



# Hydraulic Laboratory

*Room PQ004, Block PQ,  
Department of Civil and Environmental Engineering,  
The Hong Kong Polytechnic University*



THE HONG KONG  
POLYTECHNIC UNIVERSITY  
香港理工大學



DEPARTMENT OF  
CIVIL AND ENVIRONMENTAL ENGINEERING  
土木及環境工程學系

Opening Minds • Shaping the Future  
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# Introduction

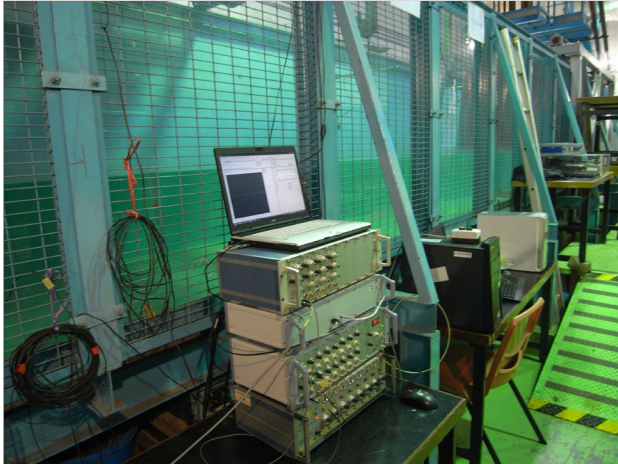
This hydraulics laboratory mainly focuses in the teaching and research areas of hydraulic engineering and related disciplines, including: numerical and physical modeling of tidal circulation, wave propagation, storm surge, conduit flow, multi-phase flow, solute and sediment transport.

It houses advanced equipment including:

- > Open Channel Tilting Flume
- > Wave Channel and Control System
- > Pressurized Water Pipeline System
- > Wind Tunnel and Measurement System
- > Nortek Vectrino Plus Side/down-looking ADV
- > Laser PIV System
- > Nortek Vector Current Meter
- > OBS-3A Turbidity Meter
- > Submersible Ultraviolet Nitrate Analyzer (SUNA)
- > Acoustic Doppler Current Profiler (ADCP)
- > 3D Printer



# Main Equipment (Research)



Irregular Wavemaker Channel and Control System

Parameter settings:

Length ~27m  
Width 1.5m  
Hight 1.5m



Open Channel (Tilting Flume)

Parameter settings:

Length 12.5m  
Width 0.31m  
Hight 0.45m



Open Channel (Sediment & Flow)

Parameter settings:

Length ~7m  
Width 1.0m  
Hight 0.4m

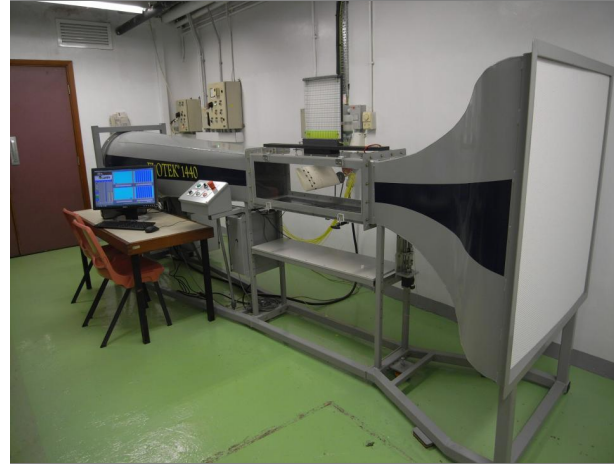
# Main Equipment (Research)



**Pressurized Water Pipeline System**

Parameter settings:

Total Length	~ 50m
Diameter	50mm
Water head	10bar Max



**Wind Tunnel and Measurement System**

Parameter settings:

Length	90cm
Width	30cm
Height	30cm
Wind speed	180mph Max



**Nortek Vectrino Plus Side-looking ADV**

Nortek Vectrino is globally used as the standard flow-measuring tool for hydraulic laboratory applications.

Acoustic Doppler velocimetry (ADV) is a velocity measurement technique that allows for the measurement of 3D flow velocities by using the Doppler shift principle.

# Main Equipment (Research)



**Submersible Ultraviolet Nitrate Analyzer (SUNA)**

The SUNA is a water quality monitoring sensor, and it is a cost-effective solution for real-time nitrate analysis in coastal and freshwater environments, providing quick and continuous nitrate measurement.



**OBS-3A Turbidity Meter**

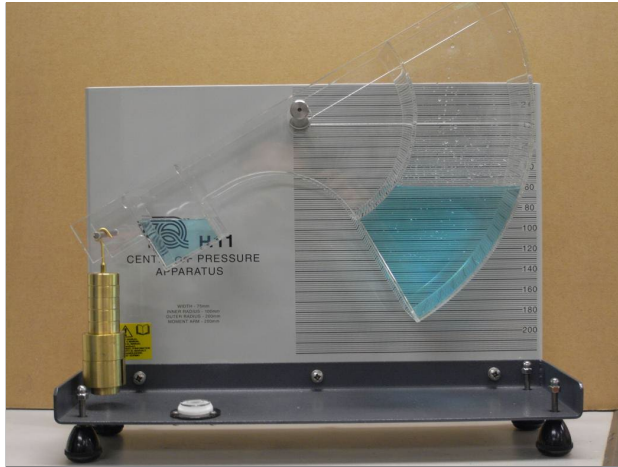
The OBS-3A sensor is an optional sensor for measuring turbidity and suspended solids concentrations by detecting near infrared radiation scattered from suspended particles.



**Laser PIV System**

The laser PIV system is a well established technique for measuring the velocity of a fluid at multiple points throughout a 2-dimensional measure plane.

# Main Equipment (Teaching)



Hydrostatic Pressure



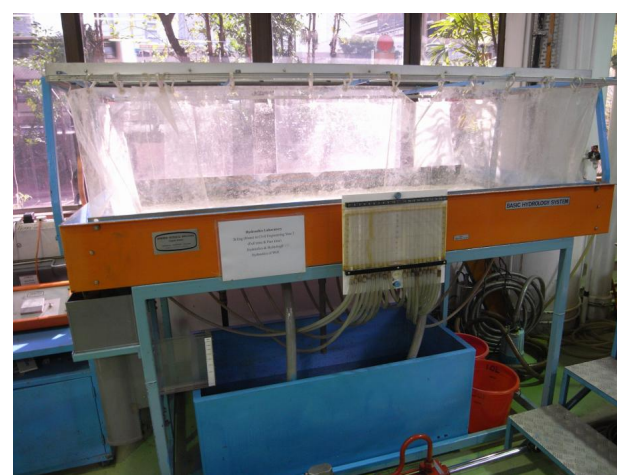
V-Notch Weir



Venturi Meter



Jet Impact



Hydraulics of Well



Pipe Friction and Surge Tower

# Academic Staff



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**Dr Stocchino, A.**

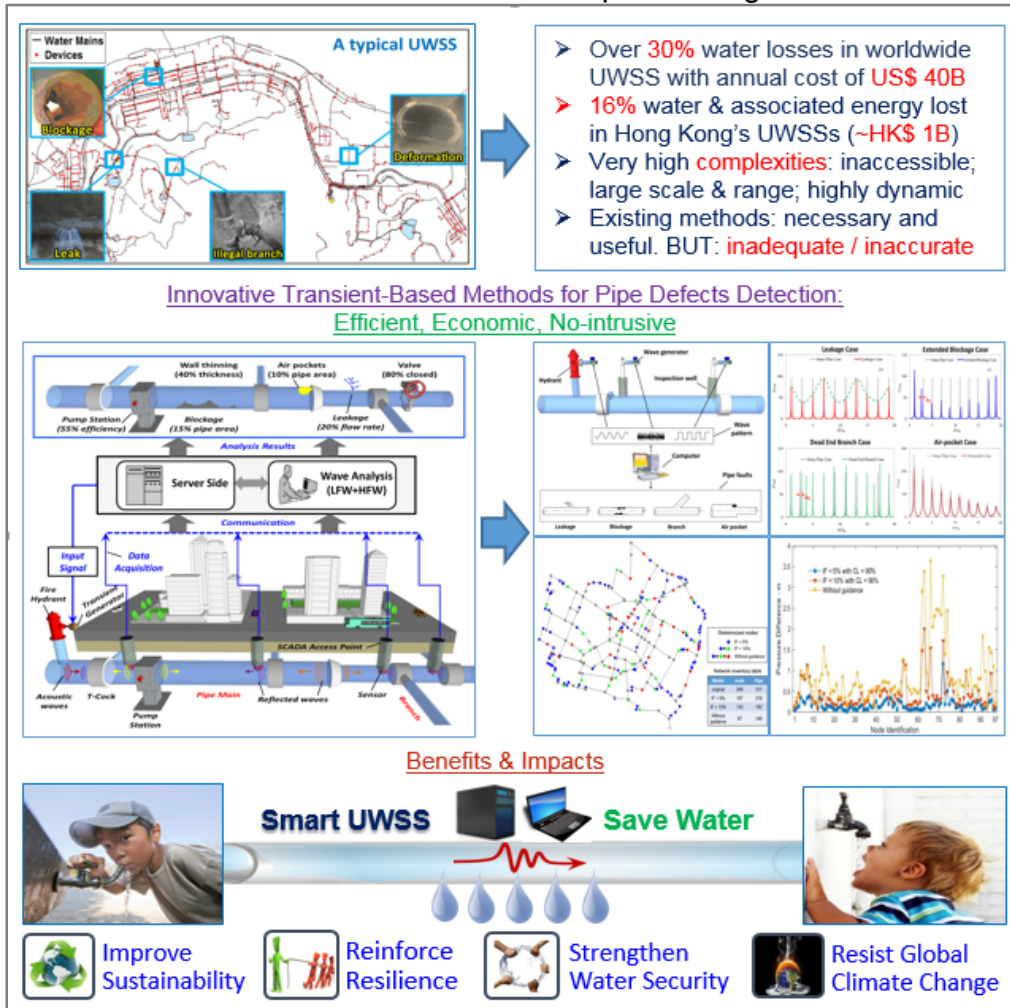
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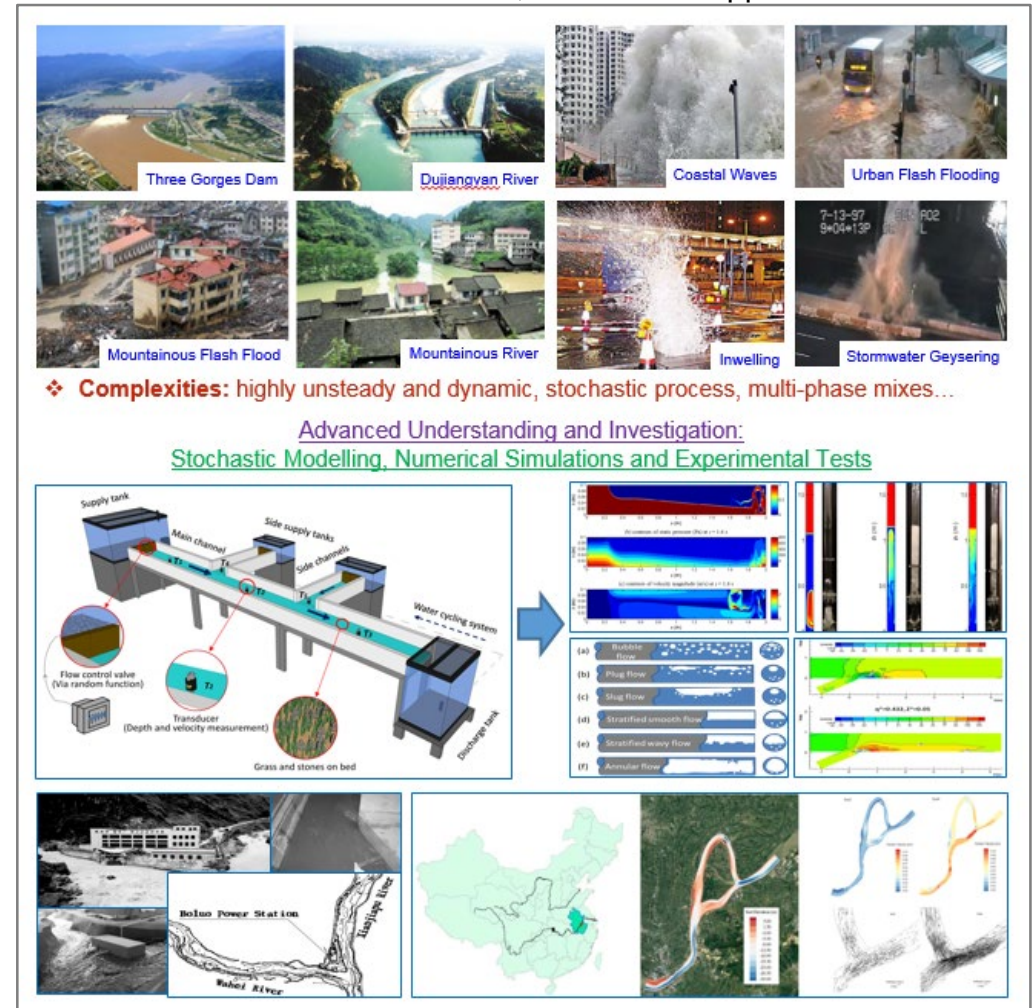
# Research Spotlight

## Smart Urban Water Supply System (Smart UWSS) — Transient-Based Water Pipeline Diagnosis



\*\* Supports from RGC TRS & GRF Projects (T21-602/15R; 15201017; 15200719)

## Fluid Mechanics & Hydraulics of Close-Open Channel Flows — Advances in Theories, Models and Applications



\*\* Supports from RGC ECS Project (25200616) & PolyU Projects



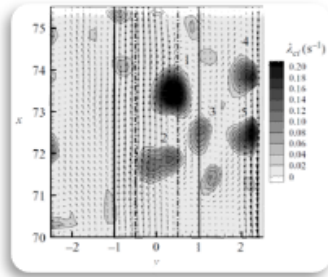
# Research Spotlight

## Dynamic Dispersion Processes in Natural Rivers

The exchange of mass and momentum between the main channel and the lateral floodplains in natural rivers is fundamental in the preservation of natural ecosystems. The study of the turbulent features and the Lagrangian dispersion is then fundamental.

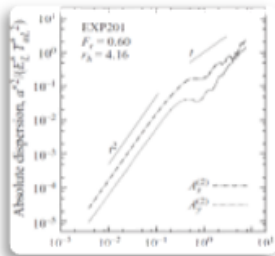


Natural River View

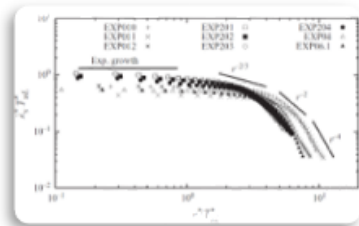


Velocity fields and the generation of 2D coherent vortices that play a fundamental role in the overall exchange processes

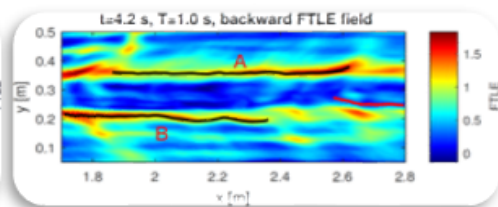
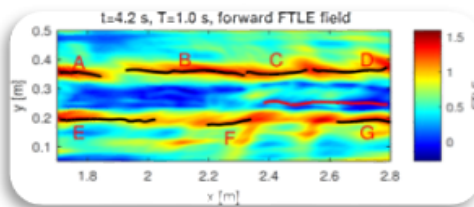
## Single and multiple statistics and Lagrangian Coherent Structures (LCS)



Dispersion regimes appear to depend on the main physical parameters and LCSs are generated along the main channel width possibly modifying the exchange of nutrients

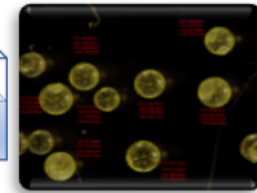
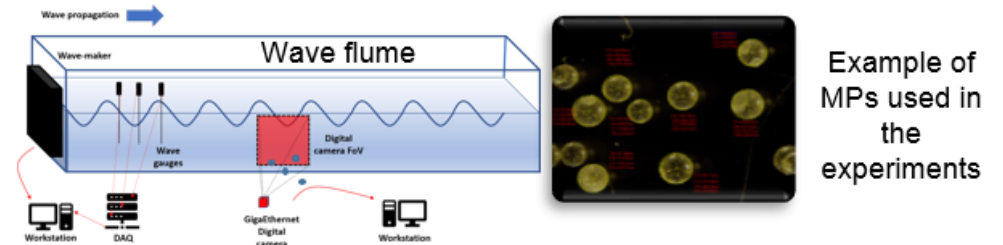


Finite Size Lyapunov Exponent

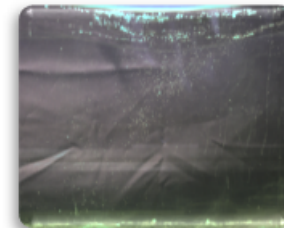


## Microplastic Transport in the Marine Environment

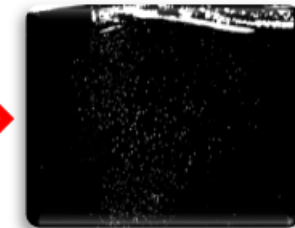
Marine plastic pollution is becoming one of the most urgent environmental issues. Microplastic (MP) debris are transported from rivers to open oceans. We aim to understand the role of sea wave transport and the effect on the settling velocity of MPs



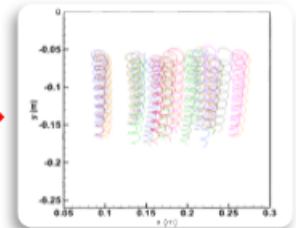
Example of MPs used in the experiments



Recorded frame

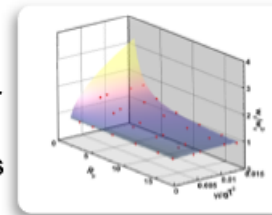


Tracking of the MPs trajectories

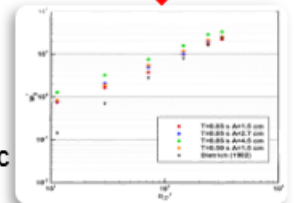


Measured MPs trajectories

New formula from nonlinear fittings of the measurements



Sea-wave Increased settling velocity of heavy plastic particles



# Lab-in-charge and Technical Staff

## Lab-in-Charge



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Tuesday to Friday 8:45am – 12:30pm, 1:30pm – 5:30pm

(excluding Saturday, Sunday & public holidays)