Mangrove forests under extreme events at the southeastern coast of the state of São Paulo, Brazil

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The Cananéia-Iguape coastal system (CICS) is one of the most biodiverse, extensive and well conserved examples of the Atlantic forest in southeastern Brazil (from 24°40'S to 25°20'S). The system is within the Atlantic Forest South-East Reserves, a World Heritage Site, and the Mata Atlântica Biosphere Reserve both from UNESCO. It is also referred to as a RAMSAR site, as it is encompassed by the Environmental Protection Area of Cananéia-Iguape-Peruíbe. Among the ecosystems and habitats the CICS hosts, well conserved mangrove forests can be found. Mangrove ecosystems are widely known to bring social, economic and ecological benefits to people and coastal biota, such as providing protection against ocean surges, fishery resources, nursery sites for coastal biota, cultural amenities such as ecotourism, medicinal and landscape resources, as well as spiritual values such that leading to the acknowledgement of the care for the Common Home.

In 2018, this coastal system was affected by two extreme events - strong winds and the opening of a barrier-inlet system, which led especially to mangrove vegetation disturbance. The last, was also known to have impacted local communities by displacing them from their villages because of the risk they were found in. Extreme events, such as these, are likely to increase due to the continued emissions of greenhouse gases into the atmosphere, and are likely to worsen the negative impact on humans and ecosystems, especially the most exposed and vulnerable as coastal environments. Hence, the objective of this study is to assess the impacts that the two extreme events brought in 2018 to mangroves and their traditional communities in the CICS. Sentinel-1 Synthetic Aperture Radar (SAR) imagery will be used to accompany mangrove vegetation loss and the changes in the opening of the barrier-inlet from 2017 to 2020. High resolution optical imagery provided by 'Secretaria de Infraestrutura e Meio Ambiente do Estado de São Paulo', Brazil and Sentinel-2 Imagery from the Sentinel Explorer Platform will be used to assess the mangrove greeness by Normalized Difference Vegetation Index and to detect mangrove vegetation loss through maximum likelihood classification for 2016, 2018 and 2020.
To assess the impact on local traditional communities, a socio-ecological questionnaire will be used to evaluate their perceptions on the event itself, and on its impacts on mangroves and people. Partial results have shown a continuous decrease of vegetation and area of mangrove patches which were disturbed by the barrier-inlet breaching, since it continues to widening. In the meanwhile, changes on vegetation cover were detected for those mangroves disturbed by strong winds through the optical imagery assessment. Although the survey that will be conducted by questionnaires is still to be done, it is expected that a more representative view of the impact caused in 2018 by extreme events in the CICS will be reached. The survey of traditional knowledge and their relationship with the mangrove ecosystem already have shown how people rely on mangroves and how important their knowledge and perspectives were to address changes in mangroves. Since the CICS is in frontline of extreme events, a more integrative research will provide a step further for the understanding of the impacts of extreme events on people and mangroves.

Keywords: Traditional knowledge; Mangrove use; Climatic anomalies; Wind extreme events; Ocean surges; Bar opening; Vegetation disturbance; Impacted people