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The impact of compound drought and heatwave events on the unprecedented 2020 fire season in the Pantanal, Brazil

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The year of 2020 was characterised by an unprecedented fire season in Pantanal, the largest continuous tropical wetland, located in south-western Brazil. This event was the largest ever recorded over, at least, the last two decades, reaching an amount of 3.9 million ha and affecting 17 million vertebrates[1,2]. Recent evidence points out that this event resulted from a complex interplay between human, landscape, and meteorological factors[3,4]. Indeed, much of the Pantanal has been affected by severe dry conditions since 2019, with 2020's drought being the most extreme and widespread ever recorded in the last 70 years[5,6]. The drought condition was maintained at record levels during most of the year of 2021, following the climate change scenarios expected for this region[7]. Prior to this comprehensive assessment, the 2020's fire season has been analyzed at the univariate level of a single climate event, not considering the co-occurrence of extreme and persistent temperatures with soil dryness conditions. Here, we show that the influence of land–atmosphere feedbacks contributed decisively to the simultaneous occurrence of dry and hot spells, exacerbating fire risk. These hot spells, with maximum temperatures 6 ºC above-average were associated with the prevalence of the ideal synoptic conditions for strong atmospheric heating, large evaporation rates and precipitation deficits[4]. We stress that more than half of the burned area during the fire season occurred during compound drought-heatwave conditions. The synergistic effect between fuel availability and weather-hydrological conditions was particularly acute in the vulnerable northern forested areas. These findings are relevant for integrated fire management in the Pantanal as well as within a broader context, as the driving mechanisms apply across other ecosystems, implying further efforts for monitoring and predicting such extreme events.

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