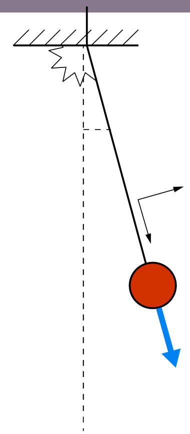
FLUID-CONVEYING PENDULUM



Added mass Added damping No effect

ANGULAR ROTATION THEOREM

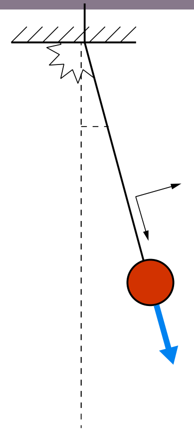
$$T_{Solid-Fluid} = \frac{\partial}{\partial t} \int_{\text{Fluid domain}} x^2 M \dot{\theta} dV + \int_{\text{Fluid boundaries}} \left(x^2 M \dot{\theta}\right)\left(\underline{U}.\underline{\mathrm{n}}\right) dS$$

Intermediate velocity: $\dot{\theta}$ Frozen in time 0

Any velocity: $\dot{\theta}(t)$ $\qquad \frac{M}{3}\ddot{\theta}$

$$\boxed{T_{Solid-Fluid} = \frac{M}{3}\ddot{\theta} + MU_R\dot{\theta}}$$

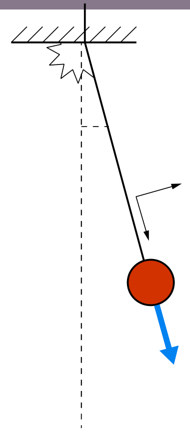
THE FLUID-CONVEYING PENDULUM AT **ANY** REDUCED VELOCITY

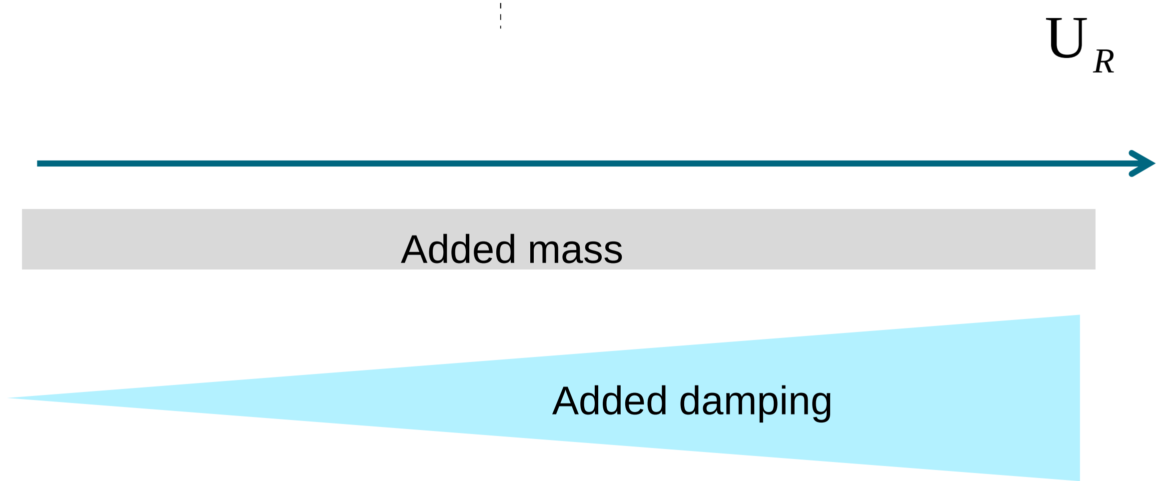


$$\left(1+\frac{M}{3}\right)\ddot{\theta}+MU_R\dot{\theta}+\theta=0$$

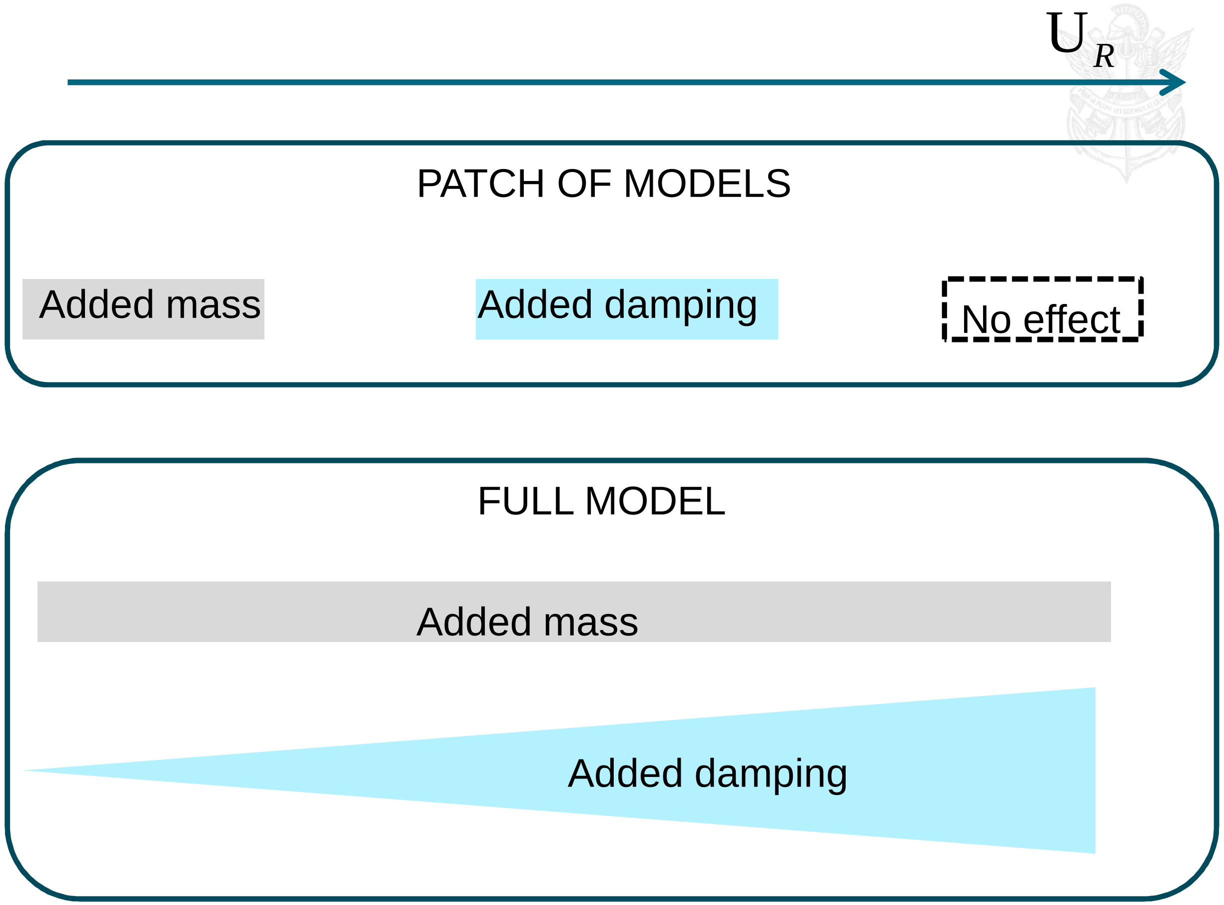
Added mass   Added Coriolis damping

THE FLUID-CONVEYING PENDULUM
AT ANY REDUCED VELOCITY





FLUID-CONVEYING PENDULUM AT ANY REDUCED VELOCITY



MODELS FOR FLUID SOLID INTERACTIONS

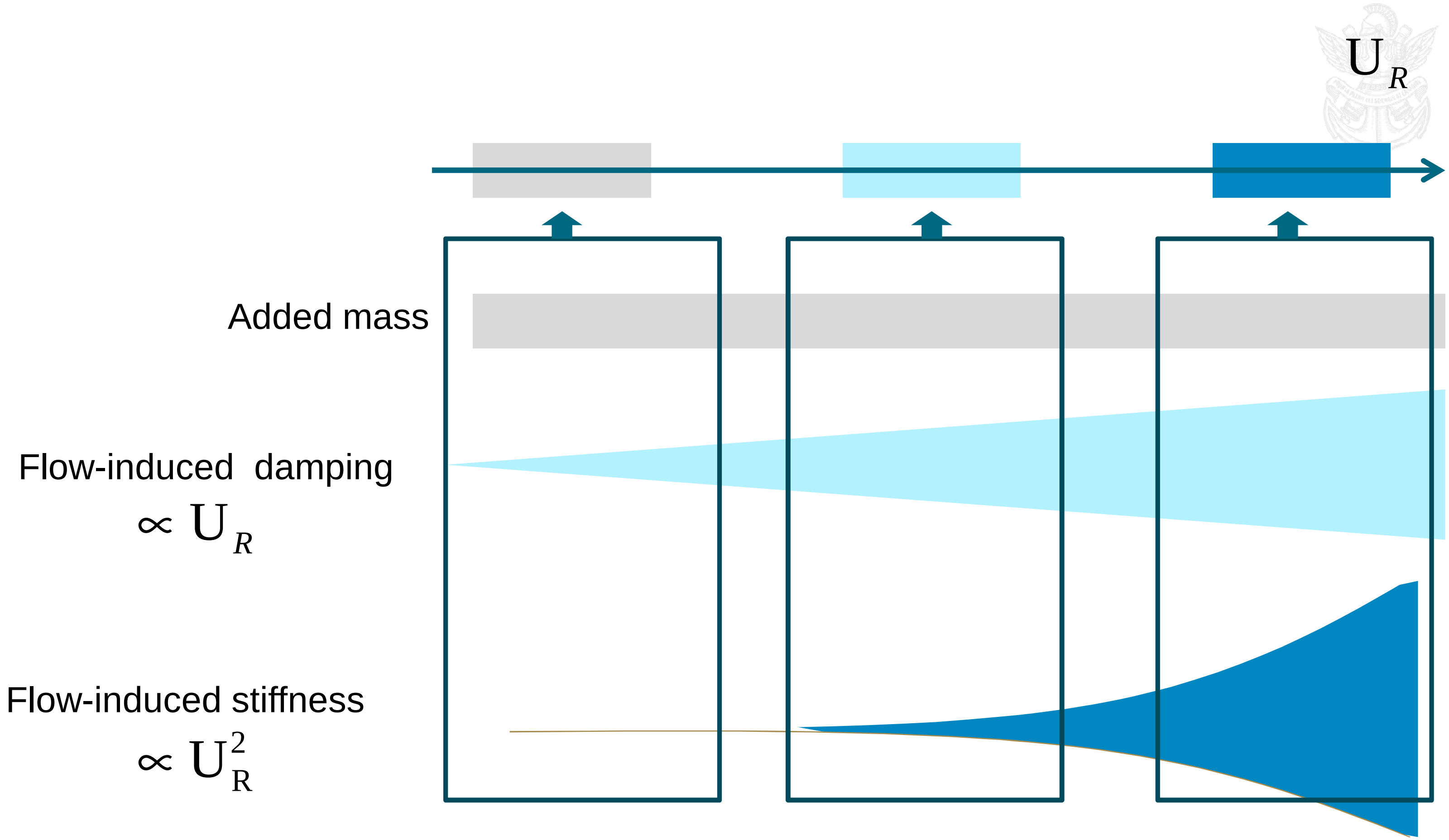
U_R

Constant

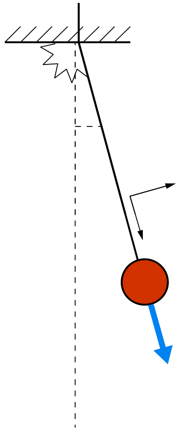
$\propto U_R$

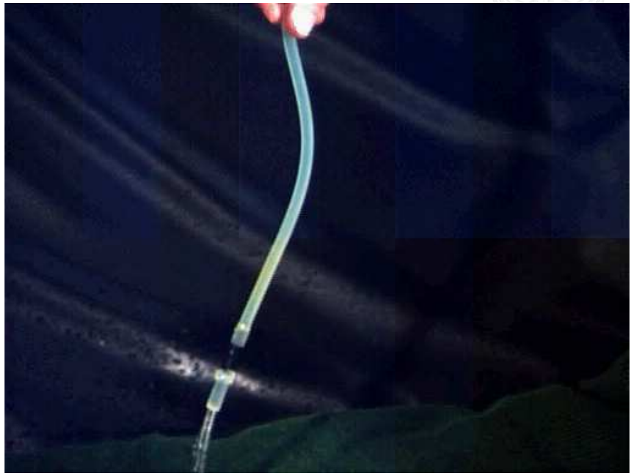
$\propto U_R^2$

MODELS FOR FLUID SOLID INTERACTIONS



THE FLUID-CONVEYING PENDULUM : ANY REDUCED VELOCITY





THE FLUID-CONVEYING PENDULUM : ANY REDUCED VELOCITY