to 50 and 30 days for elevated and extreme fire risk, respectively.

Due to the different meteorological conditions prevailing in the eastern and western areas of southern Greece, the domain of interest was split into two parts covering the eastern Peloponnese and the Attica Peninsula (Eastern Domain) and the western Peloponnese (Western Domain)



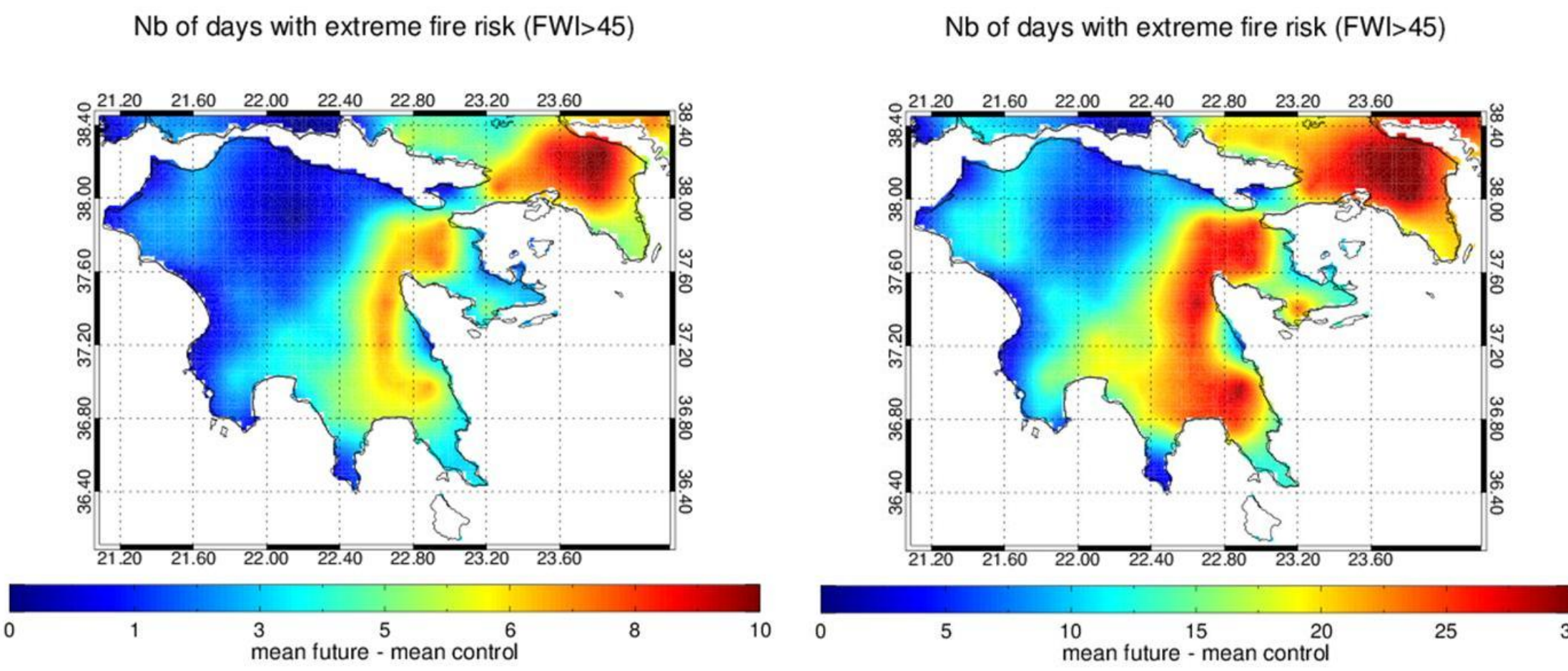
4. Future Projections

Present and future model data from the Regional Climate Model *RACMO2* were used in this study. The model was developed within the framework of the ENSEMBLES Project, by the Royal Netherlands Meteorological Institute (KNMI), at 25km horizontal resolution. The control run represents the base period 1961-1990 and is used here as reference for comparison with future projections for the periods 2021-2050 and 2071-2100.



Projected changes in the number of days with elevated fire risk ($FWI > 15$) during (a) the first future period (2021-2050) and (b) the second future period (2071-2100).

- In the near future period (2021-2050) elevated fire risk may occur in the northern part of Peloponnese with up to 19 more days of fire risk per year.
- In the second future period (2071-2100), the most considerable increases are estimated in the eastern part of Peloponnese and the Attica Peninsula with up to 50 and 40 more days of fire risk per year, respectively.



Projected changes in the number of days with extreme fire risk ($FWI > 45$) during (a) the first future period (2021-2050) and (b) the second future period (2071-2100).

- In the near future, namely 2021-2050, the most considerable increases are estimated in the eastern part of Peloponnese and the greater part of Attica with up to 7 and 10 more days of extreme fire risk per year, respectively.
- By the end of the century (2071-2100), most part of the Eastern Domain may experience increases of up to 30 days per year, with the Attica Peninsula being the most vulnerable part of the domain. Smaller increases of up to 12 days may occur on the Western Domain.

References

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