STRATEGIC SCIENCE PLAN

The research activities are based on large scale experiments and development of free-surface numerical models to study the physics of complex fluid mixing and structural response as coupled interactions.

Our Strategic Science Plan is structured under the following research themes:

- Extreme wave predictions including
  (1) climate changes
  (2) natural hazards (tsunami-, hurricane-, volcano-, landslide-generated waves and storm surges/flooding)
  (3) inundation mapping, warning systems and evacuation
- Wind driven coastal processes:
  (1) air-sea interactions in the context of wave breaking
  (2) wave-current-sediment interactions
- Nearshore hydrodynamics, debris flows and shoreline protection
- Fluid-structure-seabed interactions and vibration control including renewable energy development (wind/wave/tidal/solar)
- Man-made hazards (oil spills, coastal pollution, etc.)

RESEARCH CHAIR

Quebec's ministries of Public Safety and Transport jointly fund the Research Chair in Coastal and River Engineering to contribute to the advancement of knowledge on the natural hazards of coastal erosion and coastal flooding, which are expected to increase as the climate continues to change.

The ministries recognize that better understanding of the underlying physical processes will promote development that respects the natural equilibrium and sustainable management of coastal areas and infrastructure.

They also hope that the development of greater scientific expertise in coastal engineering with a specific focus on Quebec's coastal dynamics will enable the province to plan better interventions and adaptation strategies.

Laboratoire hydraulique environnemental
Environmental Hydraulics Laboratory

Laboratory focusing on coastal and ocean research to improve our understanding of the physics of wind-driven wave and ocean-structure-seabed interactions.

The research activities revolve around a large scale experimental wave flume facility and numerical model developments. One of the objectives is to develop sustainable approaches to control coastal erosion caused by climate change.

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FACILITY

Large scale wave flume

The flume has a depth and a width of 5 m and 120 m long. The flume is designed for modeling the interactions of waves, tides, currents, and sediment transport. The wavemaker is a piston type with a maximum stroke length of 4 m and a maximum velocity of 4 m/s. Various initial conditions can be set-up including regular and irregular waves and a host of user-defined functions, e.g. landslide and earthquake-generated tsunami. Large amplitude waves can be generated reaching the top of the flume walls with water depth ranging from 2.5-3.5 m with wave period of 3-10 s.

RESEARCH THEMES

Fluid Dynamics
- Physics of fluids
- Fluid mixing
- Multiphase flows
- Numerical methods

Coastal Processes
- Coastal erosion, scour & beach nourishment
- Nearshore hydrodynamics
- Storm surge and flooding
- Sediment transport
- Runup and overtopping

Ocean & Atmospheric Sciences
- Air-sea interactions
- Wind-driven waves, tides and coastal processes
- Storm predictions

Marine structures
- Force and impact on marine structures
- Debris flow (e.g., river jams of ice)
- Special structures (e.g. underwater vehicles)
- Structural dynamics, elasticity & vibration control

Renewable wind, wave, tidal and offshore solar energy

CONTACT US

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