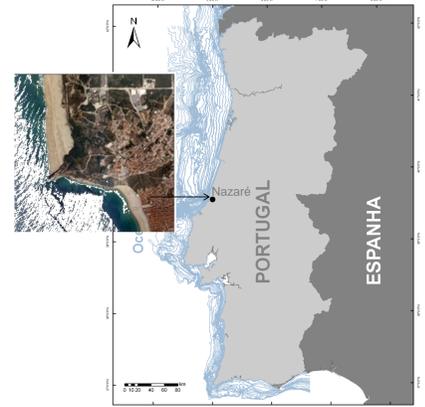


# Dark grey sea foam formation in the Norte Beach (Nazaré)

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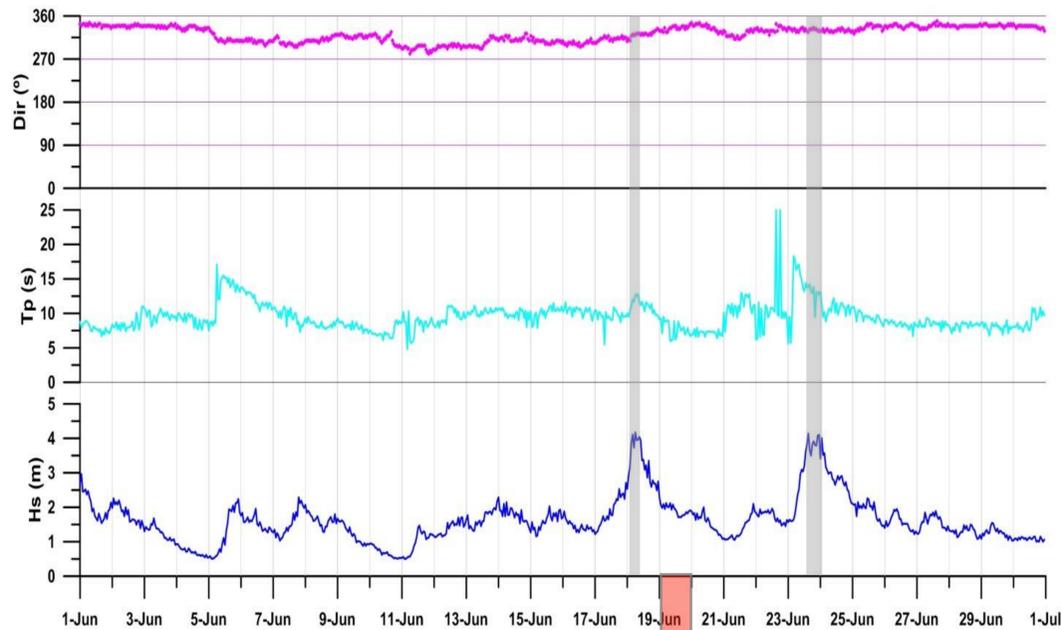
## Motivation:

- Unusual colour of the sea foam;
- Trace the source of the fine particles aggregated to the sea foam in order to improve the understanding of the Nazaré canyon head dynamics.



## Sea foam formation

The video monitoring and wave data integration from 2009 and 2013, allow to observe that the accumulation of the sea foam in the Norte beach are generally associated with spring tides and short term high energetic events (waves higher than 4m). The most intense episodes occurred in late spring (May to June). In 2013 two periods of sea foam formation were observed (in grey)



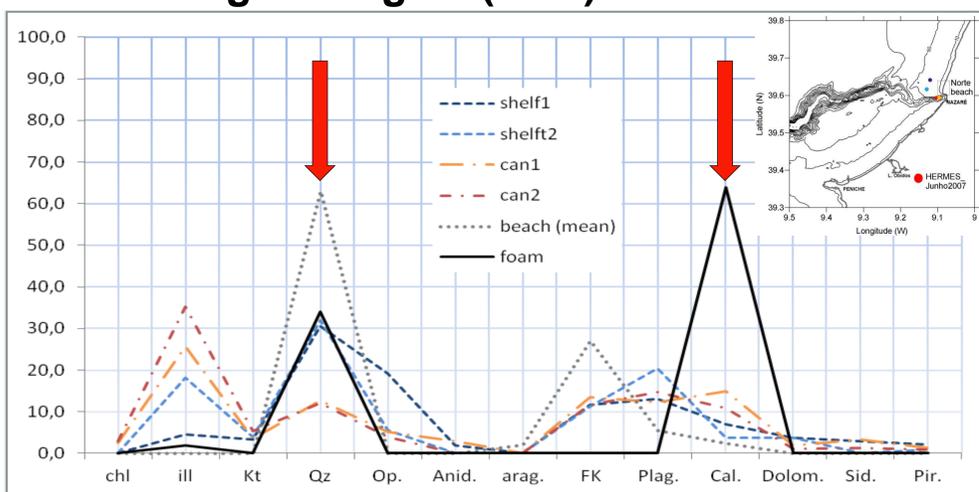
The Norte beach (Nazaré) is located at the Portuguese west coast at north of the Nazaré canyon. The dominant winds and swell are from the west and northwest, with predominant southern directed littoral drift.

In June, 18th, 2013, the waves, reached the 4m, with periods (Tp) of 11-12s, for about 7 hours, necessary condition for the formation of the sea foam. The sea foam was transported by swash motion, at high tide, and accumulated, in a back channel between the active beach berms and the former ones of the Norte beach. In the channel area, a variety of anthropogenic debris can also be found, as plastic bottles, fishing nets, buoys.



**Dark Grey Sea foam = waves (>4m) + organic matter + biogenic calcite debris (upwelling) + quartz + crude oil**

## Mineralogical signal (DRX)



The sea foam X ray fine fraction mineralogy (comparing with shelf, Nazaré canyon and beach samples) shows a dual contribution: biogenic (calcite) and terrigenous (quartz from local bottom sediments resuspension). The dark grey sea foam reflects also the introduction of crude oil (pollutants), associated with sediments and organic remains. Future geochemical studies are needed to see if public health problems can be addressed.

