

Research Incentive Call -

Mathematics applied to wildfires studies

The Thematic Committee "Mathematics & Disasters" of the Brazilian Society of Applied and Computational Mathematics (SBMAC) has been following the situation of the uncontrolled advance of wildfires in the midwest region of the country.

Analysis conducted by the National Center for Monitoring and Early Warning of Natural Disasters (Cemaden) shows that the drought event started in late 2019 in the Pantanal region, and persisting until the current month, is already considered as the most intense drought event in the last 60 years (Figure 1) (Cemaden, 2020). This extreme drought event may, at least in part, have contributed to the rapid advance of uncontrolled fires in the region, and, at the beginning of August, more than 2,800 km² of the biome had already been affected by wildfires. According to data from the "Projeto Queimadas" of the National Institute for Space Research (INPE), only until September 2020, there were more than 15,400 fires, exceeding the historical peak of just over 12 thousand fires during the entire year of 2005.

This critical situation of drought and uncontrolled wildfires is historically affecting the Pantanal Biome, National Heritage by the Federal Constitution, and considered a Biosphere Reserve and Natural Heritage of Humanity by Unesco, which also presents three Ramsar Sites that are Wetlands of International Importance.

Following its mission, the SBMAC Thematic Committee "Mathematics & Disasters" comes, through this letter, to show an incentive to research on applied and computational mathematics that aims to contribute to the understanding of the risk of wildfires, in addition to their impacts, prevention, combat and mitigation strategies.

Research initiatives involving techniques of mathematical modeling and computational simulation for fire behavior in vegetated areas are particularly encouraged, contributing to the development of useful tools to both diagnosis and prognosis of the associated impacts (Almeida, 2012). We also consider advances in techniques of digital image processing and analysis of spatiotemporal data fundamental (Ferreira et al., 2020).

Research groups from the National Center for Monitoring and Early Warning of Natural Disaster (Cemaden) and the National Institute of Space Research (INPE) have

already expressed their availability for sharing data and tools, and for scientific collaborations.

The city of Campo Grande/MS would host the National Congress of Applied and Computational Mathematics (CNMAC) in 2020 - postponed to 2021 due to the COVID-19 pandemic. One of the mini-symposia already planned for the CNMAC deals exactly with "Dynamics of the Environment, Climatic Extremes and their Consequences". We hope to hold the mini-symposium in September 2021, and there we will present an overview of the activities carried out under this call.

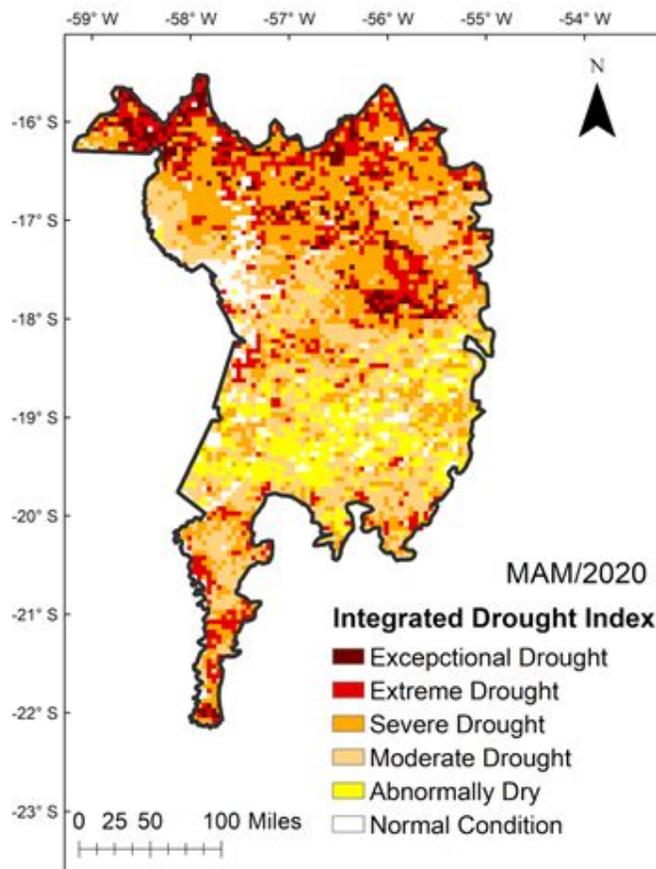
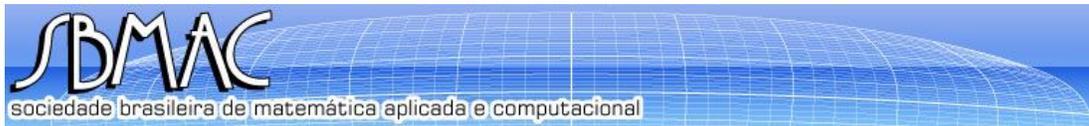


Figure 1: Integrated Drought Index – MAM (March-April-May)/2020.



Sincerely yours,

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REFERENCES

Almeida, R. M. Modelagem da propagação do fogo como ferramenta de auxílio à tomada de decisão no combate e prevenção de incêndios no Parque Nacional das Emas, GO. Tese de doutorado (Programa de Pós-graduação em Computação Aplicada - Instituto Nacional de Pesquisas Espaciais). – São José dos Campos: INPE, 2012. Disponível em: <http://mtc-m16d.sid.inpe.br/col/sid.inpe.br/mtc-m19/2012/11.01.13.13/doc/publicacao.pdf>

Cemaden (2020). Impactos de Extremos de Secas e Fogo no Bioma Pantanal. Disponível em: <http://www.cemaden.gov.br/impactos-de-extremos-de-secas-e-fogo-no-bioma-pantanal/>, acessado em 15/09/2020

Ferreira, L.N., Vega-Oliveros, D.A., Cotacallapa, M., Cardoso, M. F., Quiles, M. G., Zhao, L., Macau, E. E. N. (2020). Spatiotemporal data analysis with chronological networks. Nat Commun 11, 4036. <https://doi.org/10.1038/s41467-020-17634-2>