GUI Equipped user friendly debris flow simulator “Kanako (Ver.1.41)” handy manual

Laboratory of Erosion Control
Graduate School of Agriculture, Kyoto University
Kana Nakatani

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Topics

- Modification from Kanako (Ver.1.40)
- Modification from Kanako (Ver.1.02)
- Setting file and execute file
- Main functions
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    - Landform (topography, river width, movable bed layer thickness)
    - Supplied hydrograph from upstream end
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    - Hydrograph observation point
  - Running simulation
    - Explanation of result animation
    - Save result
- Reference

Modification from Kanako (Ver.1.40)

- When you set the river condition with no sabo dam, slow grade, and large supplied material, upstream end calculation point deposition sometimes calclated improperly.
- In river data file, there is a parmaeter determining existence or nonexistence of sabo dam; 0 as nonexistence and 1 as existence. But when saving river data without sabo dam, the parameter is saved as 1.
  - But other parameter for sabo dam number will be set as 1, so there was noproblem for simulation.
- We improved this issue.

We upgraded Kanako to Ver.1.41,
but you can also read and use the Ver.1.40 Kanako 1D river data.

Modification from Kanako (Ver.1.02) and Notice

- The target is stony debris flow. Yet immature debris flow and bed load transport is also in the subject.
- You van change the material concentration .of supplied hydrograph.
- We consider 2 grain size in Kanako (Ver.1.40).
- Initial movable bed layer can be set from 0m to 10 m range.

- When you start running simulation or save the input data, hydrograph observation points and sabo dams are set in numerical order from the upstream end automatically.

Composing files in Kanako (Ver.1.40)

- When you start ‘kanako’, default file and exe file must be set in the same folder.
- And it is better to keep default file unchanged, so when you want to change some parameters, please copy and make another file.

- After starting, you can read or save files following the normal procedure for reading or saving data.

Reading, saving, and modifying the landform data

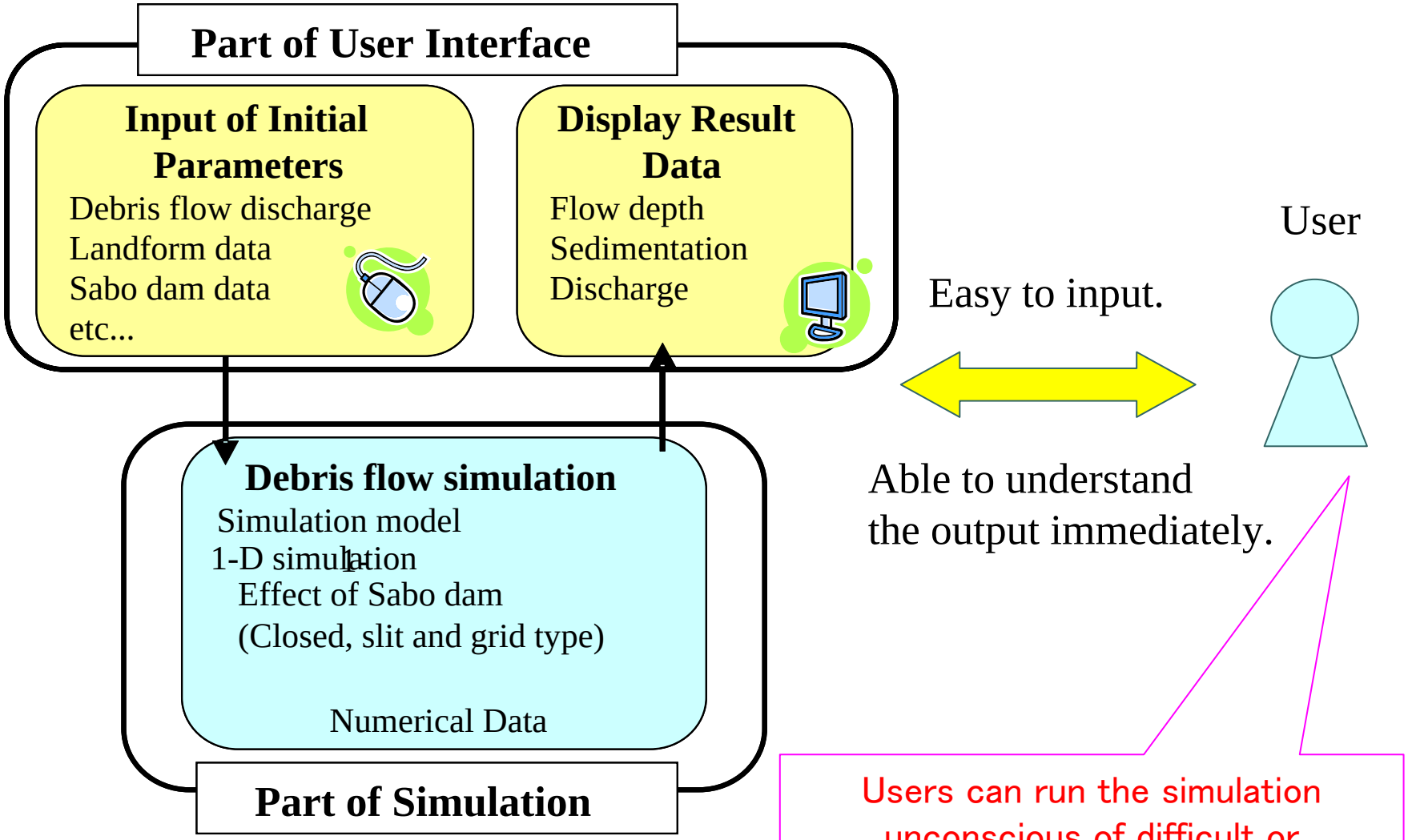
- You can save or read the setting data as DAT. or CSV. format.
- You can change the numerical values in the data file directly.
- You can also change the parameters using in the simulation (ex: Manning's roughness coefficient, coefficient of erosion or deposition rate, simulation continuance time, interval of calculation points, time interval of calculation, etc.)

When changing numerical values from file,
please see the details from "Kanako Ver.1.10 handy manual".

Necessary software

- **Microsoft .NET Framework Version 1.1 or newer version**
- Sometimes, PC on Windows XP, kanako can not start. And almost that happens because the version of .NET Framework is old or not installed.
- Maybe error message as following will be displayed.
  ″mscoree.dll could not be found″, ″mscoree.dll could not be loaded″
- In this case, please install NET Framework1.1. or the newer version.
- To install ″NET Framework″, go to Microsoft website, and download ″Microsoft .NET Framework Version Redistributable Package″

System outline

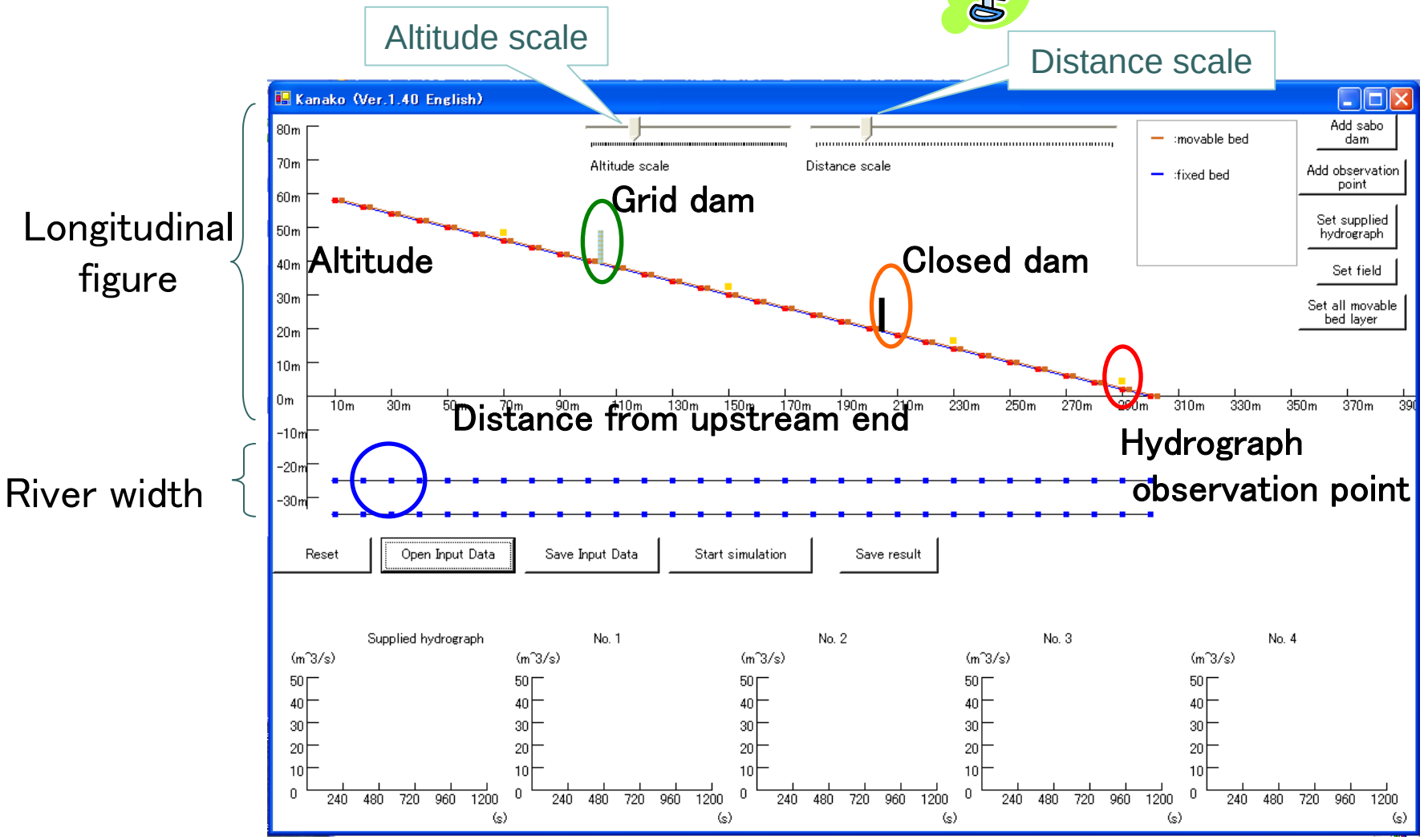


Input main functions in Kanako (Ver.1.40)

	Function details	Explanation
Input	1-D landform	Longitudinal figure on steep gullies
	Sabo dam	Type/height/location/number
	Hydrograph observation point	Number/location
	Supplied hydrograph	Input flow and concentration of debris flow
	Initial movable bed layer	Thickness of movable layer before simulation
	Field	Number of calculation points from 30-50 range.
	Save/Open data	Save/Open all input data

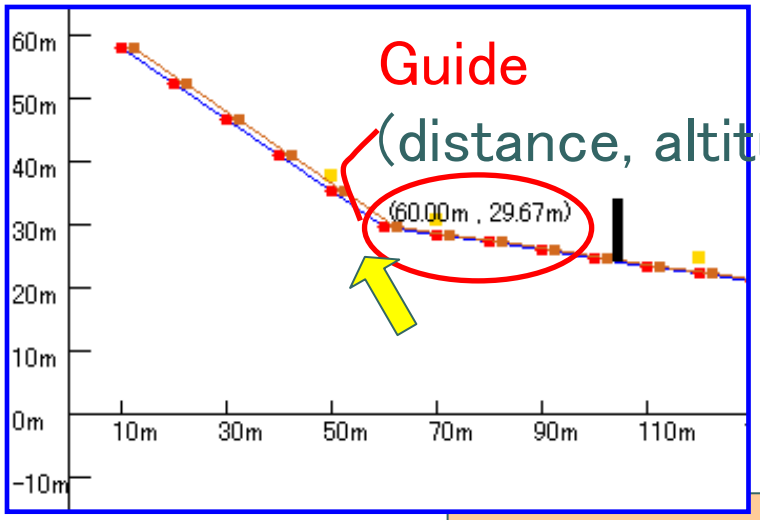
Input (1)

Parameters can basically be input using mouse and checked on monitor.



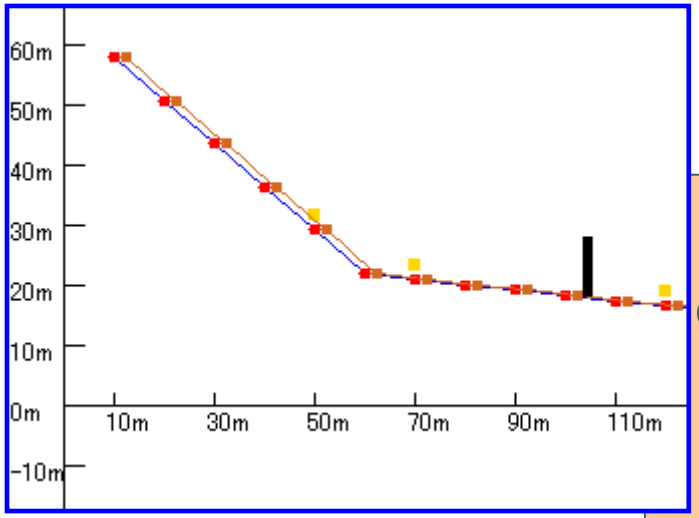
Start screen

Input(2)



Guide
(distance, altitude)

While dragging



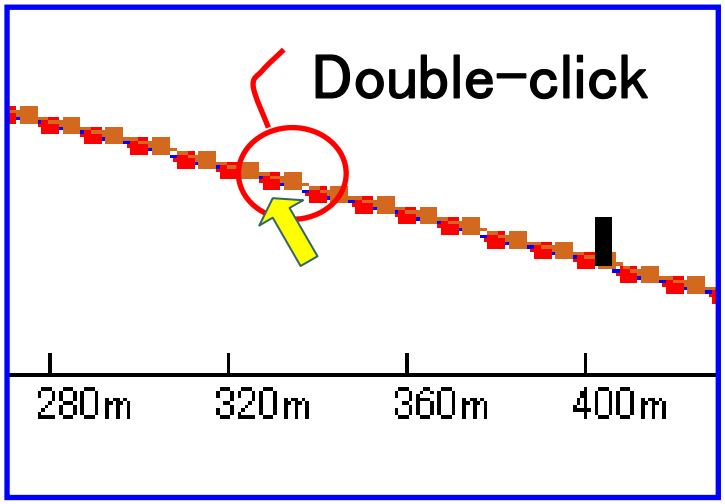
Stop dragging (River profile changed)

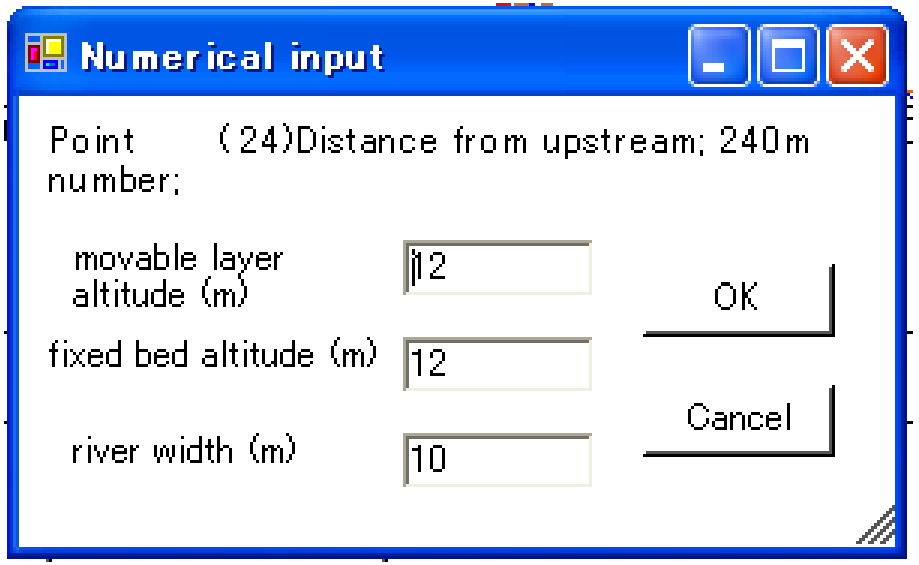
:movable bed

:fixed bed

・You can change the river profile, and supplied hydrograph by dragging the point by mouse.
・While dragging, the guide shows the current point position.

Input(3)

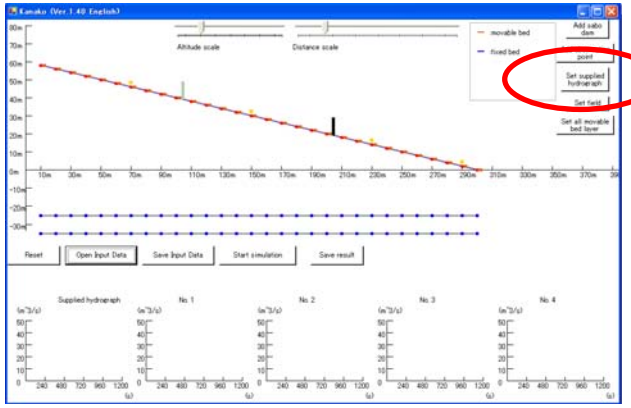




Numerical input screen

・You can also change the landform by double-click the setting point, opening the “Numerical input” screen.

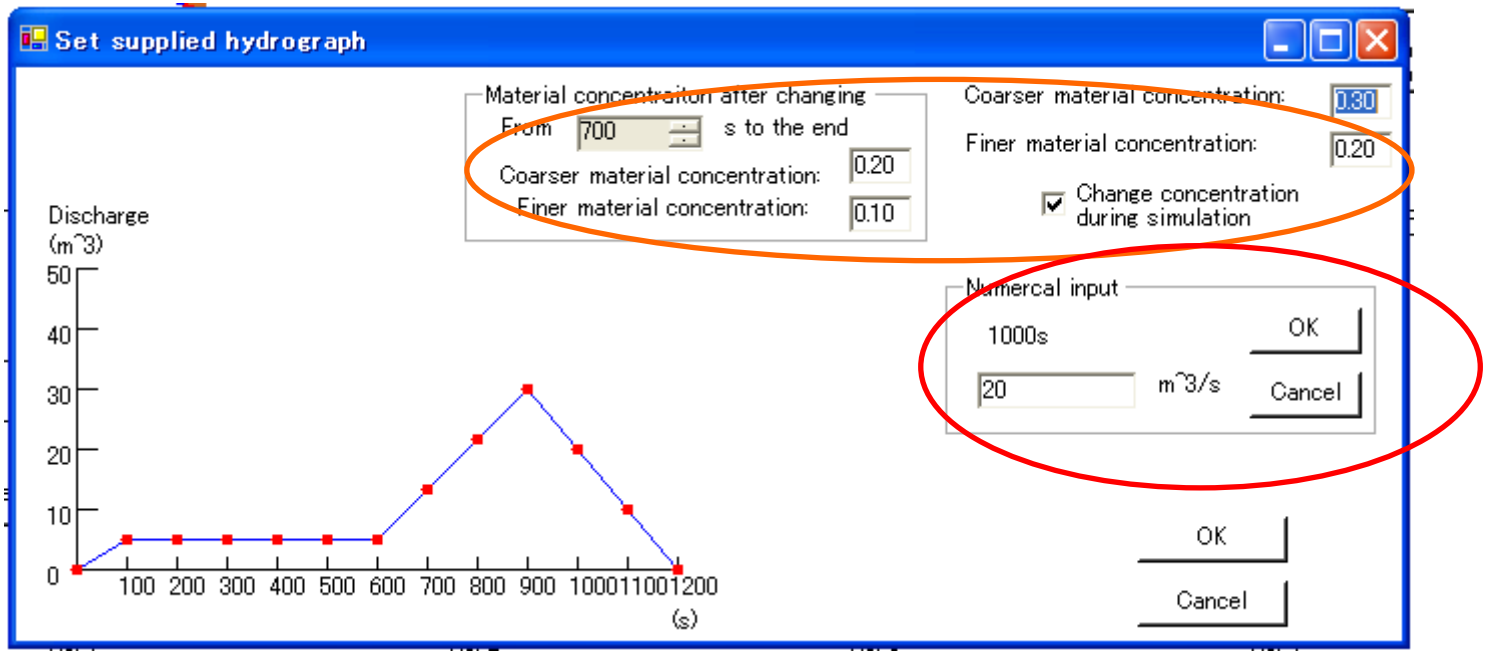
Input(4)



Click and open "Supplied hydrograph" screen

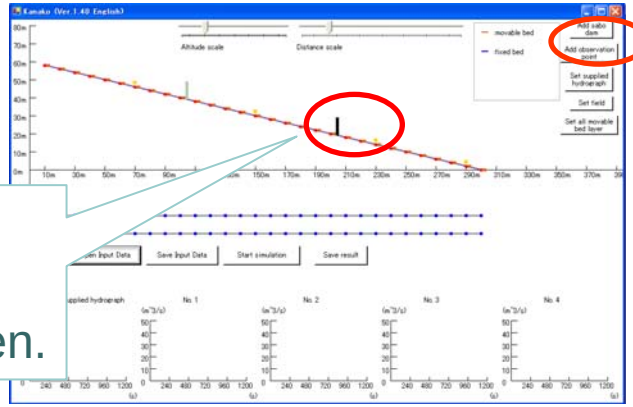
・To change the discharge, drag red points.
・To set detail discharge, double-click the point and input numerical value.

Set sediment concentration
cf1.You can change sediment concentration once during the simulation.
cf2.When changing, check the box and set "Changing time" and "concentration after changing"



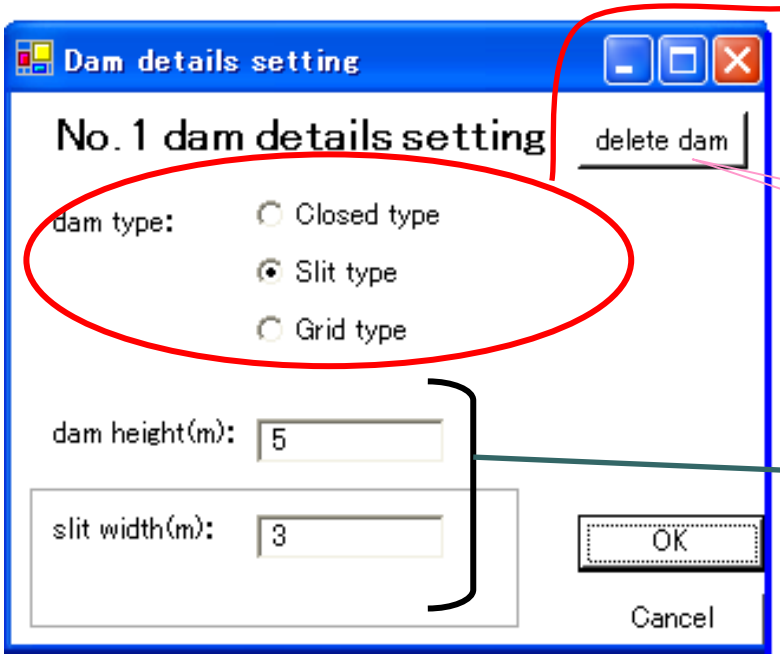
Set supplied hydrograph screen

Input(5)



When you want to add dam, click “Add sabo dam” button then dam will be added on random position.

Double-click the setting “sabo dam” and open “Dam detail setting” screen.



Dam details setting screen

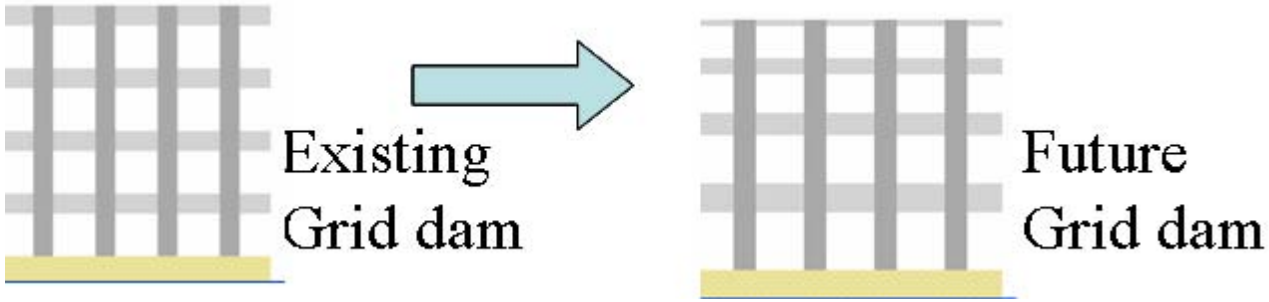
Select the dam type by radio button; closed, slit or grid type.

When deleting dam, click here.

To set the height and slit width of dam, input data to the text box.

When you double-click grid type dam on the start screen or choose grid type dam on dam detail screen, “Set grid dam” screen opens.

Cf. In existing grid type sabo dams, grid diameter and distance between each grid are fixed. But in the future, the diameter and the distance between horizontal columns on the upper part are thinner, will be the main type.



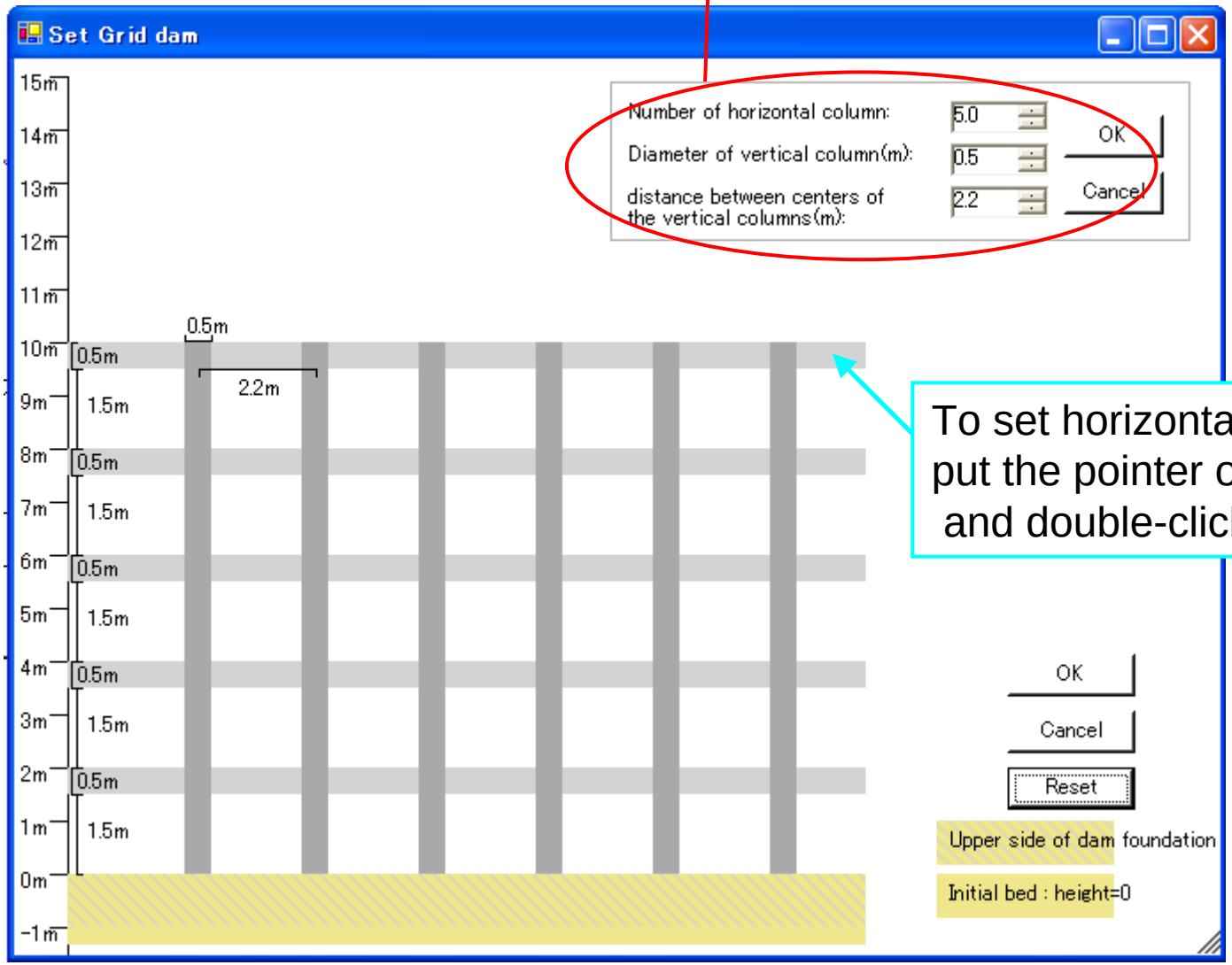
Therefore in Kanako (Ver.1.40), we can set horizontal column diameter and distance **individually**.

Notice that vertical columns' diameter and distance are set to fixed value.

Input(6)

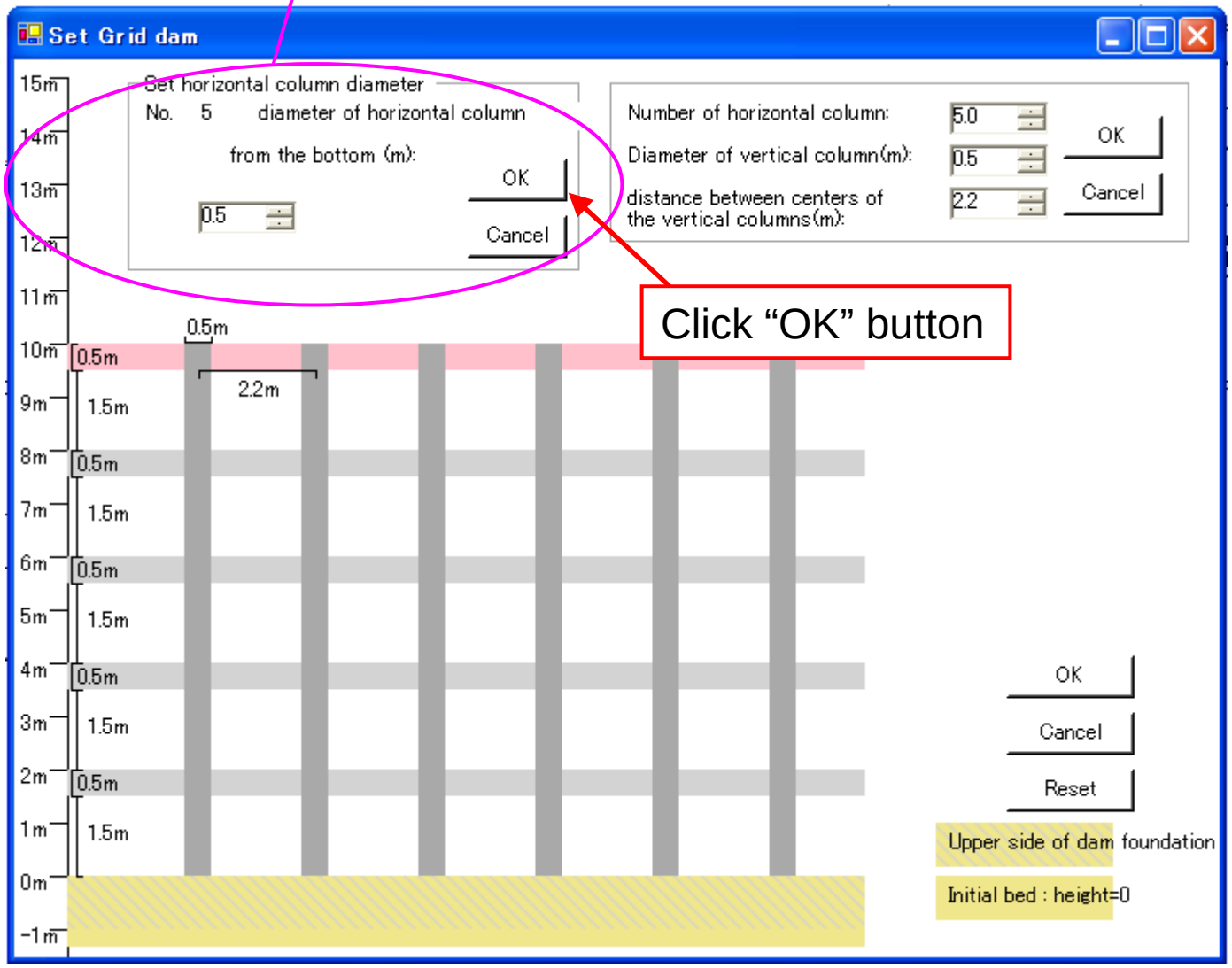
Grid type dam setting screen

Use spin control or directly input numerical value to set grid dam details.

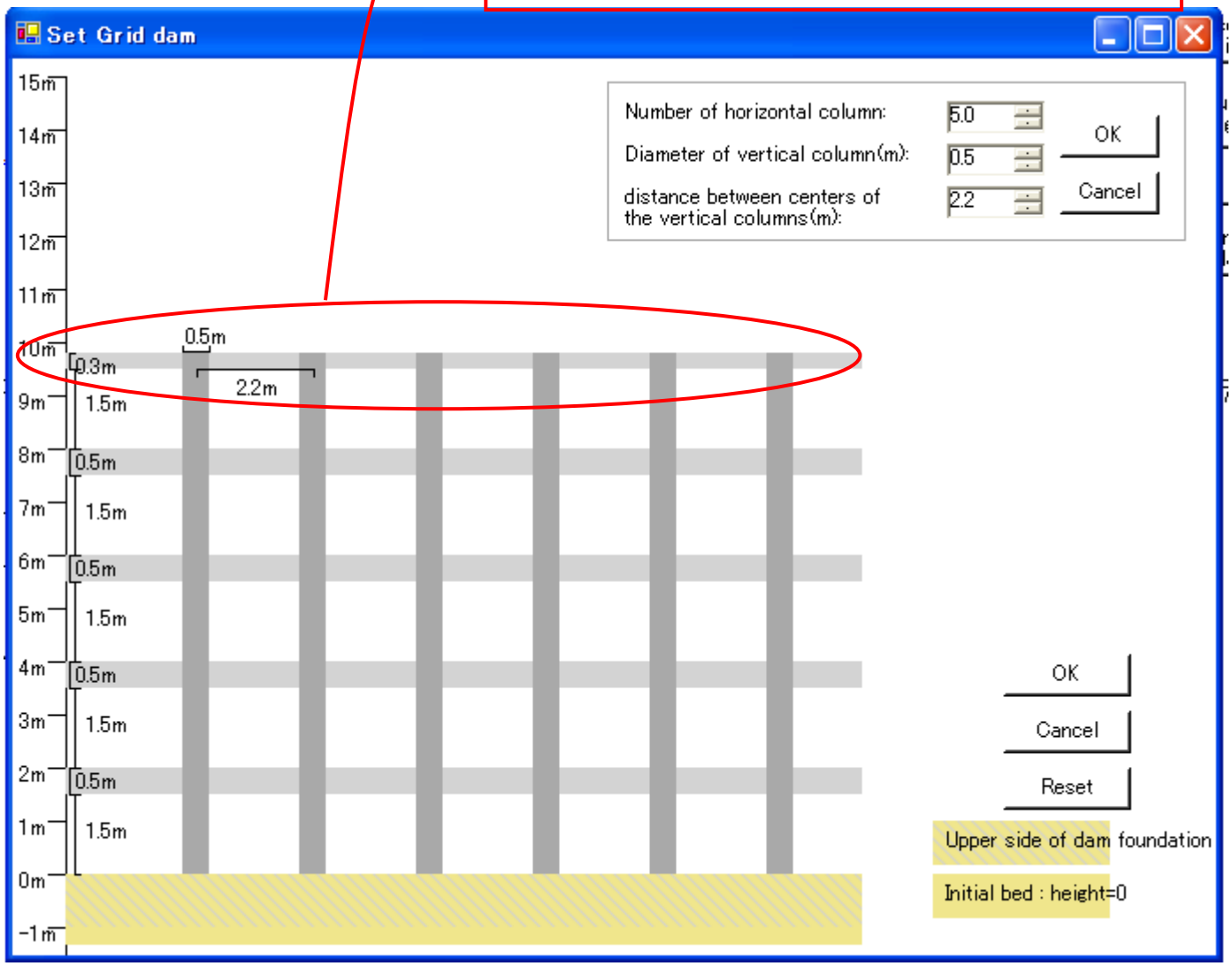


To set horizontal column's diameter, put the pointer on the setting column and double-click.

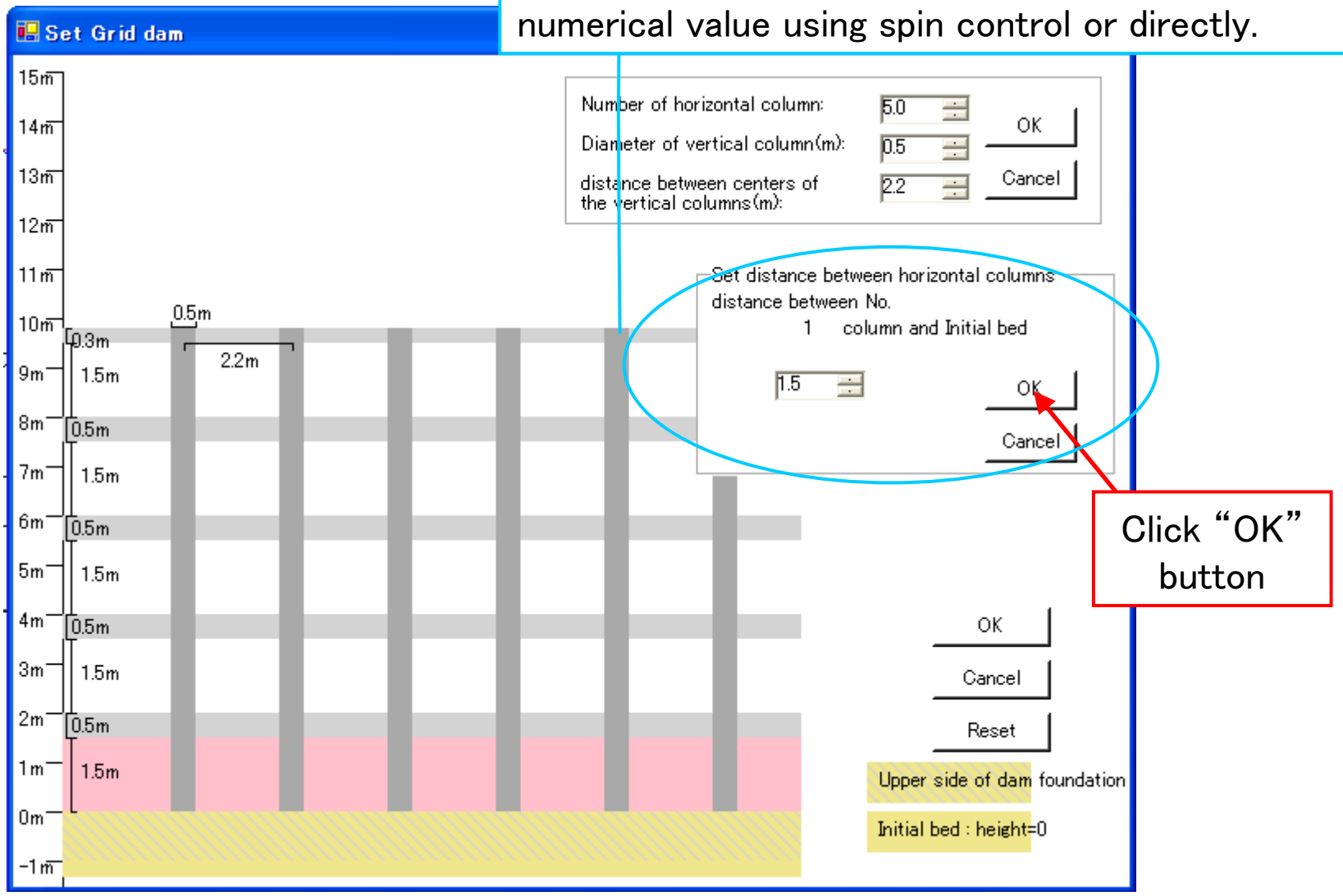
After double-click, horizontal column's color will change and group box appear. Set numerical value using spin control or directly.



Column diameter is changed. from 0.5m to 0.3 m.

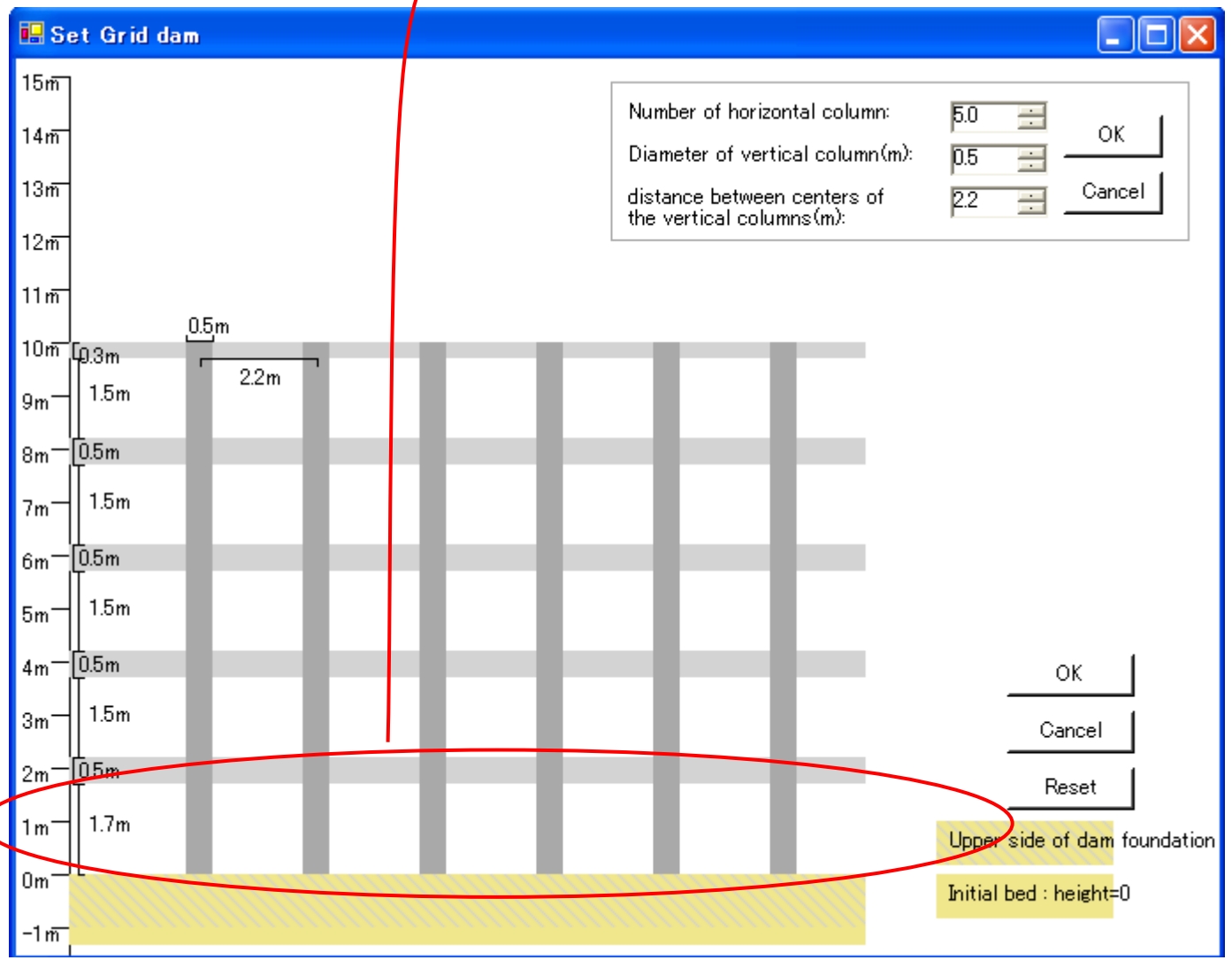


When you set the distance of horizontal columns, double-click between part of horizontal columns and color will change and group box appear. Set numerical value using spin control or directly.

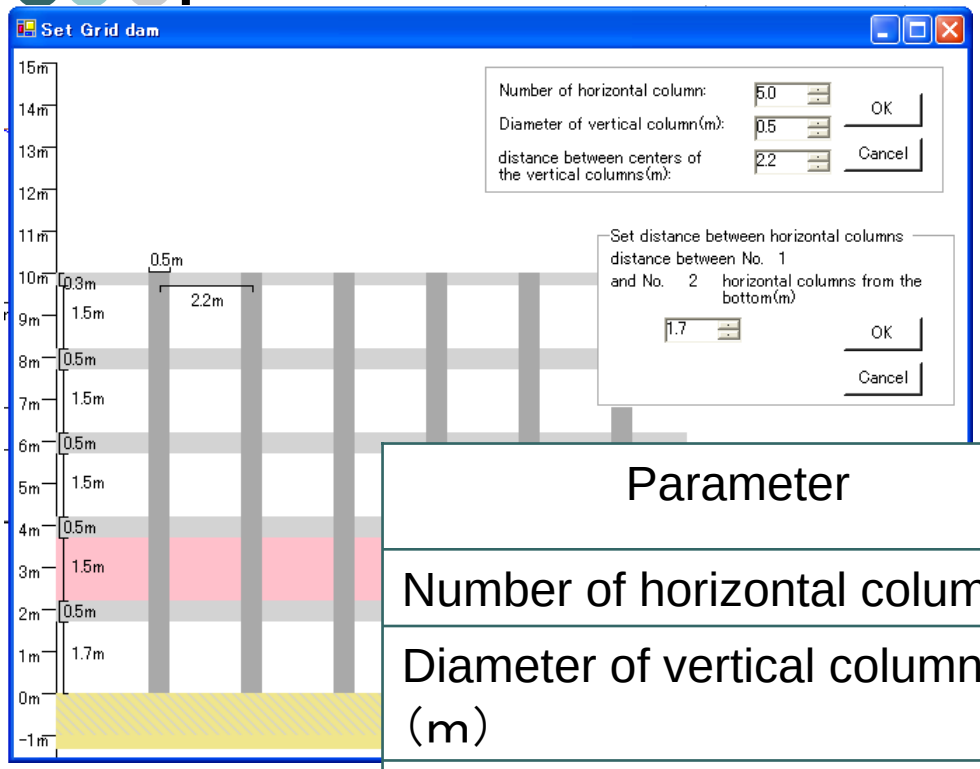


Click “OK” button

Distance between columns is changed from 1.5m to 1.7 m.

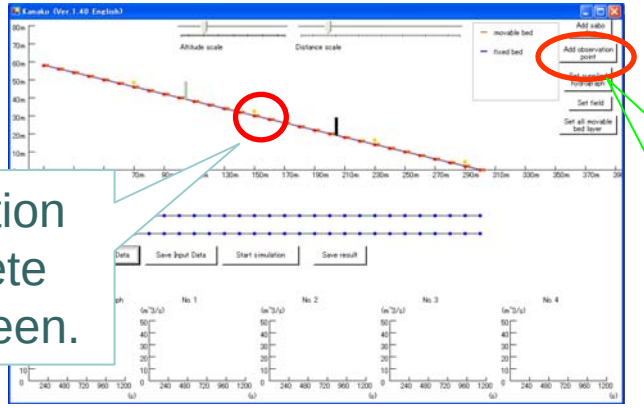


Range of parameters in grid type sabo dam setting



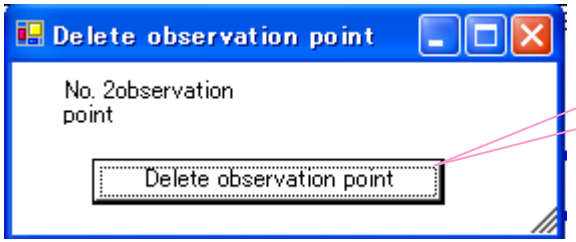
Parameter	Range
Number of horizontal columns	min:1, Max10
Diameter of vertical column（m）	min:0.1, Max:2
Distance between centers of the vertical columns（m）	min:0.1, Max:5 You can not it as same or less than diameter of vertical column.
Diameter of horizontal column（m）	min:0.1, Max:2
Distance between horizontal columns（m）	min:0.1, Max:15

Input (7)



Double-click observation point and open “Delete observation point” screen.

When you want to add observation point, click “Add observation point” button then it will be added on random position.

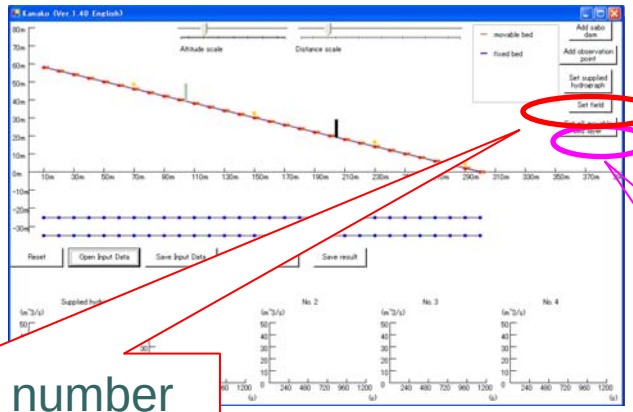


When deleting observation point, click here.

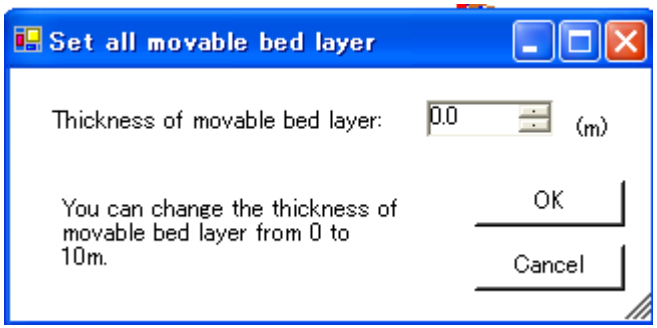
Delete observation point screen

During the simulation, hydrograph will be displayed in the bottom of screen. The first graph on the most left is the data of supplied hydrograph (whole discharge, coarse material discharge, fine material discharge) at the most upstream, others are hydrograph in each observation points.

Input(8)

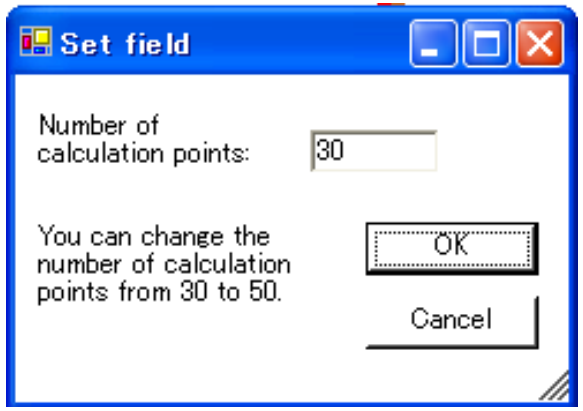


To change the number of calculation points, click “Set field” button.



Set all movable bed layer screen (Range from 0m to 10m.)

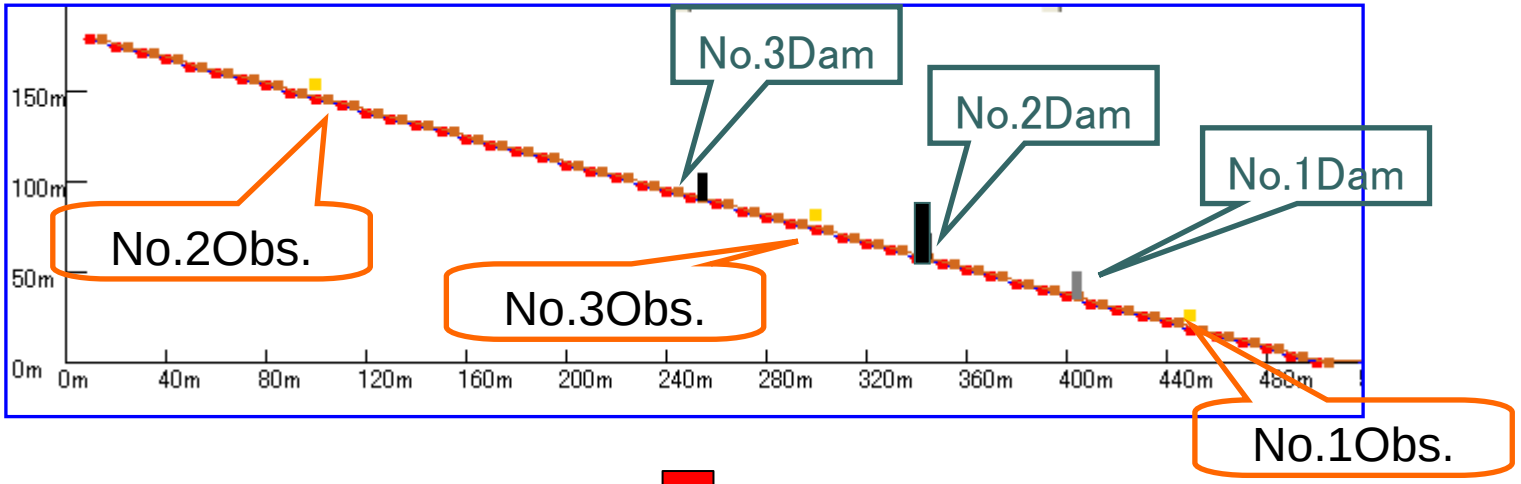
To change the thickness of movable bed layer, click “Set all movable bed layer” button.



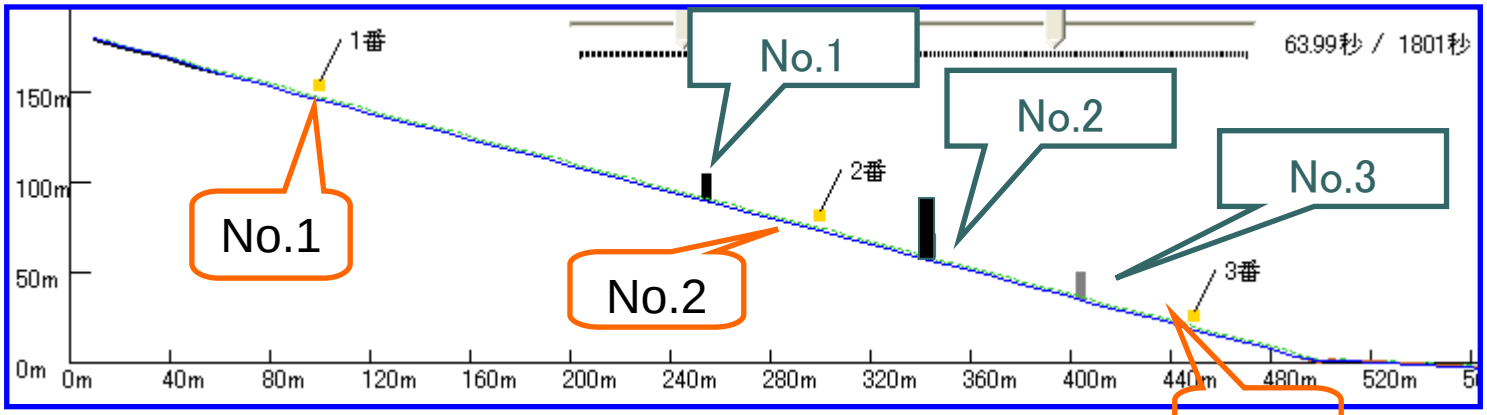
Set field screen (Range from 30 to 50.)

When dam or observation point is not set in numerical order from upstream;

Before simulation

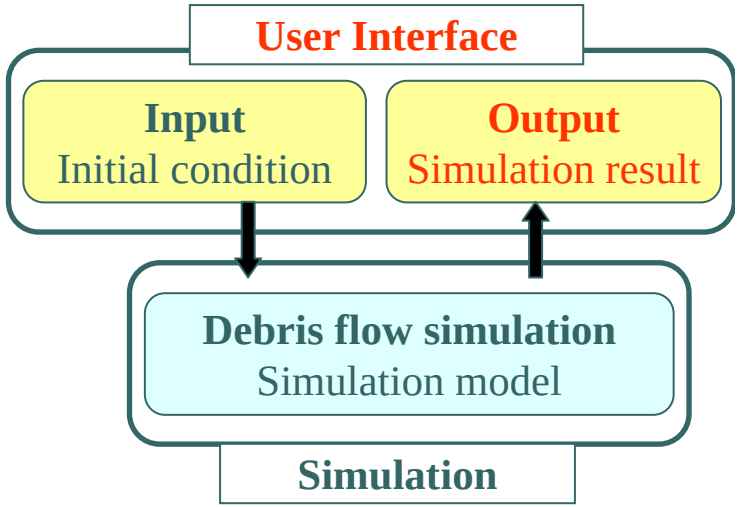


After starting simulation



After you start running simulation or save the input data, hydrograph observation points and sabo dams are set in numerical order from the upstream end automatically

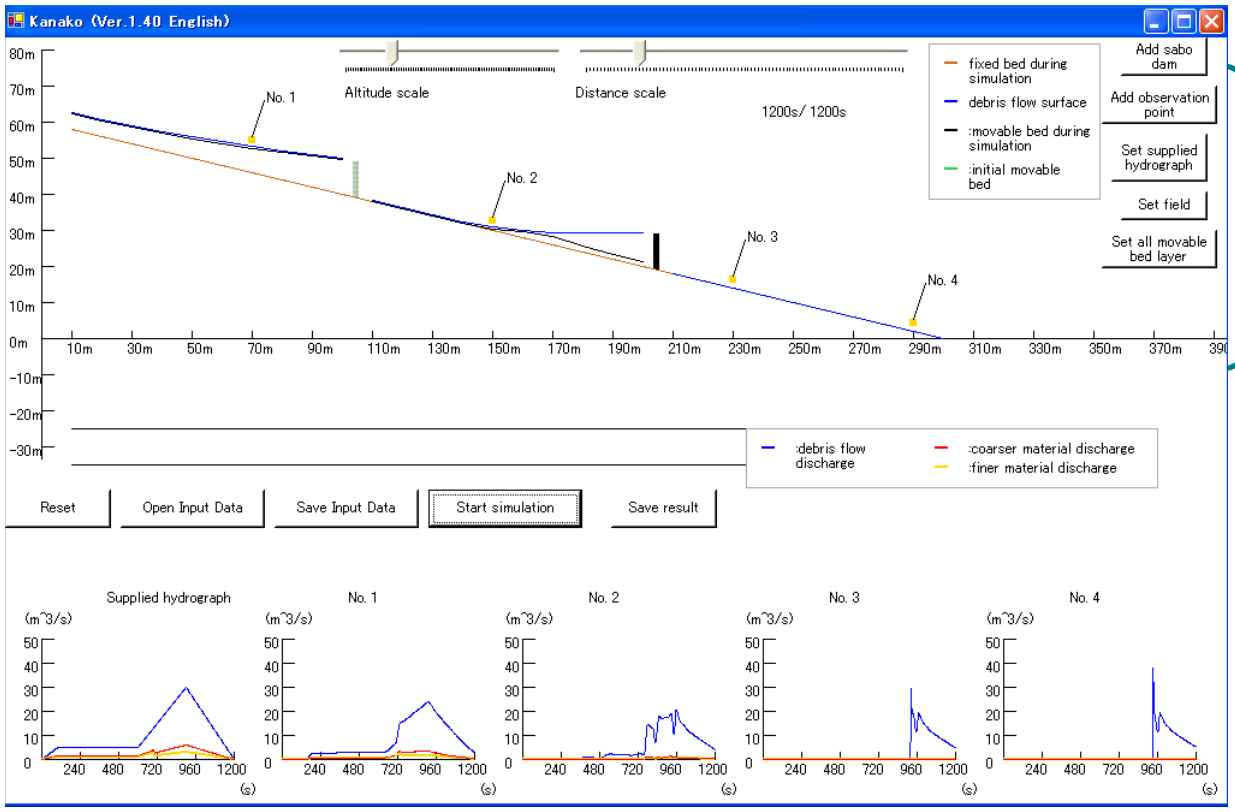
Output main functions in Kanako (Ver.1.40)



When simulation begins,
simulated debris flow is initiated and sediments move down from the upper stream.

	Function details	Explanation
Output	Display real-time animation during simulation (simplified display)	Display flow depth, sedimentation thickness initial bed on 1-D landform
		Display discharge at each observation point
	Save result after simulation	Save detail result data of simulation

Output



Simulation screen

It animates real-time image of flow depth, moving bed surface, initial bed surface, and fixed bed in the longitudinal figure.

It represents hydrograph and sediment graph, supplied from the upstream end and at each observation point.

Output

About saving result

- You can save the result as CSV format.
  - Hydrograph and sediment graph of supplied debris flow and each observation point.
  - Each calculation points volume of moved sediment

（Calculate from initial bed and end of simulation bed. Not considering the air porosity. ）

When you open the result of the simulation saved as a CSV data file using MS Excel is shown as bellow.

When 4 observation point is set.

Supplied hydrograph (m^3/s)
From the left : whole discharge, coarse material discharge, fine material discharge

No.1 Obs. hydrograph (m^3/s)
From the left : whole discharge, coarse material discharge, fine material discharge

Time (s)

No.2.Obs.

No.3.Obs.

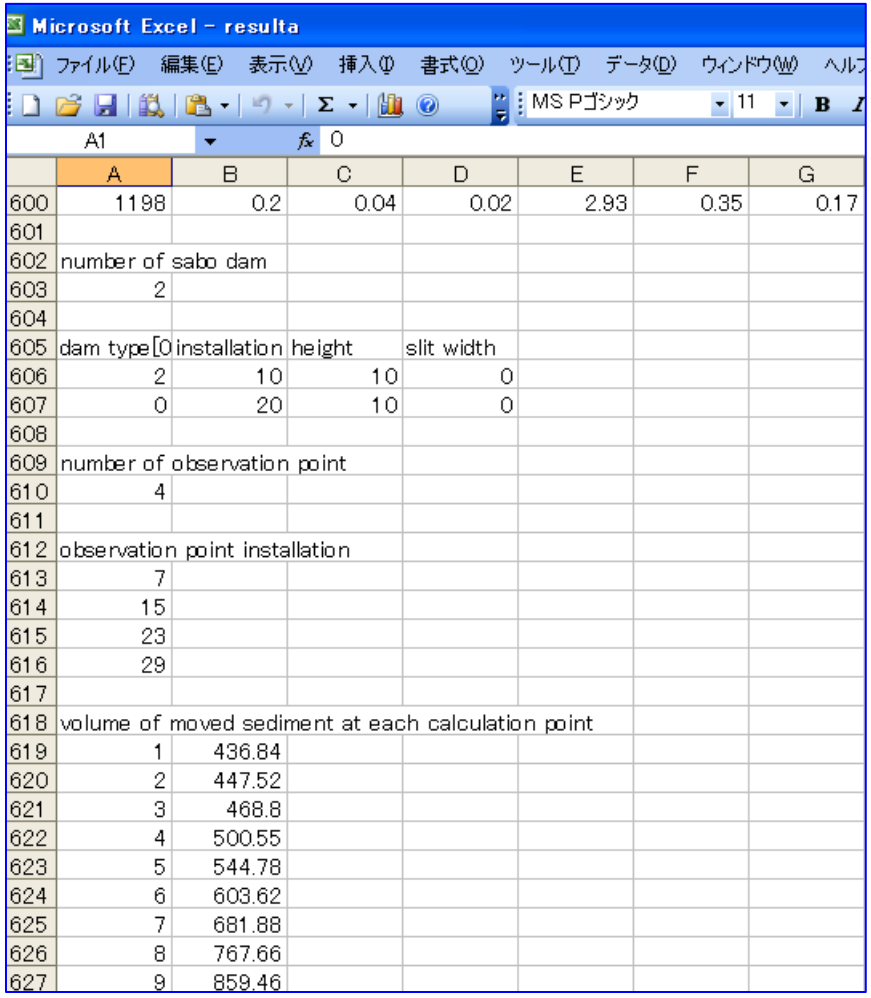
No.4.Obs.

result1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	0.1	0.03	0.02	0	0	0	0	0	0	0	0	0	0	0	0
3	4	0.2	0.06	0.04	0	0	0	0	0	0	0	0	0	0	0	0
4	6	0.3	0.09	0.06	0	0	0	0	0	0	0	0	0	0	0	0
5	8	0.4	0.12	0.08	0	0	0	0	0	0	0	0	0	0	0	0
6	10	0.5	0.15	0.1	0	0	0	0	0	0	0	0	0	0	0	0
7	12	0.6	0.18	0.12	0	0	0	0	0	0	0	0	0	0	0	0
8	14	0.7	0.21	0.14	0	0	0	0	0	0	0	0	0	0	0	0
9	16	0.8	0.24	0.16	0	0	0	0	0	0	0	0	0	0	0	0
10	18	0.9	0.27	0.18	0	0	0	0	0	0	0	0	0	0	0	0
11	20	1	0.3	0.2	0	0	0	0	0	0	0	0	0	0	0	0
12	22	1.1	0.33	0.22	0	0	0	0	0	0	0	0	0	0	0	0
13	24	1.2	0.36	0.24	0	0	0	0	0	0	0	0	0	0	0	0
14	26	1.3	0.39	0.26	0	0	0	0	0	0	0	0	0	0	0	0
15	28	1.4	0.42	0.28	0	0	0	0	0	0	0	0	0	0	0	0
16	30	1.5	0.45	0.3	0	0	0	0	0	0	0	0	0	0	0	0
17	32	1.6	0.48	0.32	0	0	0	0	0	0	0	0	0	0	0	0
18	34	1.7	0.51	0.34	0	0	0	0	0	0	0	0	0	0	0	0
19	36	1.8	0.54	0.36	0	0	0	0	0	0	0	0	0	0	0	0
20	38	1.9	0.57	0.38	0	0	0	0	0	0	0	0	0	0	0	0
21	40	2	0.6	0.4	0	0	0	0	0	0	0	0	0	0	0	0
22	42	2.1	0.63	0.42	0	0	0	0	0	0	0	0	0	0	0	0
23	44	2.2	0.66	0.44	0	0	0	0	0	0	0	0	0	0	0	0
24	46	2.3	0.69	0.46	0	0	0	0	0	0	0	0	0	0	0	0
25	48	2.4	0.72	0.48	0	0	0	0	0	0	0	0	0	0	0	0
26	50	2.5	0.75	0.5	0	0	0	0	0	0	0	0	0	0	0	0
27	52	2.6	0.78	0.52	0	0	0	0	0	0	0	0	0	0	0	0
28	54	2.7	0.81	0.54	0	0	0	0	0	0	0	0	0	0	0	0
29	56	2.8	0.84	0.56	0	0	0	0	0	0	0	0	0	0	0	0
30	58	2.9	0.87	0.58	0	0	0	0	0	0	0	0	0	0	0	0
31	60	3	0.9	0.6	0	0	0	0	0	0	0	0	0	0	0	0
32	62	3.1	0.93	0.62	0	0	0	0	0	0	0	0	0	0	0	0

result1

Below the discharge data, sabo dam parameter (number of dams, type[0:closed, 1:slit, 2:grid], location, height, slit width) and observation point parameter (number, location), and each calculation point's volume of moved sediment is saved.



Microsoft Excel - resulta

ファイル(F) 編集(E) 表示(V) 挿入(I) 書式(O) ツール(T) データ(D) ウィンドウ(W) ヘルプ

MS Pゴシック 11

A1 0

	A	B	C	D	E	F	G
600	1198	0.2	0.04	0.02	2.93	0.35	0.17
601							
602	number of sabo dam						
603	2						
604							
605	dam type[0	installation	height	slit width			
606	2	10	10	0			
607	0	20	10	0			
608							
609	number of observation point						
610	4						
611							
612	observation point installation						
613	7						
614	15						
615	23						
616	29						
617							
618	volume of moved sediment at each calculation point						
619	1	436.84					
620	2	447.52					
621	3	468.8					
622	4	500.55					
623	5	544.78					
624	6	603.62					
625	7	681.88					
626	8	767.66					
627	9	859.46					

Reference

- Nakatani, K., Satofuka, Y., Mizuyama, T.(2007), Development of 'KANAKO', a wide use debris flow simulator equipped with GUI, Proc. of 32nd Congress of IAHR, Venice, Italy, CD-ROM, 10p, A2.c-182.
- Satofuka, Y., Mizuyama T. (2005), Numerical simulation of a debris flow in a mountainous river with a sabo dam, Journal of the Japan Society of Erosion Control Engineering, Vol.58, No.1, pp. 14-19, (in Japanese with English abstract).
- Satofuka, Y., Mizuyama, T. (2006), Numerical simulation of debris flow control by a grid dam, Proc. of the 6th Japan-Taiwan Joint Seminar on Natural Hazard Mitigation, CD-ROM.
- KanakoVer.1.10 Handy manual(You can download from the "The Online Library of Civil and Environmental Engineering" for free; search "kanako" in software)
  - http://www.olcivil.com/Site/index.php