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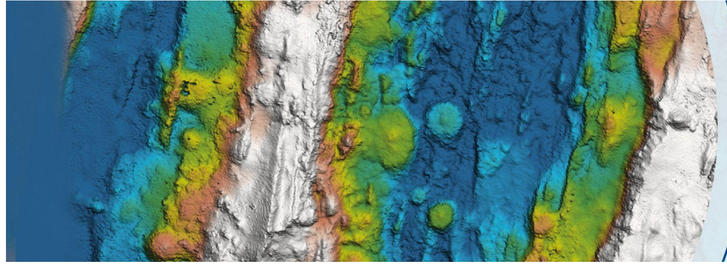
TÉCNICO LISBOA



6as Jornadas de Engenharia Hidrográfica

1as Jornadas Luso-Espanholas de Hidrografia

3, 4 e 5 novembro 2020

Critical flood conditions in two beaches of the Portuguese central west coast

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Motivation and goal

Natural and anthropogenic territorial specificities have an important role in the coastal flooding process and related impacts.

In the scope of the MOSAIC.pt project, the contributing factors for coastal flooding in two beaches located in the Portuguese central west coast during recent events are evaluated.

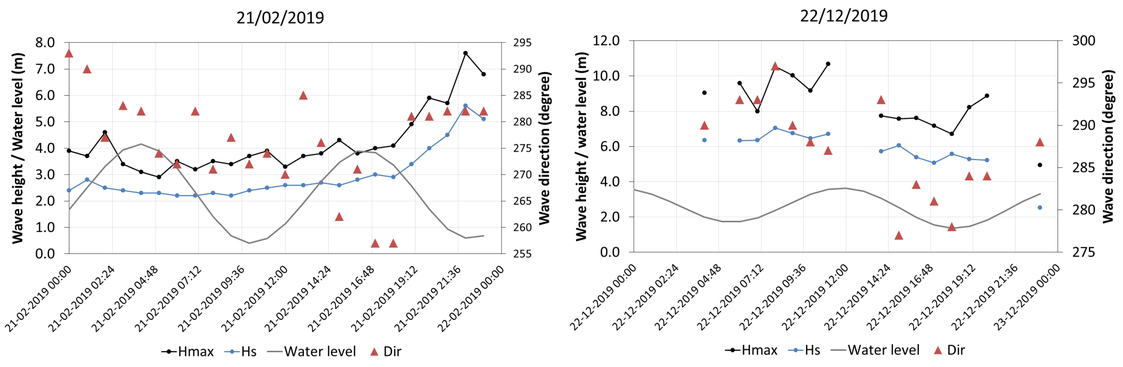
Methods

Morphological characteristics of the two beaches were monitored between February 2019 and March 2020 (Freire *et al.*, 2020) and several morphological indicators (Carapuço *et al.*, 2016) were calculated.

Two overtopping and flooding events that occurred on 21/02/2019 and 22/12/2019 were selected and hydrodynamic forcing conditions were characterized based on available data.

Overtopping and flooding events

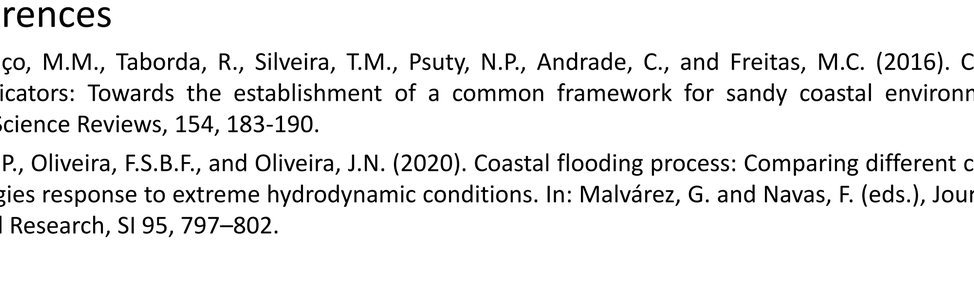
The two studied events had different forcing conditions: in February 2019, high water level was mainly forced by high spring tide, while in December 2019 extreme energetic wave conditions adding storm surge (low pressure and strong winds) contributed to high sea levels.



Water level and wave conditions during the days of the events: 21/02/2019 (left panel) and 22/12/2019 (right panel)

Cova-Gala beach was affected in both situations, but beach morphological conditions (lower foreshore and lower profile gradient) must have contributed for the higher impact of the December event.

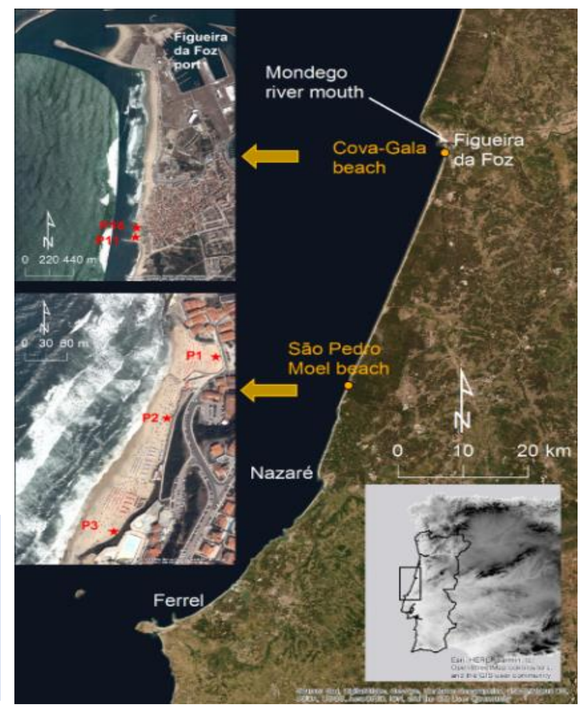
São Pedro de Moel beach was only affected by the December event, despite more robust beach morphological condition than in February.



Cova-Gala dune overwash on 21/02/2019 (left photo) and São Pedro de Moel inundation on 22/12/2019 (right photo)

Study areas

Two beaches vulnerable to coastal flooding and presenting different coastal typologies were chosen: Cova-Gala beach, located south of the Mondego river mouth south jetty, in Figueira da Foz, and São Pedro de Moel beach located 45 km further south.

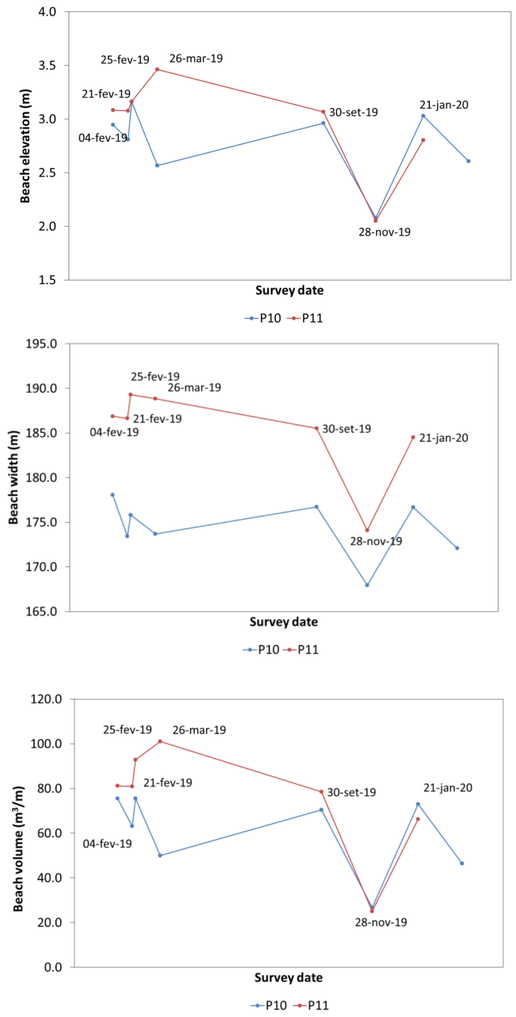


Location of studied cross-shore profiles: P10 and P11 in Cova-Gala and P1, P2 and P3 in São Pedro de Moel beaches

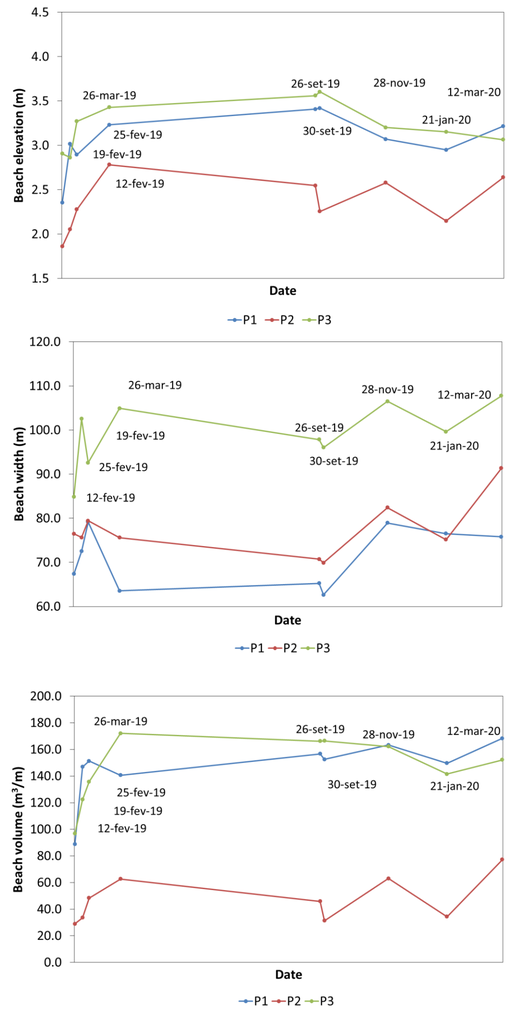
Morphological indicators

On 21/02/2019 Cova-Gala beach profiles P10 and P11 present beach volume and average elevation above all survey's average values. Prior to the December 2019 event, the profiles show the less robust situation of the monitoring period with the lowest values of beach volume, beach width, average profile elevation, and lower elevation at the upper limit of the foreshore.

Before both February and December events, average beach width of São Pedro de Moel beach profile P1 shows high values when compared to the other surveys. Prior to the December 2019 event beach volume is the second highest value observed. In both surveys, elevation of the foreshore upper limit is similar as is the cross-shore morphology, including the profile gradient.



Morphological indicators of Cova-Gala beach



Morphological indicators of São Pedro de Moel beach

Conclusions

For the same hydrodynamic conditions beaches are differently affected. Water level and beach cross-shore profile gradient seem to be the main triggering factors for overtopping occurrence in Cova-Gala. In São Pedro de Moel beach, high wave heights with smaller obliquity reach the beach with more energy, promoting inland inundation independently of the beach morphological state. These outcomes point out the importance of a comprehensive knowledge of the local factors in adequate flood hazard predictions and mitigation measures development.

References

Carapuço, M.M., Taborda, R., Silveira, T.M., Psuty, N.P., Andrade, C., and Freitas, M.C. (2016). Coastal geoindicators: Towards the establishment of a common framework for sandy coastal environments. Earth-Science Reviews, 154, 183-190.

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