

**ALGERIA NATIONAL ACTIVITY “DOWNSCALING AND CLIMATE MODELLING WITH AN
APPLICATION TO THE MANAGEMENT OF FORESTS IN ALGERIA”**

3rd Workshop on “Fire Spread and Behavior Modeling in a context of Climate Change”

July 25-29, 2016

Sassari (Sardinia, Italy)

EXPERTS

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LIST OF PARTICIPANTS:

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DESCRIPTION OF THE WORKSHOP, OBJECTIVES AND RESULTS ACHIEVED:

The seminar was held in Sassari, Italy, from July 25 to 29, 2016. It was structured in 5 days with frontal lectures, computer exercises, and training, with the goal of further preparing the participants to the analysis of fire exposure and vulnerability for the study area of Tlemcen, NW Algeria, considering historic conditions and in a context of future climate change. The lectures and hands-on exercises were coordinated by Valentina Bacciu and Michele Salis of the CMCC-IAFES Division of Sassari; two PhD students of the University of Sassari provided support for the GIS and fire spread modelling exercises.

The first day of the workshop (July 25) was devoted to the welcome address and to an overview of the work carried out by the experts (either DGF and ONM) after the 2nd workshop. Furthermore, after lunch, a number of hands-on training on fire simulations with FLAMMAP

(<https://www.firelab.org/document/flammap-software>) in the study area were performed, with the aim to calibrate FLAMMAP considering a first case study as test (Ain Tellout wildfire, which burned about 900 ha on August 2015). The simulations were performed at 30 m resolution for the whole area of Tlemcen. The fuel characteristics were collected and digitalised by DGF following the methodology presented during the 2nd workshop. The weather conditions were derived from observed weather conditions in the closest weather stations, as well as similar papers and data that focused on Mediterranean areas (for coastal and wetter areas of Tlemcen) and/or dry ecosystems similar to those of the central and southern areas of Tlemcen.

During the morning of the second day (July 26), the whole group of experts continued the calibration tests of FLAMMAP considering a second case study (Ain Keb wildfire, which burned about 820 ha on July 2015). The accuracy evaluation of the simulated perimeters of both case studies was performed applying the statistical approach presented in Sassari during the second workshop. In the afternoon, CMCC presented the WindNinja model (<http://firelab.github.io/windninja/>), which is a tool able to characterise wind fields in a study area considering topography, vegetation and general wind information as recorded in a weather station. In the afternoon, the lectures moved from the calibration and validation of historical fires to the review of the general methodology to couple fire information with future climate. Summarizing, CMCC proposed a new methodology based on wildfire spread simulation modeling to assess climate change impacts on wildfire exposure. Variations of weather variables and fuel characteristics, input data for wildfire spread simulation modeling, are derived from regional climate models, used to calculate the Canadian Forest Fire Weather Index (FWI) (which subcodes have been shown to be good estimators of dead and live surface fuel moisture in previous works). Then, according to both future climate and spatial inputs (topography, fuels and wildfire history), hundred thousand wildfires burning will be simulated in the whole study area, using as reference the conditions of three different periods: 1981-2005, 2021-2050, 2051-2080. In order to calculate FWI subcode from weather station or regional model and to prepare the climate data to run the wildfire spread simulations, Dr. Bacciu introduced the use of a number of tools (such as R, CDO, PANOPLY) and presented several exercises (ppt "1_General Methodology" and ppt "2a_CDO tools to manipulate climate data") to become familiar with the methodology.

The third day (July 27) the two groups (ONM and DGF) were split according to their main expertise: the two ONM participants worked with Dr. Bacciu in order to prepare climate data accordingly to the presented methodology; the four DGF experts continued to work on fire behavior modeling with Dr. Salis. The ONM experts focused more on climate data manipulation exploring tools and R facilities to select, develop, and analyse future climate scenarios to be further used by the DGF participants to obtain fire risk and exposure

maps under climate change conditions.

During the last part of the afternoon, the whole group visited the Sardinia Meteo-Climatic Department of the ARPA, the regional agency that works for the promotion of sustainable development and for the protection and improvement of the quality of natural ecosystems and human settlements. During this visit the participants had a quick overview of the organization and the main missions of the Department, especially those focusing on fire weather and danger forecast.

The fourth day (July 28) the two groups (ONM and DGF) continued working in two groups. The ONM experts focused especially on R tools using ONM data (both observed and regional climate model data). During the day, the training for the preparation of climate data included also the set-up of wind conditions. The DGF group performed some hands-on training for the analysis of the FLAMMAP simulation outputs using some of the main functionalities of ArcFuels, which is a tool developed by the USDA Forest Service and is aimed at streamlining the analysis of fire simulation inputs and outputs and providing tools for quantitative wildfire risk assessment. Moreover, CMCC summarized the final steps needed to perform the final simulations of FLAMMAP and cover the whole study area of Tlemcen, with the aim of preparing the final charts of fire exposure considering both historic and future climate change scenarios.

The fifth day (July 29) focused on the presentation of the ONM results of the climate data preparation phase to the DGF participants. Several suggestions were taken into consideration in order to define historic and ameliorate future weather and fuel moisture scenarios to run fire simulations and characterize fire exposure and vulnerability in the study area. The rest of the day was dedicated to the final wrap-up of the data collection and methodology to be used for the preparation of final maps of exposure and vulnerability for the study area considering historic and future scenarios of climate change. At the end of the workshop, CMCC organized a small seminar held by the Sardinia Forest Service Director, Dr. Gavino Diana, who presented the organization and the missions of the Forest Service, with a special focus on forest fire activities. In particular, Dr. Diana presented several extreme fire examples sharing its knowledge with Algerian experts on the field of fire weather forecast, fire fighting and monitoring.

The evaluation questionnaires were distributed the last day to the six participants; five of these have been filled in and showed positive overall satisfaction of all participants, concerning both the training sessions (trainers communicated the information clearly and were able to answer questions) and the general organization and logistic related to the event. The tables here below summarize the scores related to training sessions (Table 1) and general organization (Table 2):

	Session 1 Hands-on training on fire simulation with FARSITE	Session 2 Application of R to prepare and manipulate weather input data for fire danger modelling/Analysis of fire danger output	Session 3 Hands-on training on fire simulation with FLAMMAP	Session 4 Application of CDO to manipulate climate data and preparation of input data for fire exposure modeling	Session 5 Hands-on training on WindNinja/ArcFuels	Overall evaluation
1 – SA	4	2	3	1	4	4
2 - A	1					1
3 – MA						
4 – NA						
5 – SD						
No reply		3	2	4	1	

Table 1: Evaluation of training sessions. SA = strongly agree; A = agree; MA = moderately agree; NA = Not agree; SD = Strongly disagree

	A. Information and indications provided by the organiser before coming?	B. Appropriateness of the timing and deadlines for applications (registration)	C. Accommodation (Hotel)	D. Travel / transportation arrangements	E. Conference venue	F. Catering
1 - Highly Satisfactory	5	3	5	5	5	4
2 - Satisfactory		1				
3 – Moderately Satisfactory						
4 - Unsatisfactory						
5 - Highly Unsatisfactory						
No reply		1				1

Table 2: Evaluation of organization

FORESEEN NEXT STEPS:

- A. Refinement of the fire weather databases (2000-2015) and selection of fire larger than 100 ha to characterize the historic weather associated with larger fire (by September 30th);
- B. Calibration and validation of FLAMMAP with a set of case studies occurred in the area of Tlemcen (by October 31st);
- C. Analysis of the most likely variations in weather variables and fuel moisture values related to future climate change scenarios (1981-2005, 2021-2050, 2051-2080) (by October 31st);
- D. Fire spread simulations and characterization of fire exposure, under past weather condition (by November 15th);
- A. Final characterization of fire exposure and vulnerability of the area of Tlemcen by using historic and future conditions, by the end of November 2016.

ATTACHMENTS

- Agenda
- PPTs presented during the training days