「河川横断工作物下流側の河床保護と連続性確保の考え方」

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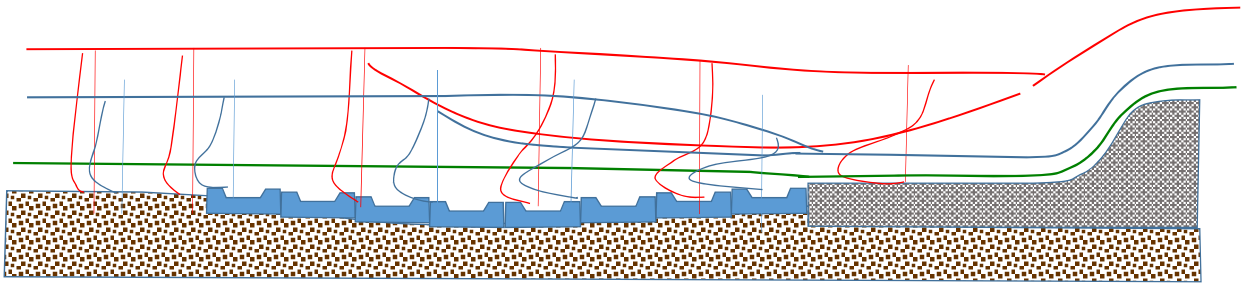
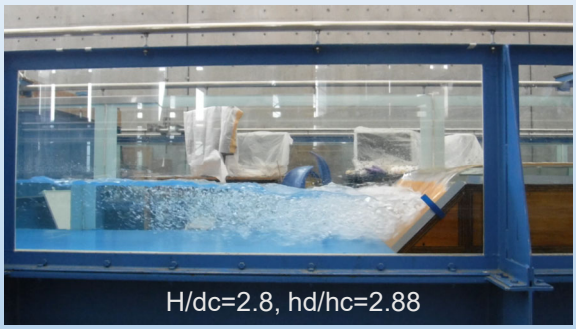
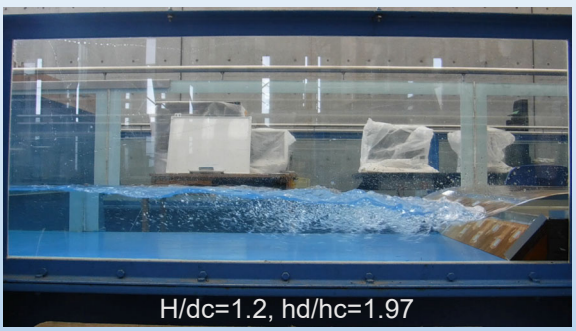
Low Drop Structure

Installation of protection blocks below low drop structure



Flow condition of plunging flows





Development of main flow

x : water surface profiles

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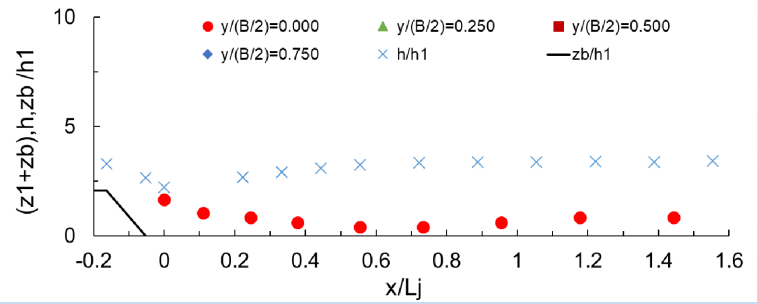

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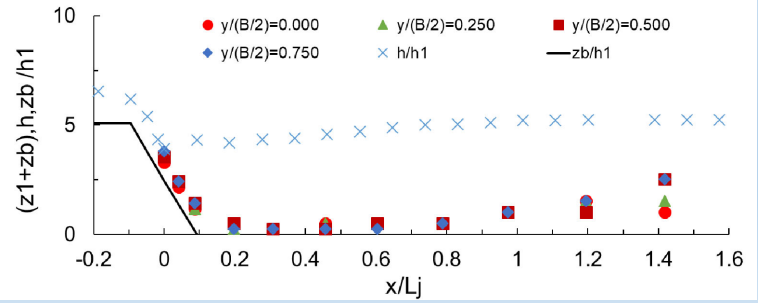
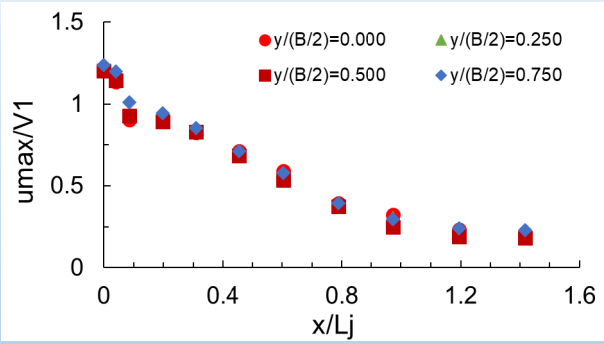


Maximum velocity decay



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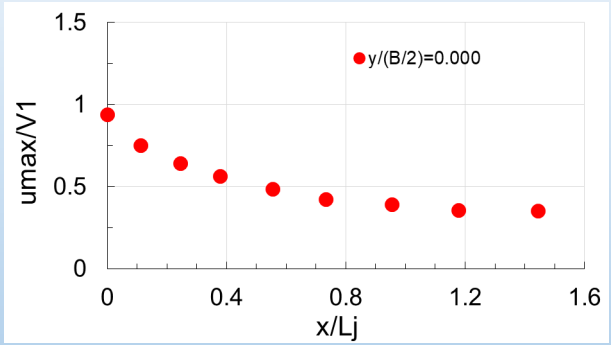

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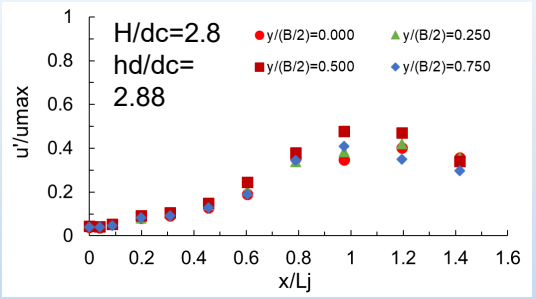
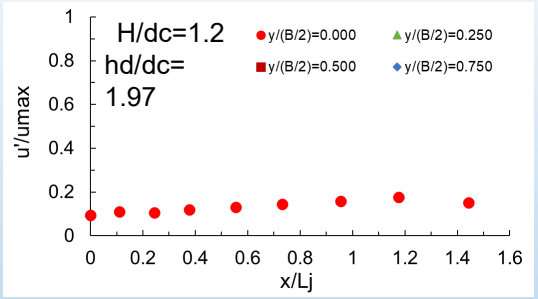
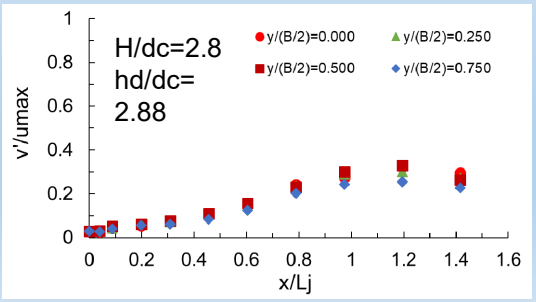
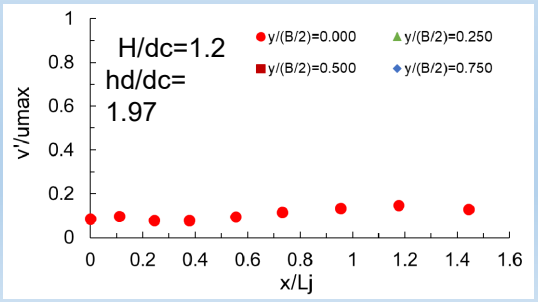
Non dimensional turbulent intensity for x and y directions









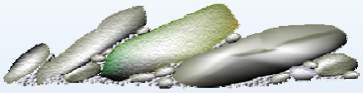
Topics of my presentation

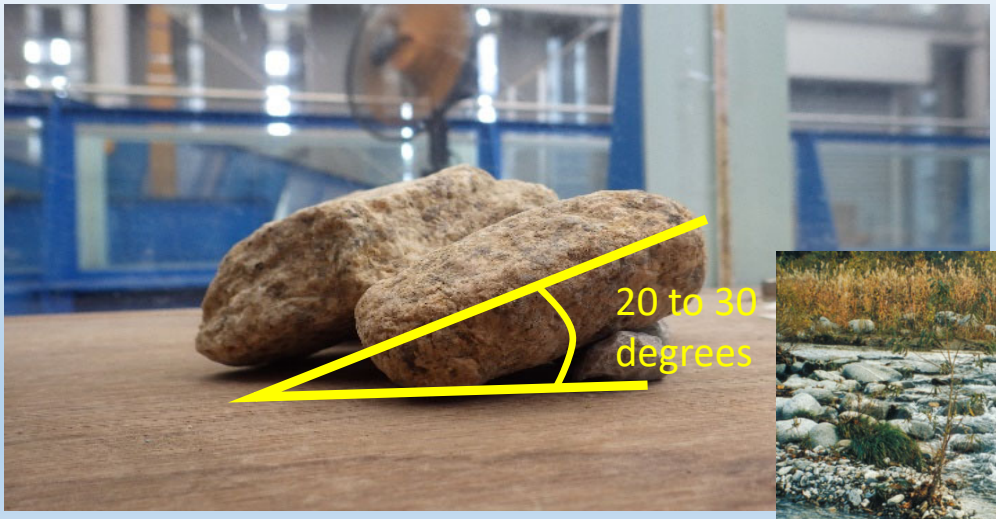
- The Jump Formation below low drop structure is effective as an energy dissipator?
- How should we propose energy dissipator as a hydraulic design at connection between stilling basin and river?
- Proposal of stacked boulders
- Energy dissipator with sloping stacked boulders
- Possibility of fish passage with stacked boulders

Flow condition in stacked boulders below a fish passage

Stacked boulders below check dam with a compound section

Formation of Stacked boulders





Experiments on stacked boulders

1 列設置の場合

Case 1（石を置いた場合）

Case 2（石を組んだ場合　傾斜角度を 20 度程度にした場合）

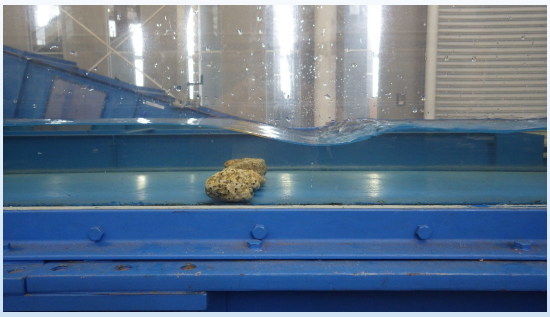
Case 3（石を組んだ場合　傾斜角度を 45 度程度にした場合）

2 列の場合

Case 4（石を置いた場合）

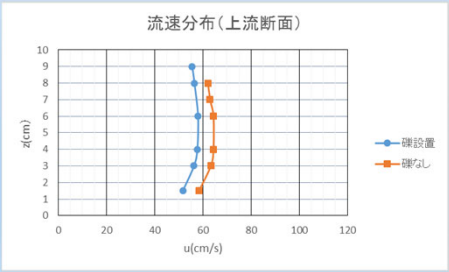
Case 5（石を組んだ場合　はじめの傾斜角度を 20～30 度にした場合）

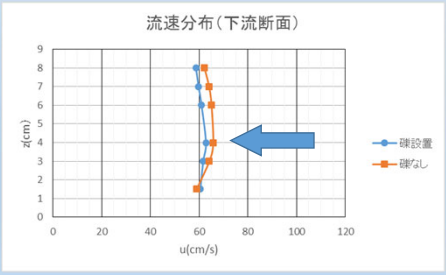
$$\tau_* = \frac{\left(\frac{F_D}{A}\right)}{\rho\left(\frac{\gamma}{w} - 1\right)S}$$

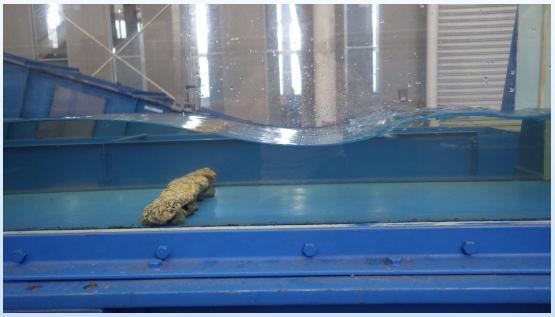


Case 1

Kinematic Viscosity ν (m^2/s)	Reynolds number Re
1.00×10^{-6}	5.31×10^{4}
Drag force acting on stacked boulders for critical condition (kgf)	Non dimensional drag force acting on stacked boulders
1.196×10^{-1}	2.42×10^{-1}

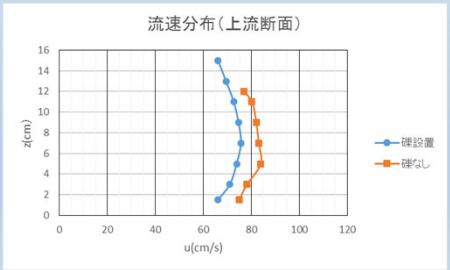


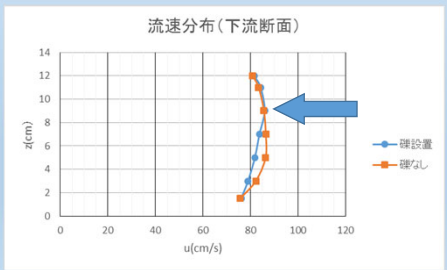


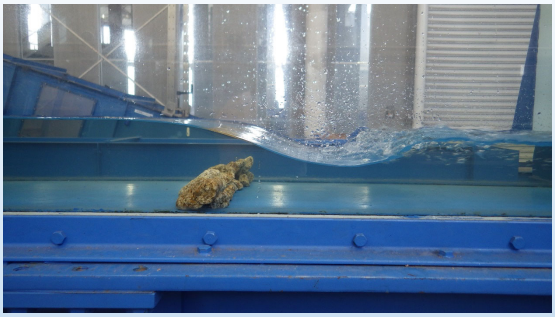


Case 2

Kinematic Viscosity ν (m^2/s)	Reynolds number Re
1.00×10^{-6}	1.07×10^{5}
Drag force acting on stacked boulders for critical condition (kgf)	Non dimensional drag force acting on stacked boulders
1.945×10^{-1}	4.07×10^{-1}

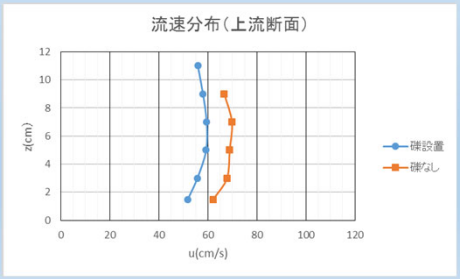


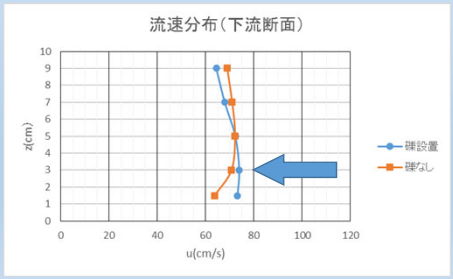




Case 3

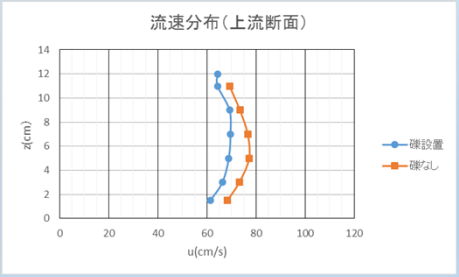
Kinematic Viscosity ν (m^2/s)	Reynolds number Re
1.00×10^{-6}	6.74×10^{4}
Drag force acting on stacked boulders for critical condition (kgf)	Non dimensional drag force acting on stacked boulders
1.362×10^{-1}	3.70×10^{-1}

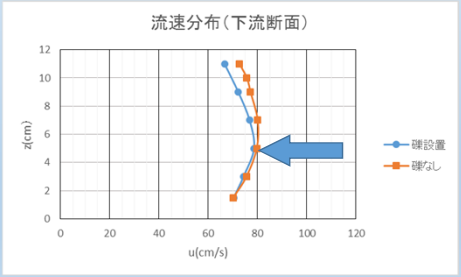


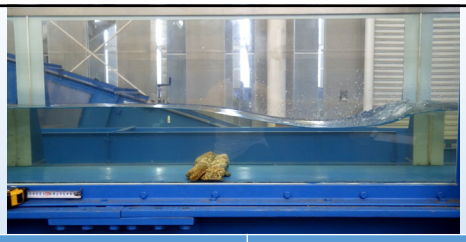


Case 4

Kinematic Viscosity ν (m^2/s)	Reynolds number Re
1.00×10^{-6}	8.44×10^{4}
Drag force acting on stacked boulders for critical condition (kgf)	Non dimensional drag force acting on stacked boulders
1.21×10^{-1}	1.48×10^{-1}

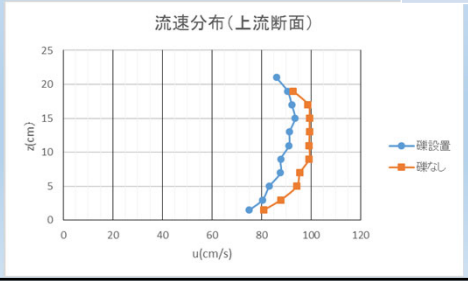


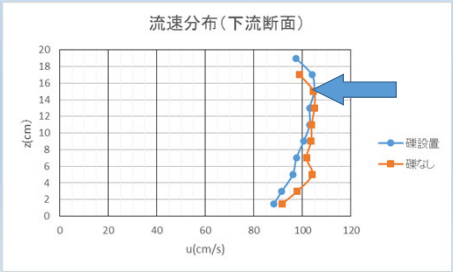


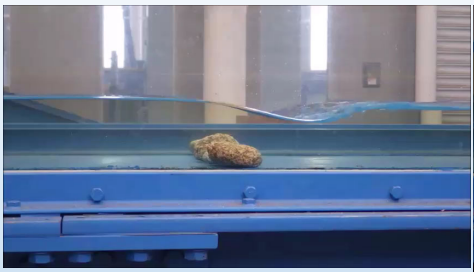


Case 5

Kinematic Viscosity ν (m^2/s)	Reynolds number Re
1.00×10^{-6}	1.91×10^{5}
Drag force acting on stacked boulders for critical condition (kgf)	Non dimensional drag force acting on stacked boulders
1.91×10^{-1}	3.50×10^{-1}

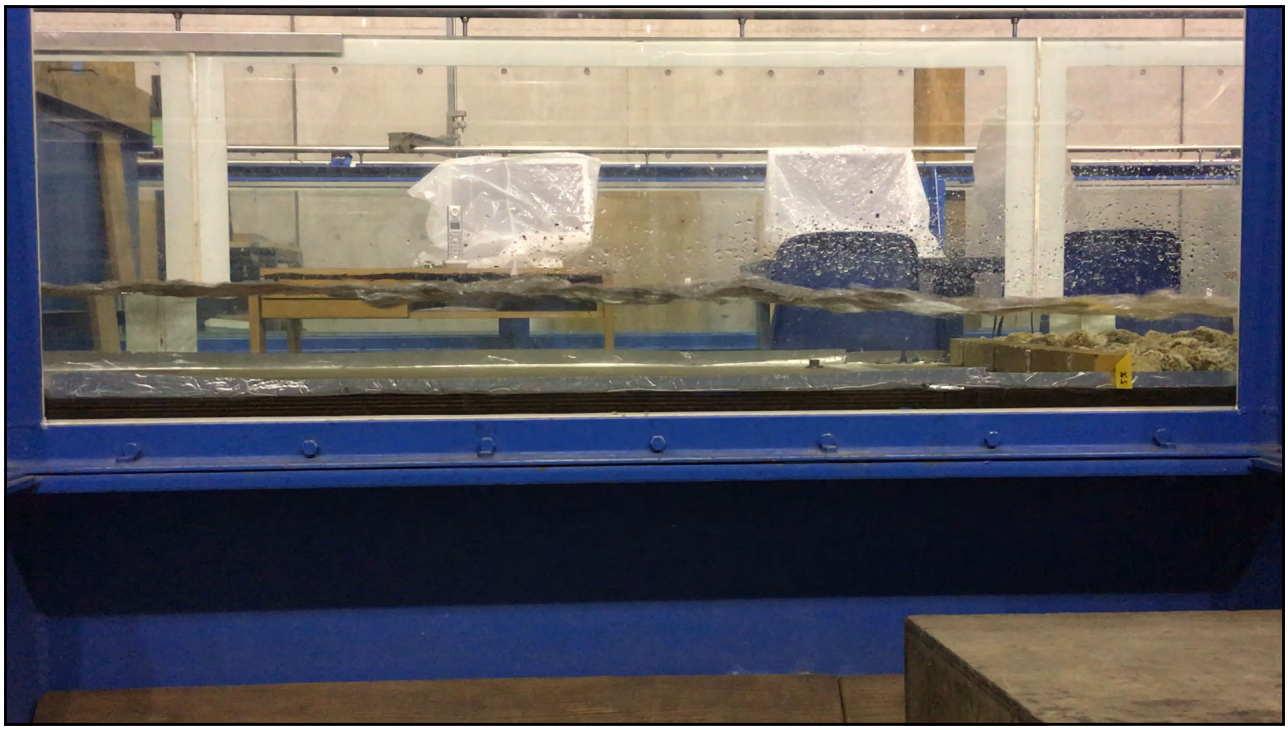


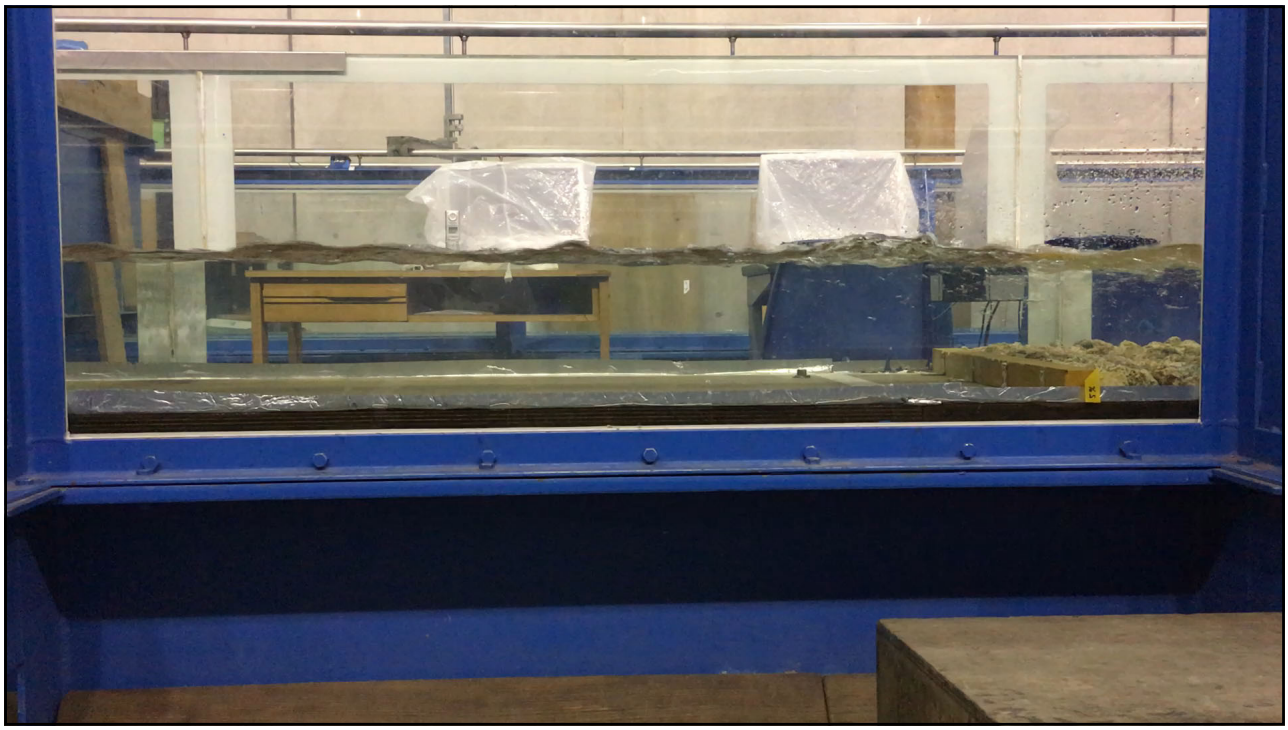


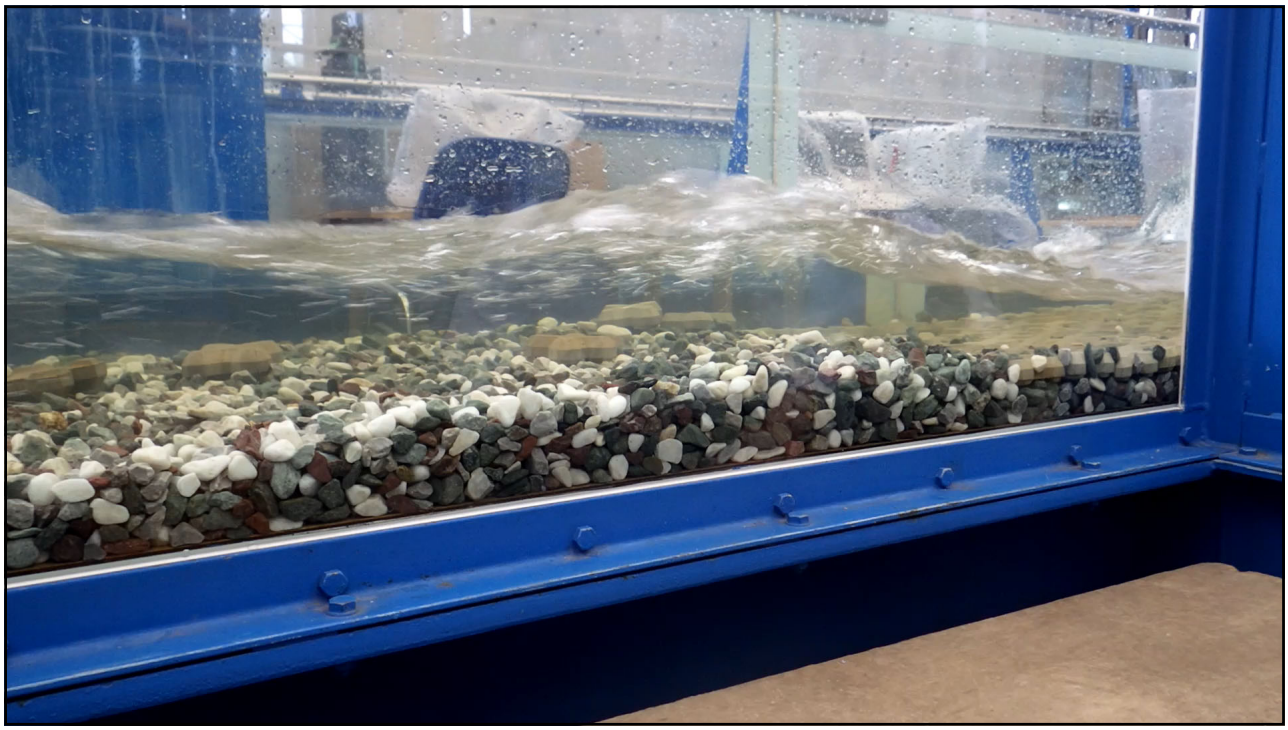


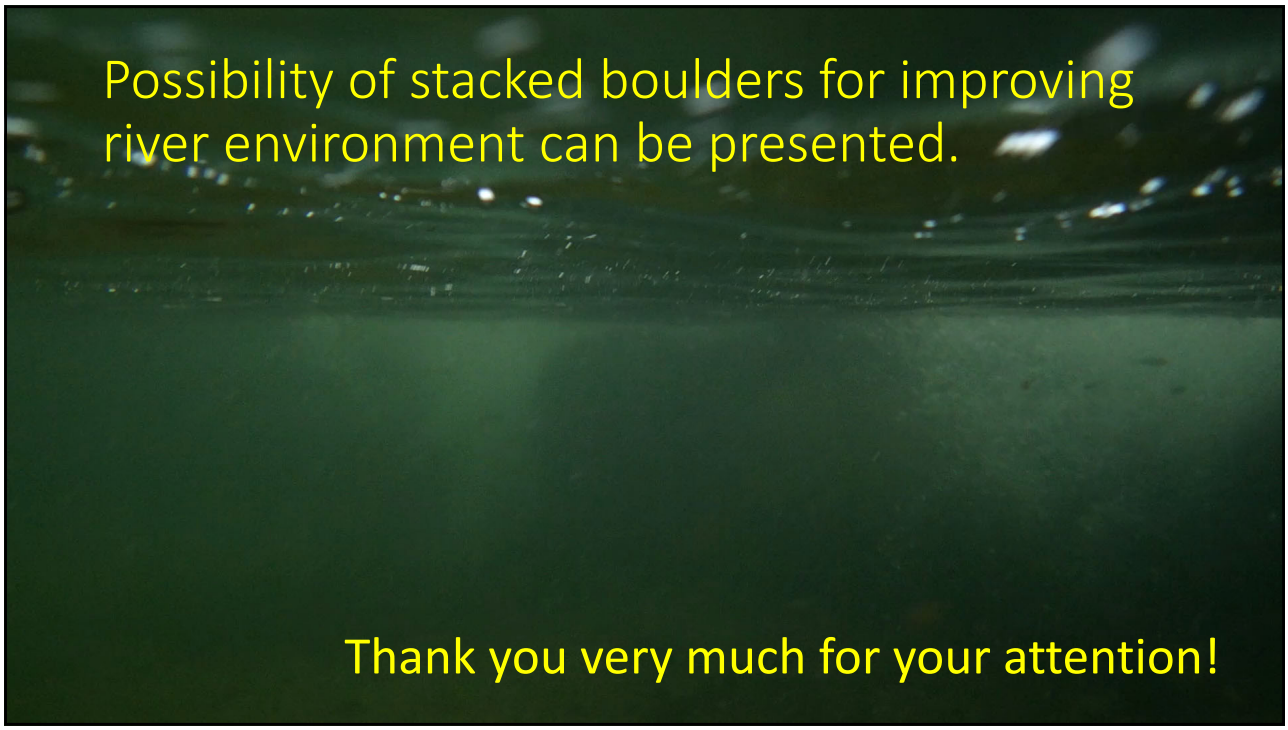
Beginning motion of stacked boulders

Proposal of sloping stacked boulders as an energy dissipator








Possibility of stacked boulders for improving river environment can be presented.
Thank you very much for your attention!