





iRIC version 4.0

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# Introduction to Nays2DH

You can use Nays2DH in the iRIC for your calculations using the following procedures;



# Tutorial I .

# Calculation of flow and morphological change of river bed in a meandering channel

### • Purpose of this tutorial

You can understand the basic operation of Nays2DH in iRIC by calculating the flow and morphological change of the river bed in a meandering channel with simple bed geometry, and also understand the fundamental bed evolution phenomena in a meandering channel.



### 1. Generate a computational grid

Generate a computational grid of a meandering channel with a rectangular cross section using the [Multi-function Grid Generator] included in iRIC.

Select Menu bar  $\rightarrow$  [Grid]  $\rightarrow$  [Select Algorithm to Create Grid].

In the grid generation algorithm selection dialog, select [Multifunction Grid Generator] and



The dialog for grid generation will be opened.

You can generate the computational grid by clicking on [Create Grid] after setting the conditions defined as follows.

			[Channel Shape] -Select Channel Shape
Groups Channel Shape Cross Sectional Shap Channel Shape Para Bed and Channel Sha Upstream and Downs Width Variation Bed Condition	Select Channel Shape Cross Sectional Shape Compound Cross Section Pattern	Straight Straight Sinair reprezented ourse Kinoshita Meandering Curve Pararel to Main Channel -	<ul> <li>: Sine-generated curve</li> <li>[Cross Sectional Shape Parameters] <ul> <li>Width : 0.3m</li> <li>Number of Grid in Lateral Direction : 16</li> </ul> </li> <li>[Channel Shape Parameters] <ul> <li>Wave Length of Meander : 4.7m</li> <li>Meander Angle : 28.6°</li> <li>Number of Grid in One Wave Length : 40</li> </ul> </li> <li>[Bed and Channel Shape] <ul> <li>Channel Shape : 0.004</li> </ul> </li> </ul>
			The default values are used for the other parameters.

A confirmation dialog which asks you [Do you want to map geographic data to grid attributes now?] will appear. Click on [Yes], and the computational grid will be generated as follows.



### 2. Set the cell conditions

The cell conditions can be set on the generated computational grid. Here, you set the Manning's roughness coefficient.

Click on [Cell attributes] in the object browser, and change the status of cell attributes to  $\square$ . You can open the cell attributes by clicking on  $\triangleright$  bottom on the left side of [Cell attributes], and then click on [Manning's roughness coefficient].



- The left side of the figure is the object browser, and the right side of the figure is the visualization screen.
- When you want to change something in the visualization screen, you need to click on the related item in the object browser.
  When you click on that item, the background color of the item changes to light blue.
  Such status is defined as 'active' here.
- While you keep the status of [Manning's roughness coefficient] as ☑, the contour on the grid indicates the value of [Manning's roughness coefficient].

Select all of computational grid by operating your mouse, and then right-click on the selected region.



Then select [Edit value] on appeared menu.

On the dialog [Edit Manning's roughness coefficient], you can specify the value of this coefficient in the region you selected.

By this procedure, Manning's roughness coefficient is set at all of cells in the grid.

Input the new value of Manning's roughness coefficient Manning's roughness coefficient :	at the selected grid cells.	<ul> <li>Manning's roughness coefficient</li> </ul>
	OK Cancel	:0.013

### 3. Set the computational conditions

This section explains how to set the computational conditions for Nays2DH. The modified part of the dialog needed for this computation is only described below. For the rest of parameters, the default values are used.

20 20 30 K L. R. O () 🗎 🖲 😭 🛇 0 ⊙ ⊙ ▶ 50 Himport... 个 🦆 🏢 🔯 🗹 Transparent U [Import]: iRIC reads • Fixed or Movable Bed Density of Vegetation (m-Height of Vegetation (m) Manning's roughnees the computational . conditions from another iRIC project file which Grain size dist Reference Informa
Grid Creating Conditio
Grid (41 x 17 = 697)
Grid shape
Node attributes
Elevation (m)
Elevation of fix was created using N Nays2DH. [Export]: You can • output the computational conditions for other ľ, Background Images Background Images (Internet Google Map (道路) Google Map (衛星写亮) runs.

Set the computational conditions for this run as follows.

Groups	Select solver type	1	Standard	~	Solver Type: setting the
Solver lype Roundary Condition		l			• Solver Type, setting the
Time	Bed deformation	l	Enabled	~	general settings of
Initial Water Surface	Finite differential method of advection terms		CIP method	~	Narra DII
Bed material Vegetation	+Confluence	Disabled		~	Nays2DH
+Confluence	+Bed material type		Uniform		
+Non-uniform mater +Bank erosion	+Sediment transport type	Bed load		~	- Bed deformation:
+Secondary flow	+Bedload transport formula for uniform sediment	Ashida a	nd Michiue forn	iula 🖂	Enabled
+Others +Hot Start	+Vector of bedload transport	Watanabe for	nula	~~	Linuoied
+Output variables	+Formula of upward flux of suspended load from river bed	Itakur	a and Kishi forn	iula 🗸	
	+Bank erosion		Disabled	~	
	+Slope collapse model		No	~	Note: You can select the
	+Turbulent model	Zero	equation model	~	items with mark [+], if you
	+How to set elevation of fixed bed	Jse initial bed elevation	s of fixed bed c	ells 🧹	select [Advanced] in [Select
Reset			ОК	Cancel	Solver Type].

Select [Calculation conditions]  $\rightarrow$  [Setting] on menu bar.

Set the boundary conditions.

Periodic boundary condition		Enabled	~
Water curface at downstream	Uniform flow	2	
water surface at downstream	Onnorm now		~
Constant value (m)			0
Slope for uniform flow	Calculated from	seographic d	ata 🗸
Slope value at downstream			0.001
Velocity at upstream	Uniform flow		
Slope for uniform flow	Galculated from i	seographic d	ata 🗸
Slope value at upstream			0.001
+Slope value of tributary channel			0.001
Time unit of discharge/water surface file		Second	~
Time series of discharge at upstream and water level at downstream		Ec	dit
+Discharge time series of tributary channel		Ed	dít
+Change the supply rate of sediment from the upstream boundary		No	
+The ratio of supplied sediment transport to an equilibrium sediment transport (%)			100
	Periodic boundary condition Water surface at downstream Constant value (m) Slope for uniform flow Slope value at downstream Velocity at upstream Slope for uniform flow Slope value at upstream Slope for uniform flow Slope value at upstream Slope value at upstream to slope value at upstream and water level at downstream +Discharge time series of tributary channel +Change the supply rate of sediment from the upstream boundary +The ratio of supplied sediment transport to an equilibrium sediment transport (00)	Periodic boundary condition Water surface at downstream Constant value (m) Slope for uniform flow Slope value at downstream Velocity at upstream Uniform flow Slope value at downstream Uniform flow Slope value at upstream Slope value value value value value value Slope value at upstream Slope value value value value Slope value value value value value Slope value value value value value Slope value value value value value value Slope value value value value Slope value value value value value value Slope value value value value Slope value value value value value Slope value value value value Slope v	Periodic boundary condition     Enabled       Water surface at downstream     Uniform flow       Constant value (m)     Calculated from eccaraphic d       Slope for uniform flow     Calculated from eccaraphic d       Slope value at downstream     Uniform flow       Velocity at upstream     Uniform flow       Slope for uniform flow     Calculated from eccaraphic d       Slope value at upstream     Ecc       Time unit of discharge/water surface file     Second       Time series of discharge at upstream and water level at downstream     Ecc       +Discharge time series of tributary channel     Ecc       +Change the supply rate of sediment from the upstream boundary     No       +The ratio of supplied sediment transport to an equilibrium sediment transport (%)     Ecc

### Boundary conditions

•

-Periodic boundary condition: Enabled -Time unit of discharge/water surface file: Second

After setting the conditions as shown below, click [Edit] for [Time series of discharge at upstream and water level at downstream].

### Set the discharge of upstream end.



- Clicking on [Add] makes new line.
- Time from 0 to 1800 (sec) with a constant discharge of 0.004 m<sup>3</sup>/s, is given in this example.

## Setting conditions related to Time.

Groups Solver Type Boundary Condition Time Initial Water Surface Bed material Vegetation + Confluence + Non-uniform material + Bank erosion + Secondary flow + Others + Hot Start + Output variables	Output time interval (sec) Calculation time step (sec) Start time of output (sec) Start time of bad getormation (sec) [Nearlive is no bed deformation] Maximum number of iterations of water surface calculation Relaxation coefficient for water surface calculation	60 0.01 0 30 0.05 0.8	-Output time interval: 60 sec -Calculation time step: 0.01 sec -Start time of output: 0 sec
Reset		OK Cancel	

## Setting conditions related to Bed material.

Groups Solver Type Boundary Condition Time Initial Water Surface Bed material Vegetation - Confluence - Non-uniform material - Hon-uniform material - Bank ension - Secondary flow - Others - Hot Sant + Output variables	Diameter of uniform bed material (mm)	0.55	- Diameter of uniform bed material(mm): 0.55(mm)
Reset		OK Cancel	

### 4. Run a simulation

After setting calculation conditions, run the computation.

For running a simulation, select [Simulation]  $\rightarrow$  [Run] in menu bar or select  $\triangleright$  on menu tool



Before running the calculation, a message recommending that you save the current project is displayed, so click "Yes" to save the project.



There are two methods of saving the project, [Save as File (\*.ipro)] and [Save as Project]. Here, select [Save as File (\*.ipro)] and save it.

💦 Select How to Save Project	?	$\times$
Please select how to save project from Save as File (*.ipro) Save as Project	the follo	owings:
OK	Can	icel



When saving the project is completed, the solver console starts up and the calculation begins.

You can visualize the result after getting a dialog which informs you [The solver finished calculation] (left figure), or by selecting [Calculation result]  $\rightarrow$  [Reload] on the menu bar (right figure) during the calculation.





### 5. Visualize the results

By visualizing the output results, we confirm the calculation result.

Select [Calculation result]  $\rightarrow$  [Open new 2D post-processing window] in the menu bar, or click on the button shown in the following figure.



#### 2D post-processing window will open.

	processing window			/	- 6
Db I	Post-processing (2D): 1				
C	Object Browser ×			/	
	Navs2DH iRIC.4x 1.0 64bit Grids	1			
	> 🗌 📴 Geographic Data				
	V V iBICZone				
	Grid shape				
	V 🔽 📴 Scalar				
	Depth(m)				
	Elevation(m)				
-	WaterSurfaceFley				
	ShearStreet(Nm,2)				The
		/			411h
			/		1111 VIVI
	Verticity(r-1)	//			
	C FroudeNumber				
	C ShieldeNumber			~	
	CrosssectionalAv				0
	SuspendedSedim				

To display the physical quantity in a contour plot, left-click on the quantity you want to visualize. We choose "ElevationChange (m)" to visualize the calculation result of bed evolution.



To change the range of color legend, right-click on [Scalar > ElevationChange (m)] and click [Property].





You can change the maximum value, minimum value, division number, etc. of the color bar.

Now, you can clearly observe a point bar on the inner bend and the erosion in the outer bend.





In the next step, the flow field is visualized by vectors. Click on the box of [Velocity] under [Arrow] in the object browser.

For setting the properties of vectors, right-click on [Arrow], and select [Property] on the popup menu that appears. The dialog for setting the vector scaling will open.

Basic Color Value: Velocity(ms=1) ✓	Length Legend	
Langtin         Anto           Arto         Standard value:           Langth on screen:         20           Minimum value to draw         (0000000 €)           Minimum value to draw         (0000000 €)	✓ Vinible       Trite:       Volocity(m/₂)       Forn Setting:       Arial 11 pt       Edit	
Sampline (e) All vertices Sampling rate: Edirection 1 0 J-direction 1 0	Format: X52t Forn Settine Arial 11 pt Edit. Color	<ul> <li>Deselect [Auto] check box</li> <li>Length on screen: 20 pixel</li> </ul>
Resion  Full Resion Custom Resion I Max J Max J Max	Transporent	<ul> <li>Legend title: Velocity (m/s)</li> </ul>
	OK Cancel Apply	



By adjusting the length of vectors, you now can see the flow field in the meandering channel.

Next, the one-dimensional graphic function is used for visualizing the water level and bed elevation in the cross section. Select [Calculation Result]  $\rightarrow$  [Open new graph window] on the menu bar.



The dialog for setting the data of 1D graph will open. Select the X Axis as [J] and add [Elevation] and [WaterSurfaceElevation] from [Two dimensional data] to [Selected data].

Calculation Result External			
Two dimensional Data		Selected Data	
Grid Location: Vertex 🗸		Elevation(m)	
Depth(m) ShearStress(Nm-2) ElevationChange(m) FixedBedElevation(m) Vorticity(s-1) FroudeNumber ShieldsNumber CrossSectionalAneBedElev(m) CrossSectionalAveBedElev(m) SuspendedSedimentConcentration Velocity(ms-1) (magnitude) BedloadFlux(m2s-1) (magnitude)	Add >> << Remove	WaterSurfaceElevation(m)	<ul> <li>X Axis: J</li> <li>Two-dimensional Data: Select [Elevation], [WaterSurfaceElevation and click on [Add].</li> <li>Note: I and J indicate the index of the longitudinal and transverse direction in the grid.</li> </ul>

The water surface and bed in a cross section are visualized. Click on [Draw Setting] for changing the visualization properties of this graph.



Nays2DH Tutorial

		? X	×
alculation Result Copy E Elevation(m) WaterSurfaceElevation(m)	xternal Label: Elevation(m) Y Axis © Left O F Line Style: Solid Line Vidth: Bar Chart: Show as Bar Chart Color:	Right	<ul> <li>Setting for Elevation(r -Line style: Solid Line -Line Width: 3 -Color: Black</li> <li>Setting for WaterSurfaceElevation -Line style: Solid Line -Line Width: 3 -Color: Blue</li> </ul>

You can change the style width and color of lines.

You can visually understand the line of water surface and river bed.



As the last step, the simulated bed elevation changes are compared with the experimental results. Right-click on [Measured Values], and select [Import] on the pop-up menu.



The measured data will be imported. Set the scalar and color bar ranges to be the same. You can change the range of color legend by right-clicking [Scalar] under [Measured Values] and selecting [property] on appeared pop-up menu.





You can do more qualitative comparison between simulated and measured bed topography. On the menu bar, select [Calculation Result]  $\rightarrow$  [Open new verification window].

You will specify the time and quantity of simulated result for the comparison as well as the measured data. Here, the bed evolution is compared.

Select the t	imestep of calculation result	
1 1 1 1 1		
Calculation Select whic Physical Va	Result h physical value to use for comparison. alue: ElevationChange(m) ~	• [Timestep]: 1800, meaning you choose the simulation result at
Measured V Select whic	alues h measured value to use for comparison.	<ul> <li>[Calculation Result]: ElevationChange(m)</li> </ul>
Value: Dz	~	• [Measured Value]: Dz

The dialog "Verification" will open. Select "Measured value vs. Calculation Result" for Chart type. The solid line in the figure means perfect agreement between simulated and measured bed evolution rate. The calculation result shows good agreement with the measured data. You can see how this agreement changes when you change the calculation condition (e.g., grid resolution, roughness, model parameters etc).



# Tutorial II .

# Calculation of flow and bed morphological change of a real river

### Purpose

You will learn how to generate a computational grid from cross sectional river survey data, and set the computational conditions to calculate the flow and morphological changes in a real river. The computational results are visualized by the post-processing tools of iRIC. You will make a snapshot and animation of the computational results.



### 1. Generate a computational grid

A computational grid will be generated by using river survey data which includes the crosssectional geometry data for the river reach of interest.

You can import a river survey data by selecting Menu bar  $\rightarrow$  [Geographic Data]  $\rightarrow$  [Elevation(m)].



The dialog for setting the imported river survey data will open.



When reading is successful, the transverse survey data is drawn.

Next, a background image can be imported. Click [File > Property] on the menu bar.



Please specify [I27-35.jpg] as background image, or import the background images by following procedure.

#### **Background Images**

•

By importing background images such as maps and aerial photographs when creating a calculation grid or mesh, it is possible to create a calculation coordinate system that takes into consideration the levees, river banks, low waterways and high water reservoir boundaries. In addition, designation of vegetation cell, fixed bed cell, obstacle cell etc. can be set while referring to the background image, as is described below.

Set the coordinate system of the imported data. Click [Coordinate System > Edit].

Basic Information		
Filename:	(No data)	
Last update time:	(Not saved yet)	
Solver:	Nays2DH iRIC.4x 1.0 64bit version 1.6.6	
Grid(s):	Setup unfinished	• The coordinate
Calculation condition:	Not set yet	read this time is
Calculation result:	No data	[Orthogonal
Coordinate System:	(Not specified) Edit	series].
Coordinate Offset:	(0, 0) Edit	
Date for t = 0:	(Not specified) : SS sec Edit	
Output Setting	Output calculation results in separate files	
	Close	

The selection screen for the coordinate system is displayed. Enter "jgd" in the search window. Select "EPSG:2454 JGD2000 / Japan Plane Rectangular CS XII" and click "OK". Since you will return to the project property setting screen, please click "Close".

(Not Specified)	^
EPSG:4612: JGD2000	
EPSG:6668: JGD2011	
EPSG:2443: JGD2000 / Japan Plane Rectangular CS I	
EPSG:2444: JGD2000 / Japan Plane Rectangular CS II	
EPSG:2445: JGD2000 / Japan Plane Rectangular CS III	
EPSG:2446: JGD2000 / Japan Plane Rectangular CS IV	
EPSG:2447: JGD2000 / Japan Plane Rectangular CS V	
EPSG:2448: JGD2000 / Japan Plane Rectangular CS VI	
EPSG:2449: JGD2000 / Japan Plane Rectangular CS VII	
EPSG:2450: JGD2000 / Japan Plane Rectangular CS VIII	
EPSG:2451: JGD2000 / Japan Plane Rectangular CS IX	
EPSG:2452: JGD2000 / Japan Plane Rectangular CS X	
EPSG:2453: JGD2000 / Japan Plane Rectangular CS XI	
EPSG:2454: JGD2000 / Japan Plane Rectangular CS XII	
EPSG:2455: JGD2000 / Japan Plane Rectangular CS XIII	
EPSG:2456: JGD2000 / Japan Plane Rectangular CS XIV	
EPSG:2457: JGD2000 / Japan Plane Rectangular CS XV	
EPSG:2458: JGD2000 / Japan Plane Rectangular CS XVI	
EPSG:2459: JGD2000 / Japan Plane Rectangular CS XVII	
EDSG-2460- IGD2000 / Janan Diane Rectangular CS YVIII	×
Hint about Japanese coordinate systems (EPSG:	<u> 2443 - 2461)</u>
Hint about UTM coordinate systems (EPSG:32601	- 32760 etc

With the above settings, the coordinate system of the imported river survey data has been described. You can import background image from some sources like Google Map.



Note: To show Google Map image correctly, you will need Google API key and set it into Menu bar > Option > Background Images (Internet).





By selecting the survey line and holding down the Shift key, bring it closer to the blue circle at the channel center point, you can move the center point with the mouse.

The channel center point was able to match the main channel center of background image.



Set calculation grid generation conditions.

Select [Grid]  $\rightarrow$  [Select Algorithm to Create Grid] on the menu bar as shown on the left. On the screen on the right, select [Create grid shape solving Poisson equation].



### Click [OK] as it is.



In this grid generation method, the calculation area is first set using the center line, the control section, and the left and right shoreline.

You can also add the number of control sections later.

First, edit the center line with the mouse so that the center line passes approximately through the center of the main channel.

If the number of vertices is insufficient, you can add using right click.



Next, click [Build Left bank and Right bank line] from the right click menu. The screen for entering the distance from the center line is displayed. Please enter the approximate distance. For this case, both the left bank and the right bank are 300m.

Left bank:	300.000	ŧ	
Right bank:	30 0.000	<b></b>	
116 16 16 16 16 16 16 16 16 16 16 16 16	terese er penne tildt die dir	,	

There are some vertices on the left bank and right bank line. Move these vertices with the mouse to set the area to be calculated.



Attention Point: The calculation area should be within the area of the imported river survey data. If you protrude from the area, the terrain data may not be mapped correctly to the calculation grid.

Please keep in mind that the center line, the left bank line, and the right bank line are roughly perpendicular to the cross section near the upstream and downstream ends of the reach- this will aid in setting boundary conditions.

Once the calculation area is set, click [Create grid] from the right click menu.



The grid division number setting screen in the streamwise flow direction (ni) and transverse direction (nj) is displayed.

Please set these as follows and click [OK].

Next, in the confirmation dialog that comes up, click the [Yes].



A calculation grid was created.



Please check the grid shape. In order to obtain better calculation results, it is important that grid lines are orthogonal as much as possible.

Are the edges collapsed and there is some grid like a triangle? If so, check the points to be noted in the calculation area and correct the calculation area.

### 2. Setting cell attributes

Set the roughness coefficients for the fixed and movable bed by choosing a value of Manning coefficient as attributes of the cell. The low water channel is treated as a movable bed and the high-water floodplain is a fixed bed; separate roughness coefficients are set for each.

Right-click [Geographic Data > Fixed or Movable Bed] of the object browser. Click [Import > Polygons] and load "floodplain.shp".



In tha	nolugon	import co	tting coroon	got the velue to	Fixed had	and alight	$(\cap V)$
III the	DOIVYOH	Innoon se	umg screen.	set the value to	IFIXED DED	гана спск	
	/0						

Load from Shape file attribute		Name 1 floodplain	Value 1	
Name 🗸	omatically (ex. PolyData1)			
/alue				
) Load from Shape Name	file attribute			
Specify value	Fixed bed $\sim$			



A polygon with "Fixed bed" attribute is loaded.

In the same operation, read the low waterway polygon "mainchannel.shp" as the value "Movable bed".



Copy the polygon because the place you want to set Manning's roughness coefficient is the same as fixed bed and movable bed part. Right-click on the polygon you want to copy and select [Copy].



Select the geographic information to copy the selected polygon.

	🔎 Select Geographic Data	?	$\times$			
	Please select which geographic data to copy	/ this po	olygon.			
	Elevation (m)		-		•	Select [Manning's
	Elevation (m) Elevation of fixed bed (m) Obstacle				_	roughness coefficient]
	Density of Vegetation (m-1)					
	Height of Vegetation (m)					
-	Manning's roughness coefficient			<b>9</b>		
2	Grain size distribution					

Set the value of the polygon to be copied.

This operation is performed on both the high-water bed and low-water channel polygons.

For each			
Name	ked or Movable	e Billig's roughness coe	
floodplain	Fixed bed	0.03	<ul> <li>Polygon w low waterv coefficient</li> </ul>
			Polygon w high waterl

At this stage, the cell attribute has not yet been reflected in the calculation grid. To map a cell attribute to a calculation grid, select [Grid > Attributes Mapping > Execute] on the menu bar.



If you check the cell attributes of the grid, you can see that the cell attribute is mapped in the calculation grid.



- If you want to fine-tune after mapping, you can change the value by specifying it in cell units.
- However, it is important to note that if you change the cell attributes directly on a cell-by-cell basis and then perform the mapping again, the directly modified part will disappear.

## 3. Setting calculation conditions

Set the calculation conditions. Since only the changes are described, you can infer the settings that are not explained here as the default values.

Calculation Condition		· ^	
roups Solver Type	Select solver type	Standard 💌	
Boundary Condition	Bed deformation	Enabled 💌	
Initial Water Surface	Finite differential method of advection terms	CIP method 👻	
Bed material	+Confluence	Disabled 🔻	
+Confluence	+Bed material type	Uniform 👻	• Solver type: setting the
+Non-uniform mater +Bank erosion	+Sediment transport type	Bed load 👻	general settings of Nays2I
+Secondary flow	+Bedload transport formula for uniform sediment	Ashida and Michiue formula 👻	
+Others +Hot Start	+Vector of bedload transport	Watanabe formula 👻	-Bed deformation: Enable
+Output variables	+Formula of upward flux of suspended load from river bed	Itakura and Kishi formula 🔻	Deu deformation. Endore
	+Bank erosion	Disabled 👻	
	+Slope collapse model	No 👻	
	+Turbulent model	Zero equation model 🛛 👻	
	+How to set elevation of fixed bed	Use initial bed elevations of fixed bed cells $\   {\bf v}$	

Set the necessary calculation conditions.

### Set the boundary condition.

Calculation Condition		? ×		
Groups Solver Type Boundary Condition Time Initial Water Surface Bed material Vegetation +Confluence +Non-uniform mater +Bank erosion -Secondary flow +Others +Hot Start +Output variables	Periodic boundary condition Water surface at downstream Constant value (m) Skope for uniform flow Skope value at downstream Velocity at upstream Skope value at upstream *Skope value of tributary channel Time unit of discharge/reter surface file Time series of discharge at upstream and water level at downstream *Discharge time series of tributary channel Change the supply rate of sediment from the upstream boundary *The ratio of supplied sediment transport to an equilibrium sediment transport (0)	Disabled	<ul> <li>Boundary Con</li> <li>Time unit of discharge/wate Hour</li> </ul>	dition r surface fil



### Setting conditions related to Time.

Calculation Condition Groups Solver Type Boundary Condition Time Initial Water Surface Bed material Vegetation +Confluence +Non-uniform material +Bank erosion +Secondary flow +Others +Hot Start +Output variables	Output time interval (sec) Calculation time step (sec) Start time of output (sec) Start Time of bed deformation (sec) (Negative is no bed deformation) Maximum number of iterations of water surface calculation Relaxation coefficient for water surface calculation	? × 200 0.5 80 3800 10 • 0.8	<ul> <li>Output time interval: 200 (sec)</li> <li>Calculation time step: 0.5 (sec)</li> <li>Start time of output: 0 (sec)</li> <li>Start Time of bed deformation: 3600 (sec)</li> </ul>
Reset		Save and Close Cancel	(500)

### Setting conditions related to Bed material.



### 4. Run a simulation

6		
Ob	Solver Console [Nays2DH iRIC.4x 1.0 64bit] (running)	
~	Navs2DH on iRTC 4 x	
	Copyright (C) 2003-2023 by Yasuvuki SHIMIZU, Hokkaido	Univ., Japan, and Hiroshi T
	AKEBAYASHI, Kvoto Univ., Japan, All Right Reserved	
	0.000 500.0000 -0.5570 0	
	200.000 513.8889 -0.5332 11 out	
	400.000 527.7778 -0.5094 11 out	Street and
	600.000 541.6667 -0.4857 11 out	
	800.000 555.5556 -0.4619 11 out	
	1000.000 569.4444 -0.4381 11 out	
	1200.000 583.3333 -0.4143 8 out	
	1400.000 597.2222 -0.3905 11 out	
	1600.000 611.1111 -0.3668 11 out	
	1800.000 625.0000 -0.3430 11 out	TI I TI I TI I
	2000.000 638.8889 -0.3192 11 out	
	2200.000 652.7778 -0.2954 11 out	
	2400.000 666.6667 -0.2717 11 Out	
	2600.000 660.5556 -0.2479 11 Out	
	3000 000 708 3333 -0 2003 11 out	
	3200 000 722 2222 =0 1766 11 out	
~	3400.000 736.1111 -0.1528 11 out	
	3600.000 750.0000 -0.1290 11 out	hitigurs Farmits O
	3800.000 763.8889 -0.1052 11 out	
	4000.000 777.7778 -0.0814 11 out	$\sim$
	4200.000 791.6667 -0.0577 11 out	
	4400.000 805.5556 -0.0339 11 out	
	4600.000 819.4444 -0.0101 11 out	
	Manning's roughness	Phetaubuto
	Grain size distribution	NČSCI Pak
E.	Measured Values	
C	Background images	
~ 6	Background Images (Internet)	

5. Visualization and out output of calculation results

Output the calculation result in iRIC and output the image.



Select [Calculation result]  $\rightarrow$  [Open new visualization window (2D)] on the menu bar.

Fix the color range of the contour so that it does not visualize low water depths. Right-click [Scalar > Depth (m)] in the object browser and select [Property].

Relationship between values and colors	Value Range	Color Bar Setting	
Automatically adjust based on value range	Automatic	C 16-24	
Setup Manually	Max: 15	Direction	
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3 7.525	Reverse colors	Label Display	<ul> <li>Max: 15 m</li> </ul>
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witch to Discrete Mode		< · · · · · · · · · · · · · · · · · · ·	Decener [ muchanend]
Import Export			
Draw contour lines Line width: 1 🗘 px 🖲	Use values of colormap () Specify	division number 10 0	

Next, visualize the arrow.

Select [Arrow > Velocity (ms-1)] in the object browser.



By right clicking on [Arrow > Velocity (ms-1)], you can set some parameters for visualizing the vector. Below is an example.

Standard value: 5000000 Im/s     Leneth on screen: 50 Im/s     Sampling     All vertices     Sampling rate:     I-direction     I-direction     I - direction     Color     Tritle     Format:     Point Setting:     Color     Tritle:     Color     Tritle:     Color     Tritle:     Color     Tritle:     Color     Tritle:     Color     Tritle:   Description     Color     Tritle:           Output <th>Hocity(m/s)           Arial 11 pt           Edit           2f           Arial 11 pt           Edit</th>	Hocity(m/s)           Arial 11 pt           Edit           2f           Arial 11 pt           Edit
Sampling       Length         All vertices       Format:         Sampling rate:       Format:         I-direction       1 ©         J-direction       1 ©         Section       Color         Title:       Length         Background:       Size and Position         Outstom Region       1 ©         I Max:       73 ©	2f Vrial 11 pt Edit
Region  Full Region  Active Region  Custom Region  I Max:  I Max:  Custom Region  Custom Region	
I Min: Position	☑ Transparent
	Distance from right 25.00 \$ % Distance from bottom 5.00 \$ %
	Width:         160         px           Height:         100         px
J Max:	

Use the animation tool bar to check the calculation result.



Also you can draw the hydrograph at the same time.

Select [Calculation Result > Open new Graph Window] in the menu bar.

Point Data	Selected Data	
	Discharge(m3s-1)	

You can draw a contour map and a hydrograph at the same time.

The computational results can be outputted as image file. Select [File > Continuous Snapshot /Movie/ Google Earth Export] on the menu bar.



Nays2DH Tutorial

Make the necessary settings in the continuous snapshot wizard.

← 💦 Continuous Si	apshot / Movie / Go	ogle Earth Export Wizard		? >	<	
Window Selecti Please select target	on windows and specify I	how you want to output file	<b>1</b> 5.			
Target windows	(2D): 1 1					Target windows: Select both Output file: In one file
Output file In one file Respectively	Layout As is Horizontally Vertically	Background white transparent	Nevt	Cancel	•	Layout: As is

Specify the file output location and image file format.

		, <b>5</b>		
R Continuo	us Snapshot / Movie / Google Earth Export Wizard			
le Pronerti	85			
	ke exercise of output files			
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	Next	Car	icel	

## Specify whether to output movie.

	?	×	
Continuous Snapshot / Movie / Google Earth Export Wizard      Movie Properties      Please specify the properties of output files.     Output movie files      File name      Output file img.mp4			• Output the movie files
Play speed ● Specify movie length[sec] 20 ○ Specify frames per second 5 Next	Can	cel	

## Specify the start and end time to output.

imesi	tep Setting				
'lease s tart :	specify the start time step, stop time step	, and the skip rate.	1 6 1 1 6 1	1	200 sec
top :				360 😫	72000 se
				Skip ra	te : 1 🕻

You can also export the image file into Google Earth

		?	×	
Continuous Snapshot / Movie / Google Earth Export Wizard				
Dutput to the Google Earth				
Please specify the properties of output files.				
Output to the Google Earth				
Note: This feature is available only when a coordinate sy Post-processing (2D) window snapshot is output.	ystem has been specifie	d, an	d	
KML file name				
Name : output kml				
Post-processing (2D) window for positioning				
Post-processing (2D): 1			$\sim$	
	Next	Cano	el	
				1

When the setting is completed, a confirmation screen (left figure) appears, so select [Finish]. The screen on the right is the output screen.

💦 Continuous Snapshot / Movie / Google Earth Export Wizard		
Confirm the result		
The files in the list below will be created or updated.		
E:¥iRIC¥Nays2DH¥Ex2¥imgmp4	<b>^</b>	
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Image files grouped with a contour diagram and hydrograph in the movie are output.

An example of the Google Earth export of the computational result

