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# Simulating large fire events in Portugal using cellular automata

Bárbara Mota, Joana Freire, and Carlos DaCamara
Instituto Dom Luiz, University of Lisbon, Lisbon, Portugal (btmota@fc.ul.pt, jcfreire@fc.ul.pt, cdcamara@fc.ul.pt)

Forest fires are part of the landscape of Mediterranean countries, devastating thousands of hectares every year. These fire events cause great environmental losses, and impact economy and society, besides being a threat to the affected populations and firefighters. The year of 2017 was particularly catastrophic in the history of wildfires in Portugal. This year holds the record of burnt area (443 418 ha from the 1st January to the 31st October) and of lost lives (115 people died). There are several singularities about 2017: the deadliest events took place in June and in October, both months being out of the regular fire season, and around 51% of the total burnt area was due to the fires of October.

Our goal is to model the spread of the wildfires that took place in 2017 in Portugal making use of a probabilistic cellular automata (CA). CA are discrete systems with simple evolution rules acting at a local level, but capable of producing global complexity. They have the advantage of being both computationally light and can be easily modified by implementing additional variables and different rules for the evolution of the fire spread. In the case of forest fires, it is well known that topography, type, density and moisture of vegetation, and weather conditions, in particular wind direction and speed, are determinant in the propagation of fire.

We will pay special attention to the major fire events that took place in October 2017, which started on the 15th, a day with very strong wind associated to the close passage of hurricane Ophelia. Validation of results will be performed against information provided by firemen's reports and active fires as derived from radiometers on-board geostationary satellites (SEVIRI on-board Meteosat) and polar orbiters (MODIS on-board TERRA/AQUA and VIIRS on-board Suomi NPPs).

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