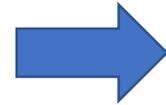# Sediment transport and channel changes : Harada Daisuke
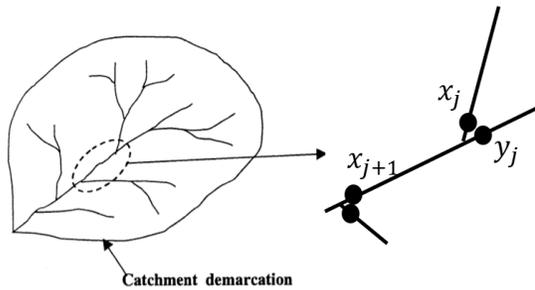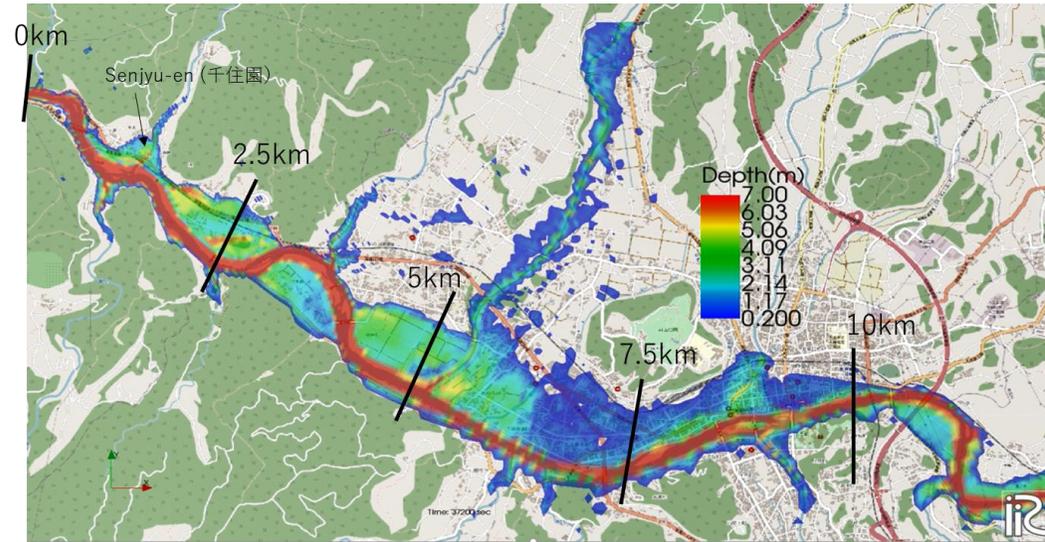
Meteorology, Hydrology
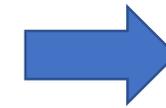
Sediment transport in basin scale

Catchment demarcation

$x_j$
$y_j$
$x_{j+1}$

Flood flow with sediment

0km
Senjyu-en (千住園)
2.5km
5km
7.5km
10km

Depth(m)
7.00
6.03
5.06
4.09
3.11
2.14
1.17
0.200

Time: 37200sec

Kuma river flood disaster, 2020

Risk communication

VR contents

Hazard map

River planning

Experiment

Sediment transport model

Driftwood model
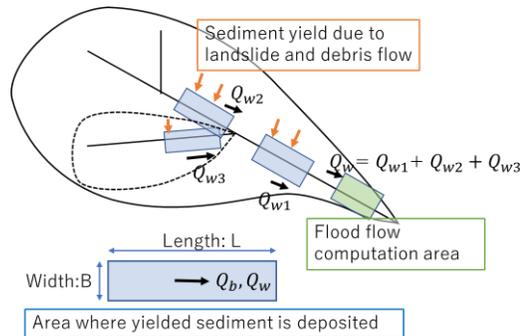
Bank erosion model

Gofukuya river

Dyke breach

Original channel

a bridge

The Akatani river

赤谷川

River channel

200m

N

Before flood

Immediately after flood

Akatani river, 2017

Gofukuya river, 2019

ICHARM has been conducting research on floods with a massive transport of sediment, which have been frequent in Japan in recent years, to clarify their mechanisms and phenomena and study effective methods for sharing information in the event of such disasters.

Development of methods to evaluate sediment and driftwood transport with flood flow
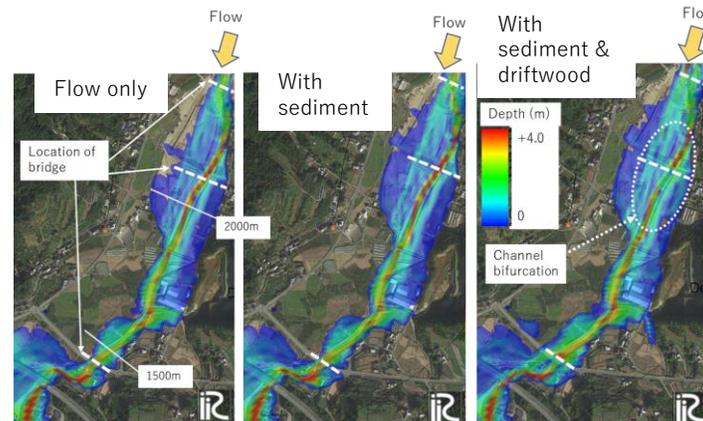
①Basin scale

Sediment yield due to landslide and debris flow

$Q_{w2}$

$Q_{w3}$

$Q_{w1}$

$Q_w = Q_{w1} + Q_{w2} + Q_{w3}$

Flood flow computation area

Length: L

Width: B

$Q_b, Q_w$

Area where yielded sediment is deposited

The wash load inflow supplied from the mountainous area to the basin is therefore evaluated as a summation of the wash load production from the respective areas indicated as blue rectangles.

②2D model

Analysis of the Akatani river flood disaster

Flow

Flow

Flow

Flow only

With sediment

With sediment & driftwood

Location of bridge

Depth (m)
+4.0
0

2000m

Channel bifurcation

1500m

Development of method to evaluate driftwood in terms of convection-diffusion equation

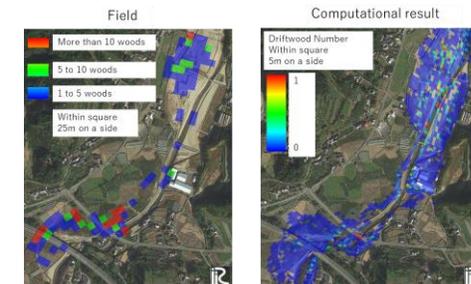In case of: $\partial z / \partial t > 0$

$$\frac{\partial C_{drf} h}{\partial t} + \frac{\partial C_{drf} uh}{\partial x} + \frac{\partial C_{drf} vh}{\partial y}$$
$$= \frac{\partial}{\partial x}\left(\varepsilon_x h \frac{\partial C_{drf}}{\partial x}\right) + \frac{\partial}{\partial y}\left(\varepsilon_y h \frac{\partial C_{drf}}{\partial y}\right) - c_* \frac{\partial z}{\partial t} C_{drf} r(t, x, y) - v_n C_{drf} p_b \delta(x - x_i, y - y_i)$$

$C_{drf}$ : Driftwood concentration

$S$ : Driftwood volume in the riverbed

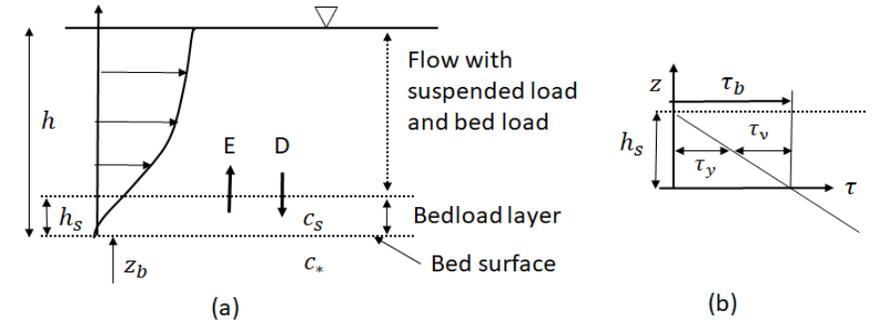(Harada et al., (2019))

Driftwood computation

Field

Computational result

More than 10 woods

5 to 10 woods

1 to 5 woods

Within square 25m on a side

Driftwood Number Within square 5m on a side
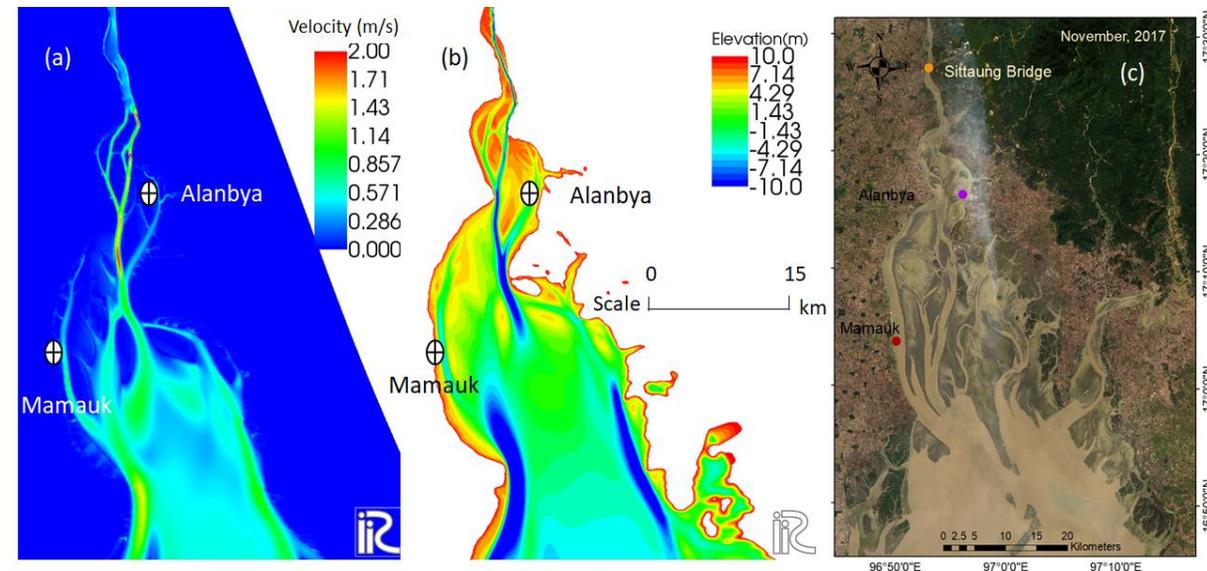1
0

# 2. Research in the Sittaung river, Myanmar

## Field survey



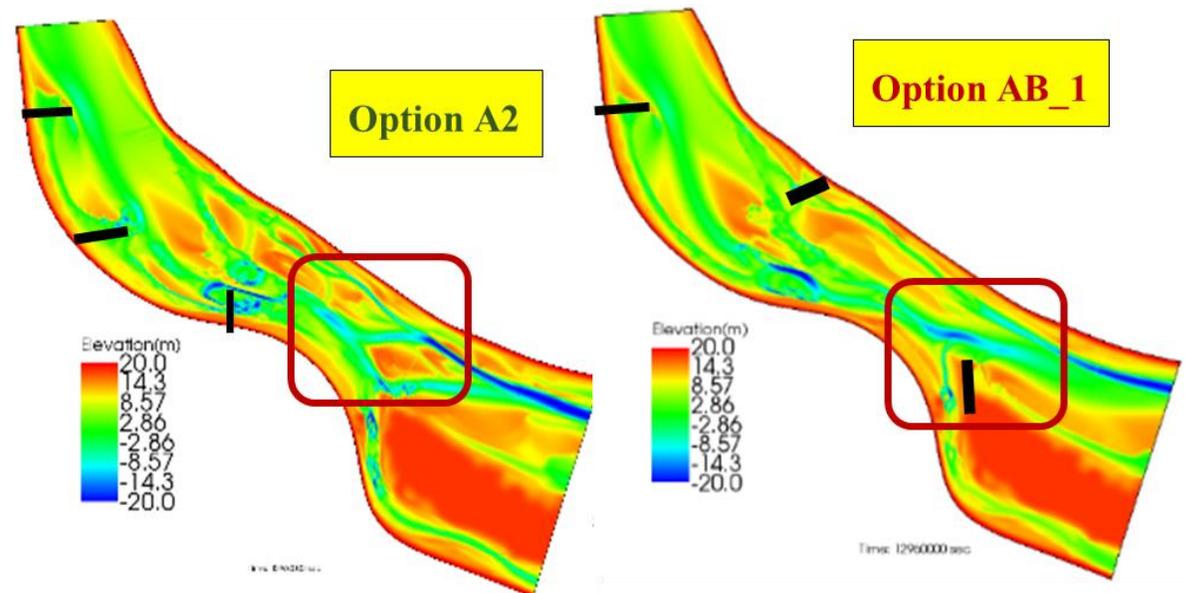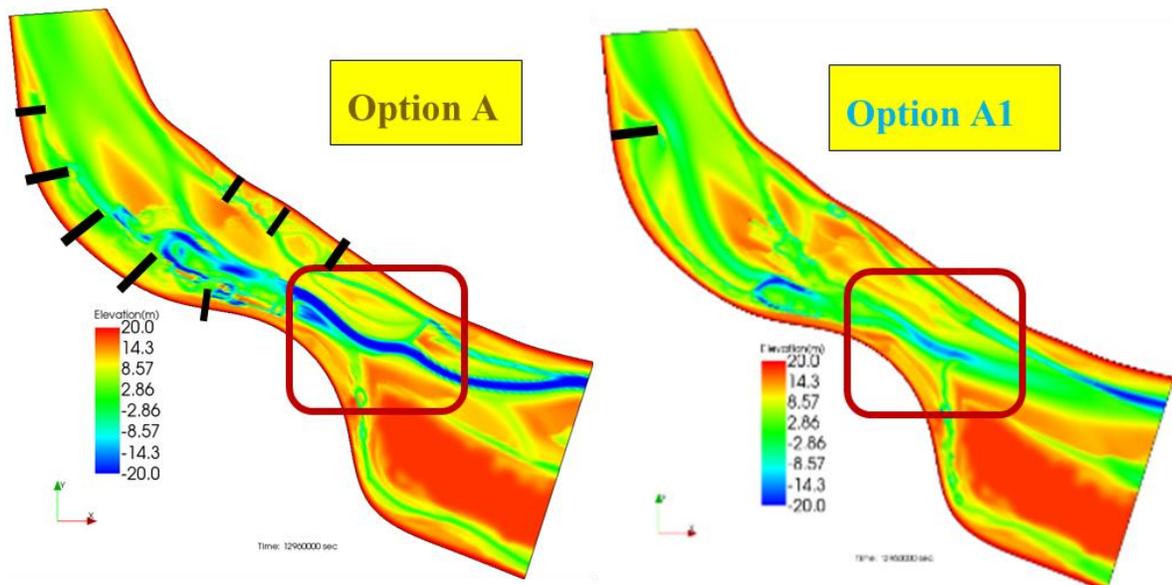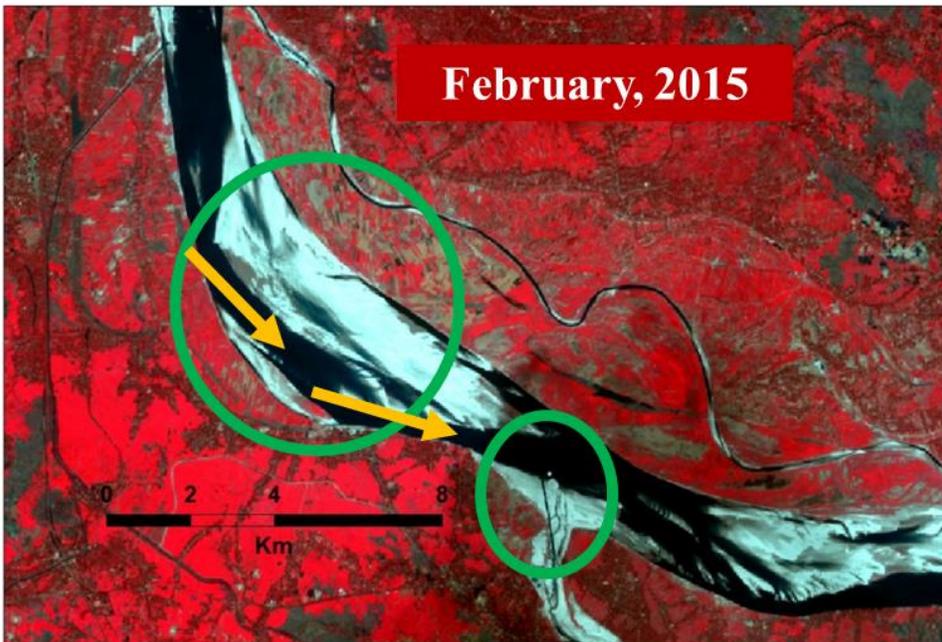## Development of new sediment model



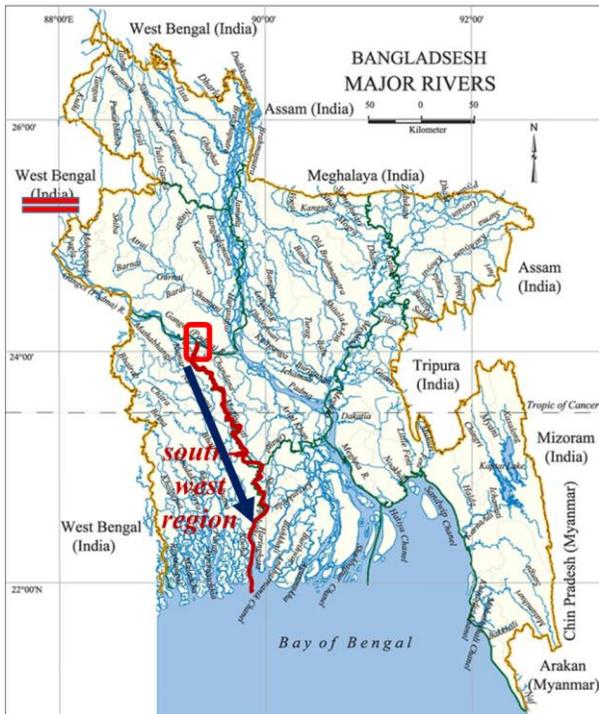## Topographic changes by satellite image (1972-2018)



## Numerical simulation on the development of sand bar with bank erosion

BANGLADSESH
MAJOR RIVERS

south west region

February, 2015

Option A

Option A1

Option A2

Option AB_1

As a researcher, as a river engineer