

Environmental controls on summer surf zone hazards, beach crowd, and resulting life risk at a high-energy sandy beach (La Lette Blanche) in southwest France

Bruno Castelle, Jeffrey Dehez, Jean-Philippe Savy, Vincent Marieu, Sandrine Lyser, Stéphane Bujan, David Carayon, Rob Brander.

Surf beaches can be dangerous environments due to potentially powerful wave conditions and the presence of rip currents [1]. Understanding and predicting surf zone risks is therefore of paramount importance to prevent drowning incidents. However, hazard and water-user exposure at the coast, which combined give life risk, have been systematically measured separately. For the first time, the present work addressed all the components of the risk at a given beach by implementing a cross-disciplinary research in close collaboration with lifeguards at a rip-current dominated beach in southwest France.

The experiment took place at La Lette Blanche beach, southwest France, during the lifeguard-patrolled summer period (July-August) 2022. This coast is exposed to high-energy ocean waves which, together with a meso-macrotidal tide regime, result in a wealth of surf zone hazards, primarily rip currents and shore-break waves, occurring at different times and locations along the beach. During this 2-month period, beach crowd and the levels of rip current and shore-break wave hazards were estimated hourly by the lifeguards during patrolling hours (11AM-6PM). Wave, tide and weather conditions were also continuously recorded at nearby tide gage, wave buoy and weather station, providing comprehensive insight into the primary environmental controls.

Results show that daily-mean rip-current hazard is increased for large, long-period and shore-normal waves, while shorebreak-wave hazard is increased for long-period waves and large tide range. Not surprisingly, beachgoer crowd increases for warm, sunny and light wind days, with the severe heat wave occurring in July 2022 significantly decreasing beach crowd. Days combining strong hazards and large beach attendance were also those associated with the largest amount of rescues at Vielle Saint-Girons, and of drowning incidents in southwest France. Warm, sunny and light sunny days, with large, long-period shore-normally incident waves and large tide range were the most risky days, with maximized beach crowd and shorebreak-wave and rip current hazards peaking at different times of the day and at different sectors of the beach.

This collected dataset together with additional drowning datasets and machine learning techniques [2] form the basis of the ongoing development of new beach exposure hazard/life risk alert system.

References :

[1] Castelle, Brander, Tellier, Simonnet, Scott, McCarroll, Campagne, Cavailhes, Lechevrel, 2018, Surf

zone hazards and injuries on beaches in SW France, Nat. Hazards

[2] Carayon, Castelle, Dehez, 2023. Using machine learning to predict drownings in surf beaches of southwest France, WCDP 2023.