



Abstract

# The Catastrophic 2021 Wildfires in Greece: An Outbreak of Pyroconvective Events <sup>†</sup>

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**Abstract:** During the 2021 fire season in Greece, multiple wildfires occurred, with the most catastrophic ones in southern and eastern continental parts of the country. According to the European Forest Fire Information System, the 2021 fire season in Greece was the second most catastrophic one, with almost 130,000 ha of burnt land. The 2021 fire season was characterized by a prolonged drought that was initiated during spring, as well as a wet snow event during February which was accompanied by severe damage to trees across the eastern parts of the country. Furthermore, during the 2021 summer, two heatwaves occurred, one during the end of June and a second one during the end of July and the beginning of August. An analysis of ERA5 reanalysis data shows that the second heatwave was the longest on record. This preconditioning developed by the aforementioned factors may have contributed to the accumulation of dead fuels and thus setting the environment for extreme fire behavior. The 2021 fire season was extraordinary not only for the extended burnt areas but also for the extreme fire behavior that these wildfires exhibited, particularly those during August. Here, we focus on one of these wildfires that occurred in the northern suburbs of Athens, where exceptional and long-lasting pyroconvection took place during August 3, 5 and 6. Pyroconvection is examined using satellite data from SEVIRI, while the atmospheric conditions during this event are examined using ECMWF analysis data. Our observational analysis validates the long-lasting pyroconvection where pyrocumulus and pyrocumulonimbus clouds were present for many hours. Furthermore, the analysis of the ECMWF data suggests that the increase in atmospheric instability and the moisture transport in the mid-troposphere led to this exceptional pyroconvection event. Finally, we discuss potential mechanisms that contribute to the development of extreme fire behavior through an analysis of temperature and moisture components from seasonal to daily time scales.

**Keywords:** pyroconvection; extreme fire behavior; Greece



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