Evaluation of critical atmospheric patterns for the occurrence of forest fires in a climate change context in the northwest of Argentine Patagonia.

Verónica Dankiewicz[1,2], Matilde M. Rusticucci[1,2,3], and Soledad M. Collazo[1]
[1]Departamento de Ciencias de la Atmósfera y los Océanos, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires (DCAO/FCEN-UBA), Argentina
[2]Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina
[3]Instituto Franco Argentino Sobre Estudios de Clima y Sus Impactos (UMI-IFAECI), CNRS, Intendente Güiraldes 2160, Ciudad Universitaria Pab II, 1428 Buenos Aires, Argentina

Forest fires are a global phenomenon and result from complex interactions between weather and climate conditions, ignition sources, and humans. Understanding these relationships will contribute to the development of management strategies for their mitigation and adaptation. In the context of climate change, fire hazard conditions are expected to increase in many regions of the world due to projected changes in climate, which include an increase in temperatures and the occurrence of more intense droughts. In Argentina, northwestern Patagonia is an area very sensitive to these changes because of its climate, vegetation, the urbanizations highly exposed to fires, and the proximity of two of the largest and oldest National Parks in the country. The main objective of this work is to analyze the possible influence of climate change on some atmospheric patterns related to fire danger in northwestern Argentine Patagonia. The data were obtained from two CMIP5 global climate models CSIRO-Mk3-6-0 and GFDL-ESM2G and the CMIP5 multimodel ensemble, in the historical experiment and two representative concentration pathways: RCP2.6 and RCP8.5. The data used in this study cover the region's fire season (FS), from September to April, and were divided into five periods of 20 years each, a historical period (1986-2005), which was compared with four future periods: near (2021-2040), medium (2041-2060), far (2061-2080) and very far (2081-2100). The statistical distribution of the monthly composite fields of the FS was studied for some of the main fire drivers: sea surface temperature in the region of the index EN3.4 (SST EN3.4), sea level pressure anomalies (SLP), surface air temperature anomalies (TAS), the Antarctic Oscillation Index (AOI) and monthly accumulated precipitation (PR). In addition, the partial correlation coefficient was calculated to determine the independent contribution of each atmospheric variable to the Fire Weather Index (FWI), used as a proxy for the mean FS danger. As a result, we observed that SST EN3.4 is the only one that could indicate a reduction in fire danger in the future, although no variable presented a significant contribution to the FWI with respect to the others. In the RCP8.5 scenario, greater fire danger is projected by the TAS, the PR, the SLP, and relative by the AOI, while in the RCP2.6 scenario, only the TAS shows influence leading to an increase, which would be offset by the opposite influence of SST EN3.4 for the same periods in this scenario. In conclusion, in RCP8.5 it could be assumed that there is a trend towards an increase in

fire danger given the influence in this sense of most of the variables analyzed, but not in RCP2.6 where there would be no significant changes.