

AVVISO DI SEMINARIO

(22 Luglio 2024, ore 11:00 – 12:00, Aula IDR1, sede di Idraulica del
DESTEC, Università di Pisa)

Corso di Dottorato in Ingegneria dell'Energia, dei Sistemi, del
Territorio e delle Costruzioni

Corso di Dottorato Industriale in Analisi e Controllo delle Strutture
e Opere d'Arte Infrastrutturali

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Programma:

Universal law of pier scour: an application of turbulence phenomenology

Abstract:

A plethora of studies, in the last six decades, have been carried out to formulate the equilibrium scour depth at piers. Despite several attempts, the researchers remain far to achieve a unique relation for the same, because the existing relations traditionally rely on the empiricism. This keynote presents a breakthrough—the universal scaling law of equilibrium scour depth at a circular pier embedded in a sediment bed (in clear-water scour condition) stemming from the turbulence phenomenological theory. The result reveals that the equilibrium scour depth to pier diameter ratio obeys the two-fifths scaling law with the newly coined pierscour number, that accounts for all possible parameters participating in a local scour phenomenon, namely approach mean flow velocity, threshold shear velocity for sediment grain motion, approach flow depth, pier diameter, and sediment grain size. Importantly, the scaling law contains an additional term in the form of a product of the drag coefficient raised to the power $2/5$. The additional term takes account of the pier shape effect on the equilibrium scour depth. The derived unique scaling law preserves the dimensional homogeneity and corroborates with the laboratory experimental measurements.