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Abstract

The Varympompi 2021 (Athens, Greece) Extreme Wildfire: Insights from Coupled Fire–Atmosphere Numerical Simulations †

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Abstract: The 2021 fire season was unprecedented in Greece. According to the European Forest Fire Information System, the country faced 79 wildfires that burned more than 130,000 ha. Overall, 70% of the total burnt area of 2021, approximately 94,000 ha, is attributed to five wildfires that broke out in early August and evolved into extreme pyroconvective events. Among these events, the Varympompi wildfire (EMSR527a) attracts particular interest for several reasons. First, it took place in the northern suburbs of Greece's capital city, Athens, thereby jeopardizing the safety of a large population and ultimately causing the death of one volunteer firefighter. Further, it exhibited extreme fire behavior characterized by erratic fire spread, massive spotting, and the occurrence of pyroconvection (EMSR527a). Last, it became the subject of a political and social debate focusing on the environmental conditions that enabled the escalation of its behavior and extent. Therefore, the purpose of this study is to shed light on the physical drivers of the extreme Varympompi wildfire. The factors that contributed to this event are sought in the combination of antecedent conditions that preconditioned fuels and concurrent conditions that enabled the wildfire to couple with the atmosphere. We evaluate our hypotheses using observations and ultra-high-resolution numerical simulations, carried out using the advanced WRF-Fire coupled fire–atmosphere modeling system. Our main focus is on deconstructing the Varympompi wildfire to unravel the relative contributions of fuels, weather, and topography to the observed fire size and behavior.

Keywords: extreme fire behavior; coupled fire-atmosphere modeling; Greece

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