



# SUMMARY SHEETS

# Turbulence

**Background.** Situated at the head of the Gulf of St Tropez, Port Grimaud is exposed to north-easterly to easterly winds, particularly the Levant, which is a moderate to strong easterly wind in autumn and winter, often associated with rainy weather.

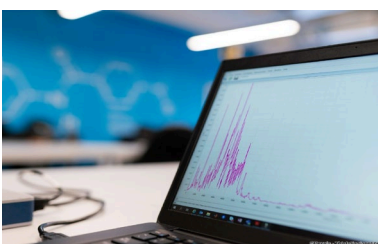
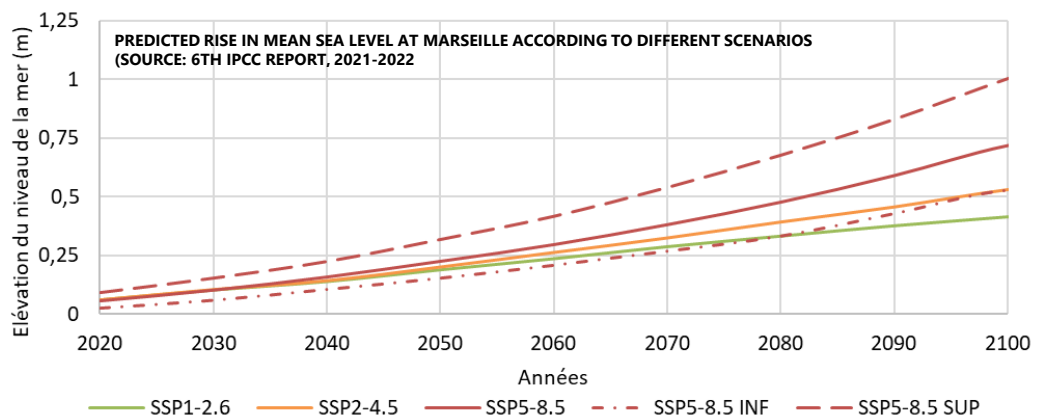
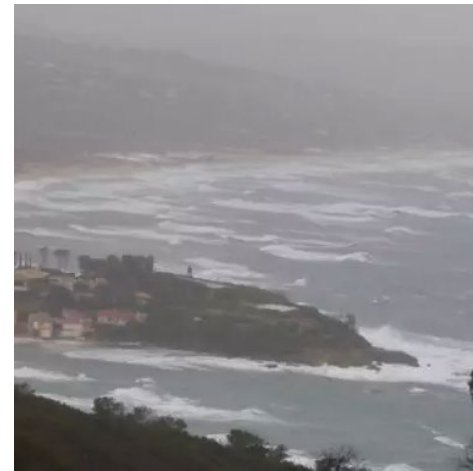
The easterly wind will create waves likely to reach the harbour entrance channel, hindering access to the harbour and disrupting its smooth operation.

In addition, the low elevation of the breakwater means that it can be penetrated by large waves in the event of a storm surge, posing a safety risk for users as well as private and public structures. This phenomenon is set to be exacerbated in the future, as a result of the rise in average sea level linked to climate change.

The purpose of restructuring the entrance channel is to limit residual turbulence and allow year-round use of the outer harbour, taking into account future changes in the average water level.

**Over the period 1993-2018,** Dodet et al. (2019) shows an increase of:

- $3.09 \pm 0.62$  mm/year at Toulon
- $4.25 \pm 0.82$  mm/year at Nice.

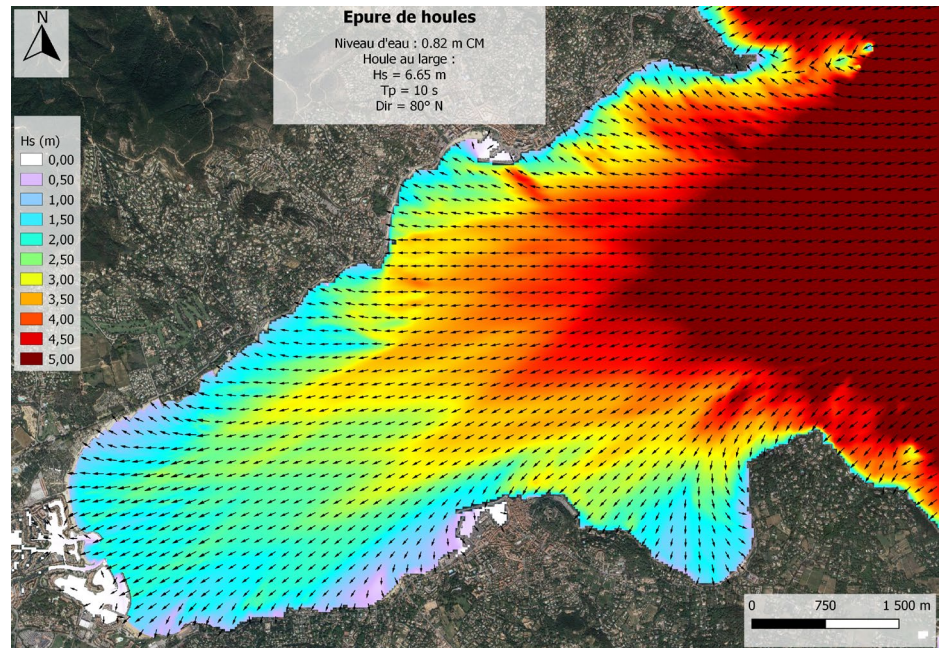
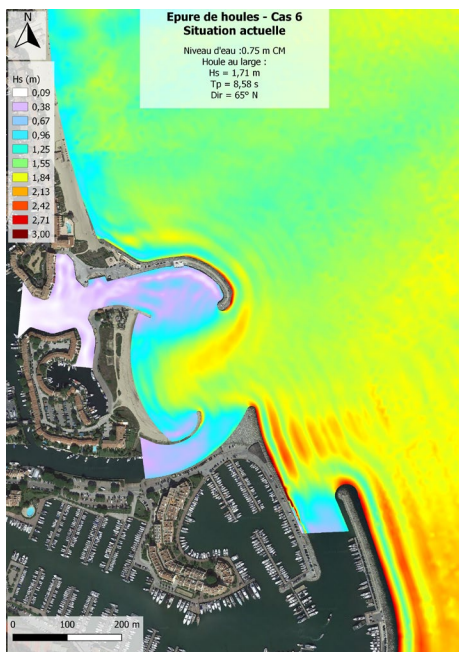


**Methodology.** As part of the preliminary studies, digital modelling has been used to accurately characterise port turbulence and sea swell, taking into account storm surges and the rise in sea level caused by global warming.



## Assessment. The analysis confirms:

- The analysis confirms that there is currently good protection from north-easterly to east-north-easterly turbulence, and that there is a high exposure to easterly conditions, which can disrupt navigation and port operations, even with moderate easterly winds. The scenarios considered are mainly aimed at improving the protection of the channel from easterly conditions.
- The analysis confirms that the breakwater is highly vulnerable to being breached, due to its low elevation, which poses a risk to its integrity and the safety of users. An elevation is to be considered in the reconfiguration scenarios for the entrance channel, albeit limited so as not to impact on the view of Saint-Tropez for residents and to respect the overall work of François SPOERRY.



## Glossary.

Storm surges: *waves breaking over coastal defences (natural or artificial)*

## Objective of the Port Grimaud 2030 Project

- Limiting turbulence in the outer harbour to improve access and navigation.
- Allowing year-round mooring in the outer harbour to limit inconvenience to residents
- Ensuring the longevity of structures by anticipating the effects of global warming.

