

土石流や斜面崩壊の発生はコンピュータで予測できるのでしょうか？

HYDRO DEBRIS

水文土石流解析モデルの紹介

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磯部洋明 准教授 リモセン・宇宙



細野七月 特任助教 実験・粒子法
(DISPH)の固液混相流への応用



黒木竜介(大学院生)
村嶋慶哉(理学部学部生)
黒川翔太(卒業生)

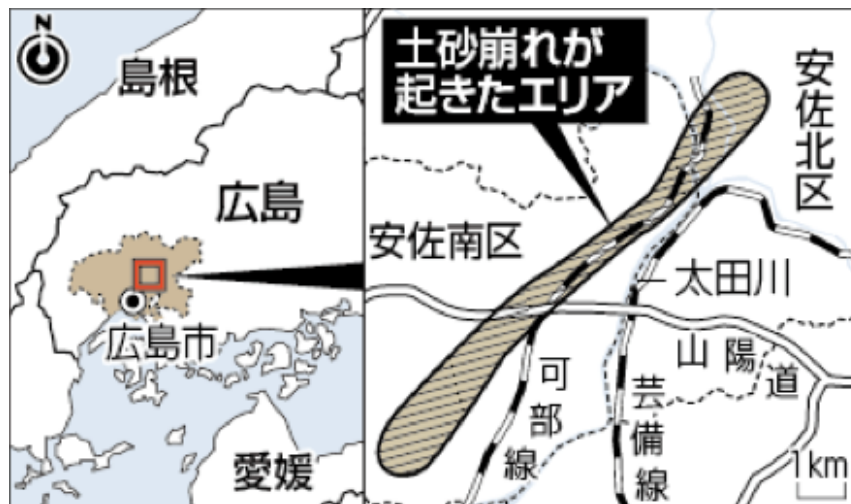
伊豆大島土石流災害

- 2013年10月15-16日、台風16号によって、伊豆大島での204時間積算雨量が800mm / 24 時間と記録された。
- Occurred in October 15 & 16 in 2013 through Typhoon 16th, cumulative reached 800 mm during
- Debris flow disaster in M



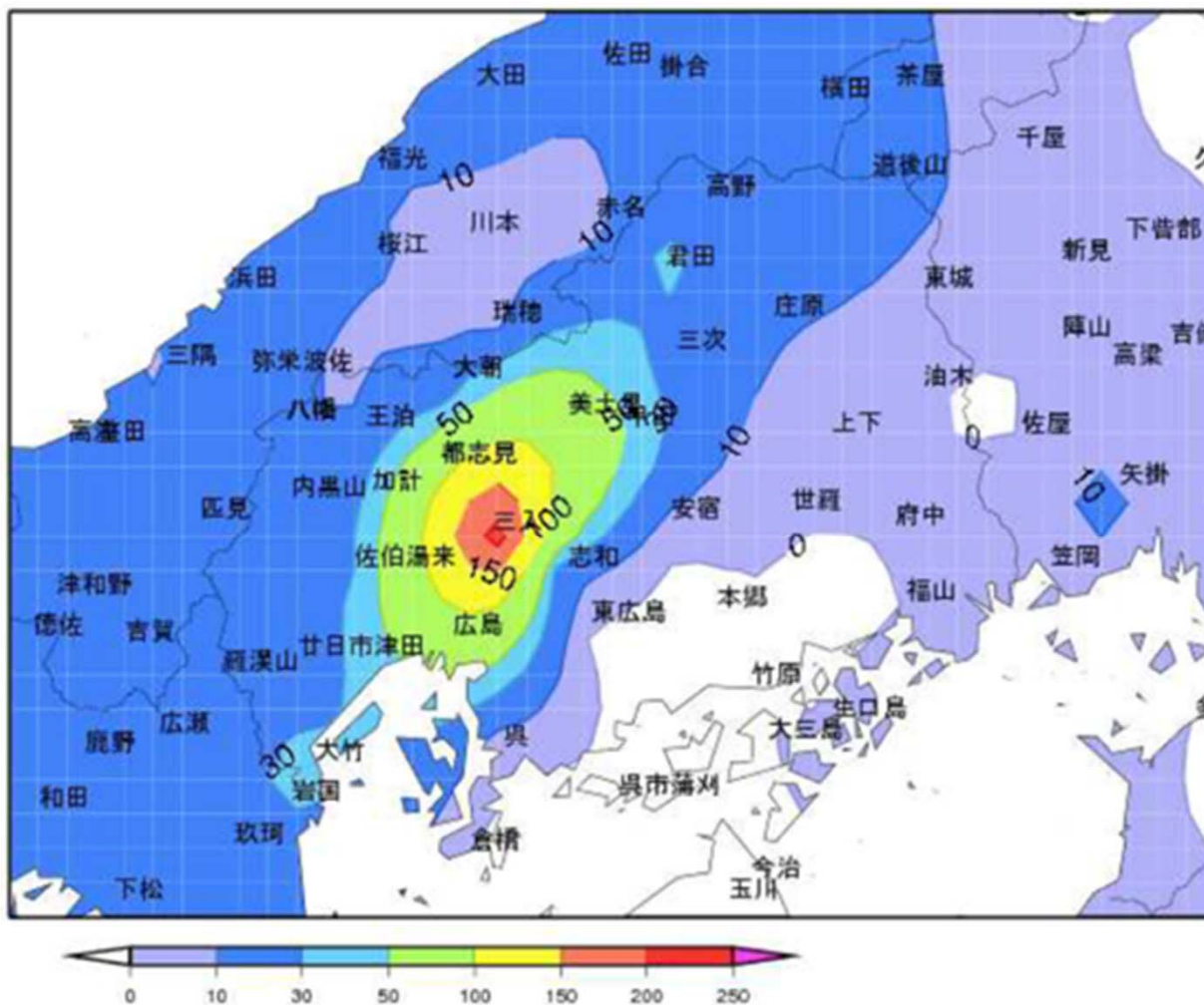
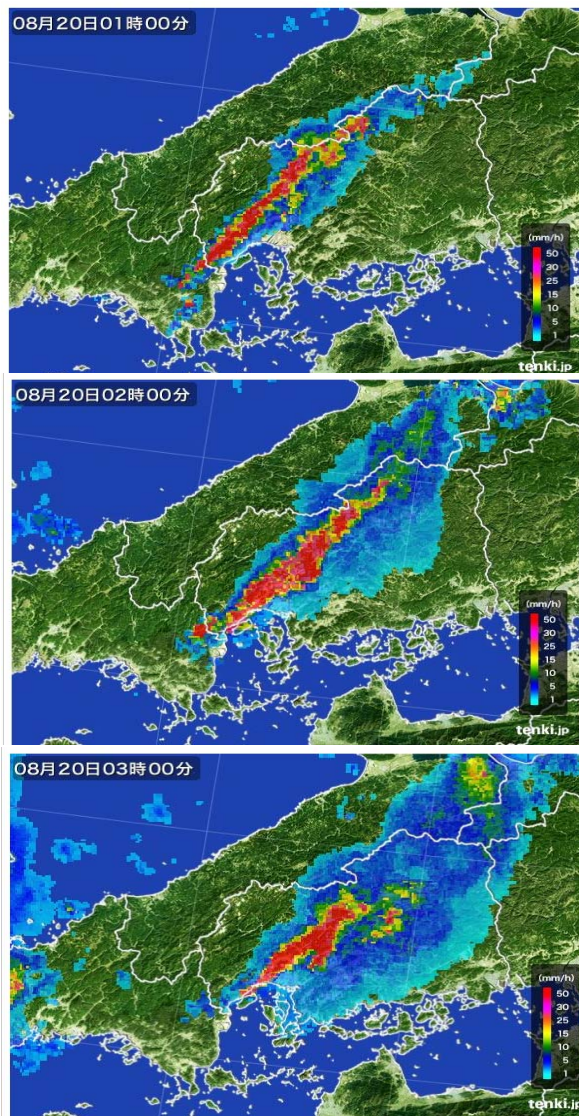
Debris flow in Hiroshima

- Occurred in 19&20th August 2014 in Hiroshima City associated with extreme rainfall with 250 mm during 12 hours.
- 107 debris flow occurred and caused 74 person killed and 44 injured



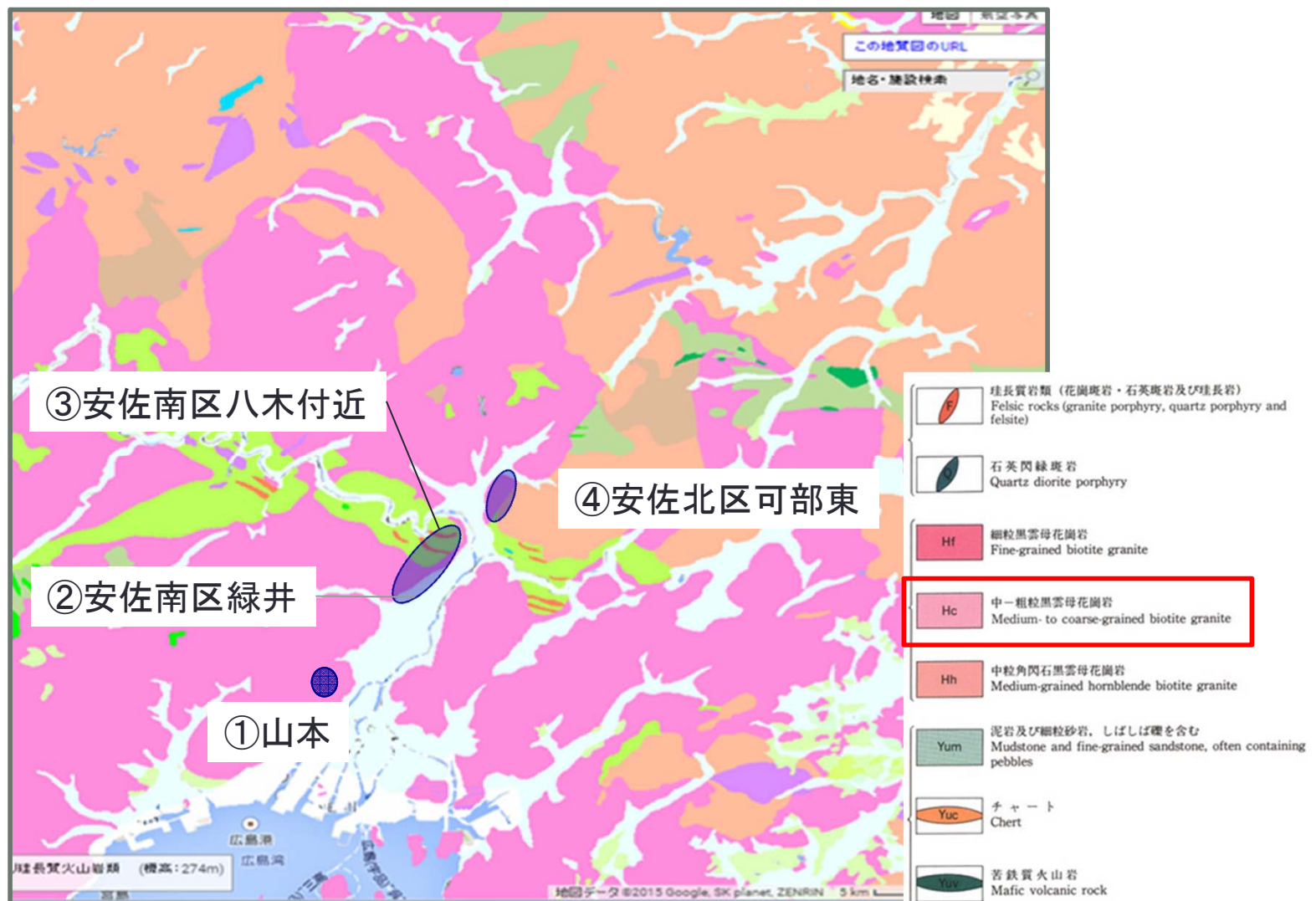
時事ドットコム: 8月20日掲載の図より引用

3.2 Rainfall in Hiroshima



8月19日11時～20日9時までのアメダス期間雨量

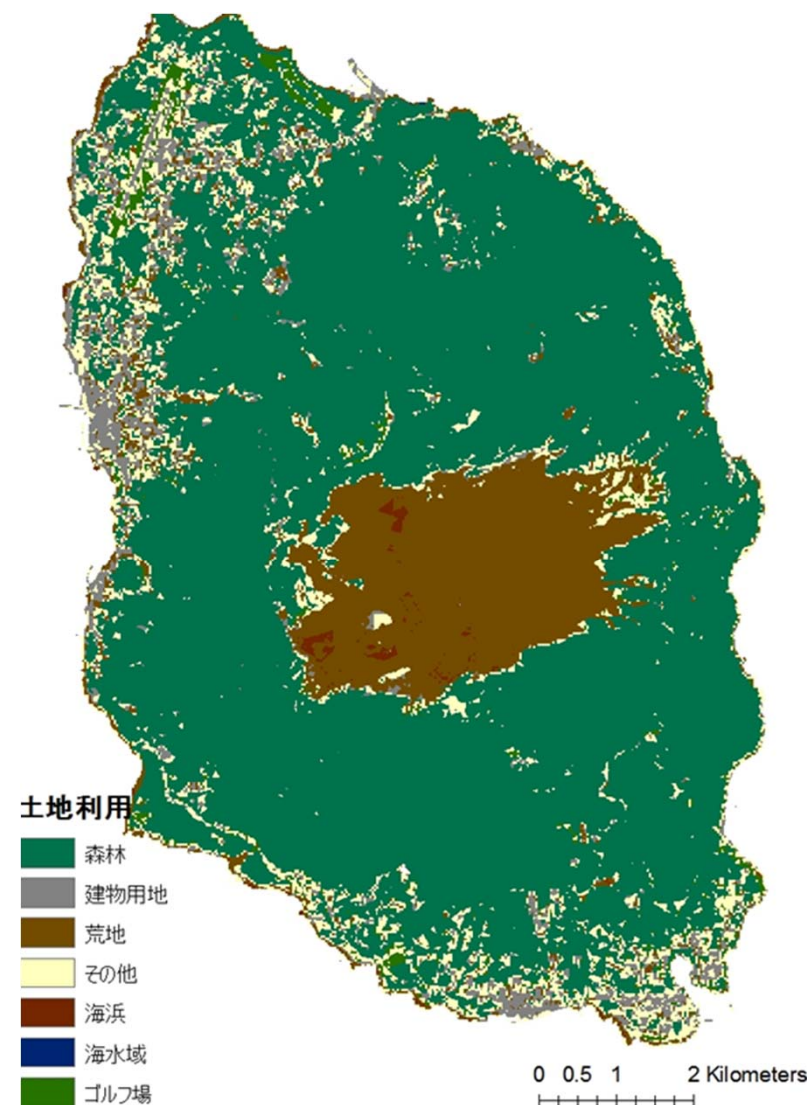
Soil type in Hiroshima



産総研地質調査総合センター 20万分の1日本シームレス地質図 (<https://gbank.gsj.jp/seamless/>)

Landuse in Izu-Oshima

Landuse classification has been performed by using Landsat-8/OLI specifically using band 3-5 by supervised classification with the 10-m grid spacing



Rio de Janeiro / Teresopolis 2011 January



Rio de Janeiro / Teresopolis 2011 January



**Debris Flow, induced by Extreme Rainfall –
Similarity between Brazilian and Japanese Disaster**

Nagano/Nagiso 2014 July

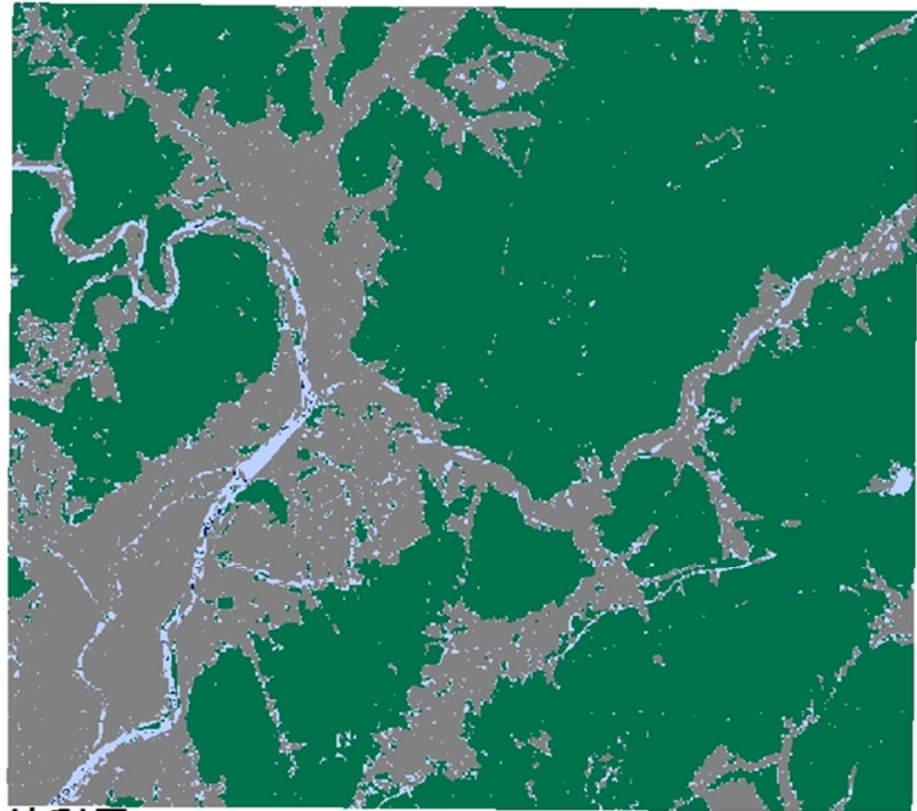


Hiroshima / Kabe 2014 August

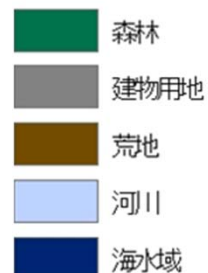


Land-use Hiroshima

Landuse classification
using Landsat-8/OLI sp
supervised classificatic
spacing



土地利用



0 1 2 4 Kilometers



Soil type classification – Izu-Oshima


Created soil-type map by using MLIT map



Soil type in Izu-oshima

10m grid spacing
distribution of scoria-
type volcanic ashes.

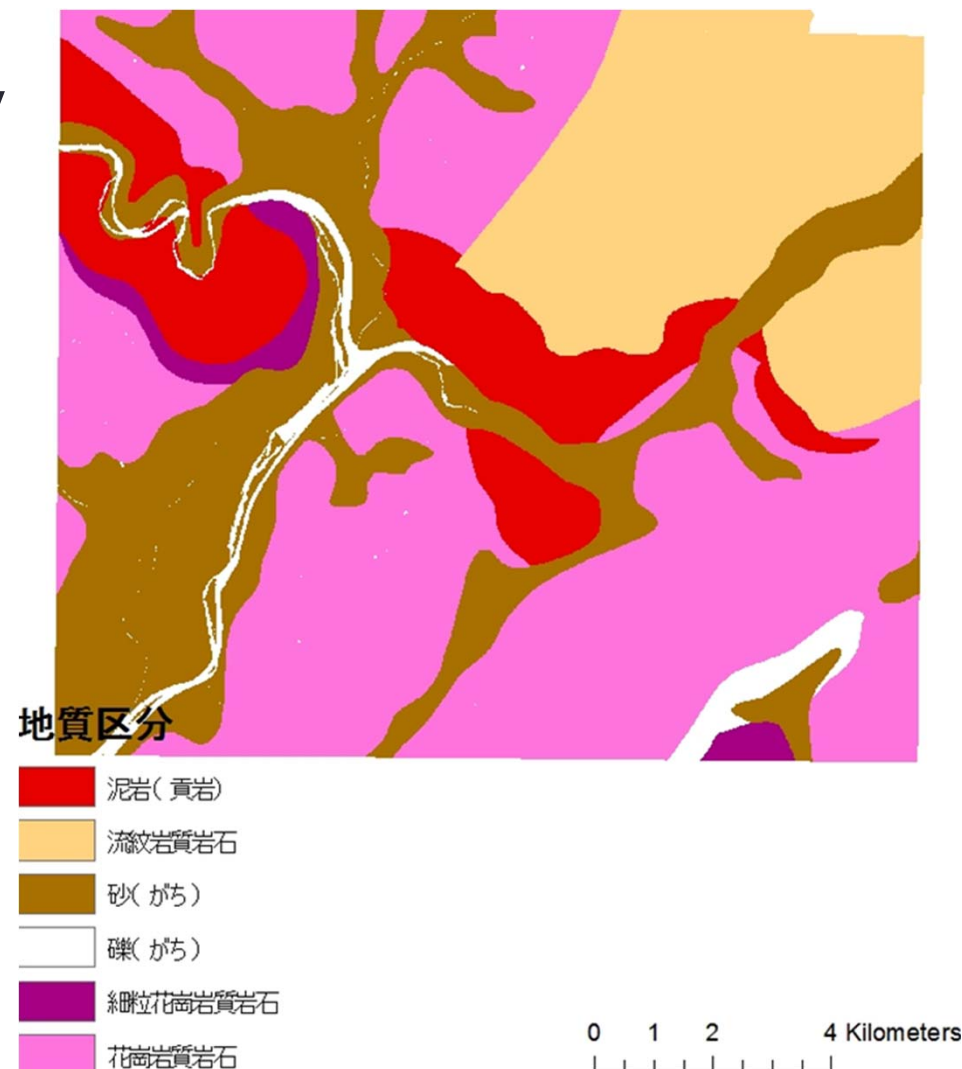


 玄武岩スコリア

0 0.5 1 2 Kilometer

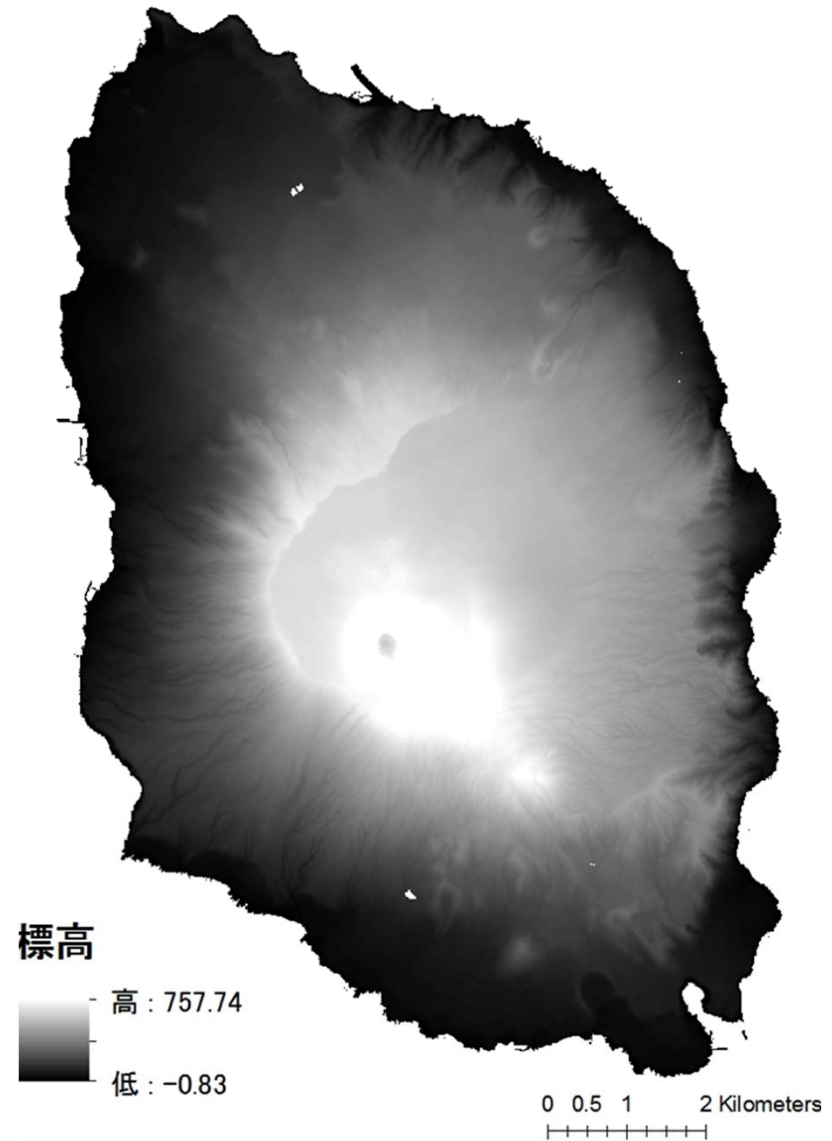

Soil-type Hiroshima

Created soil-type map by
MLIT



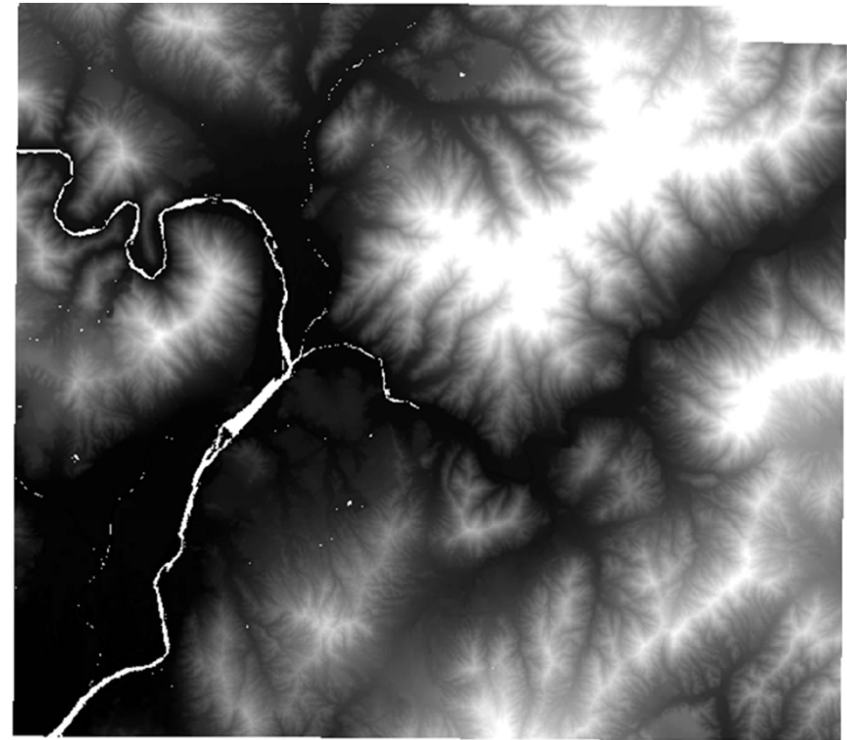
DEM (Izu-Ohshima)

10m grid spacing

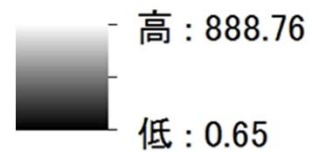


DEM (Hiroshima)

Created 10m grid spacing

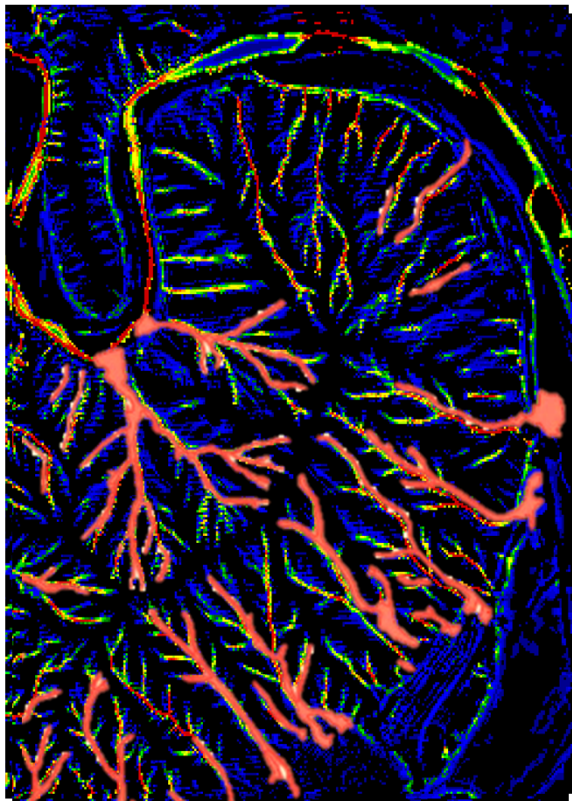


標高

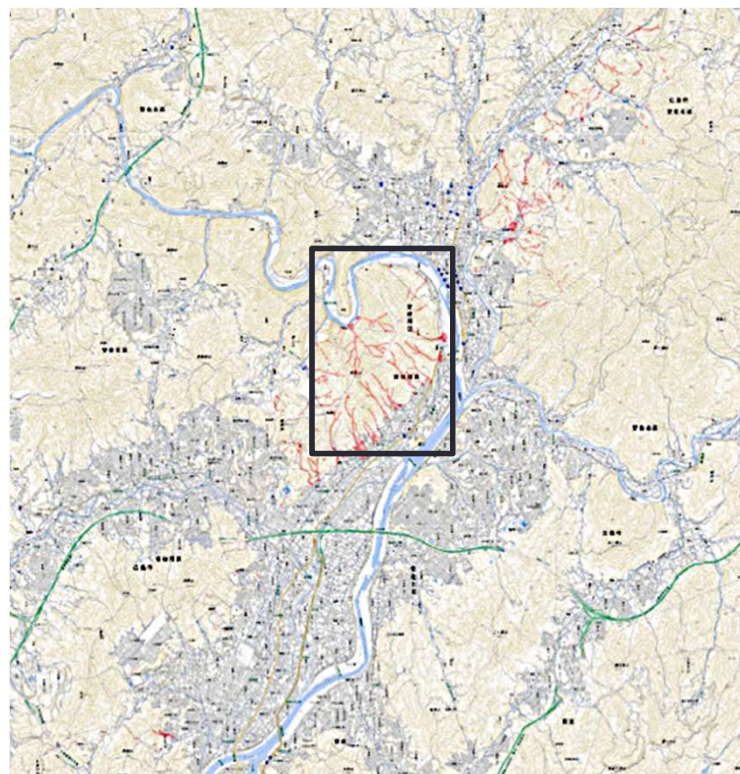


0 1 2 4 Kilometers

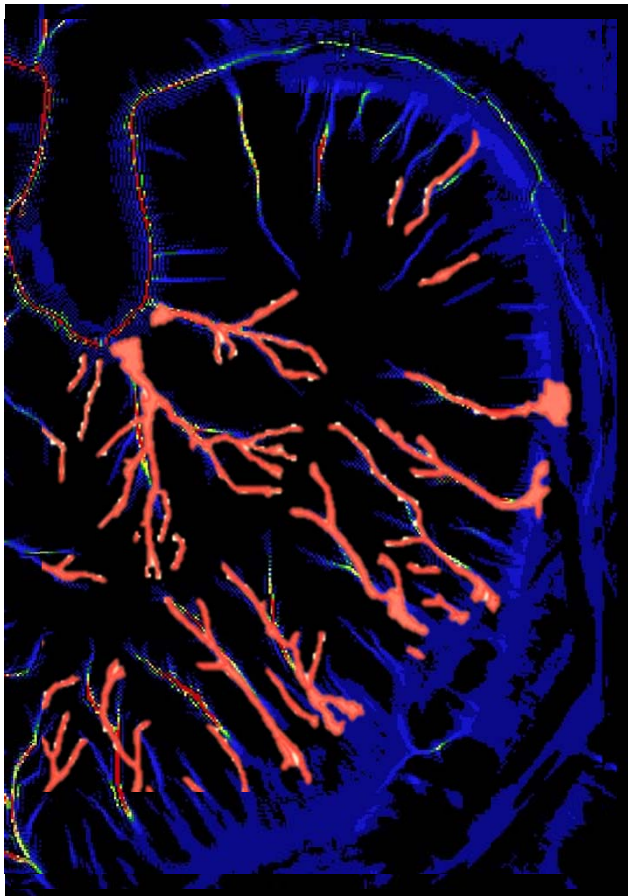
Numerical Prediction of Debris Flow Occurrence using Observed Raifall (with low threshold)



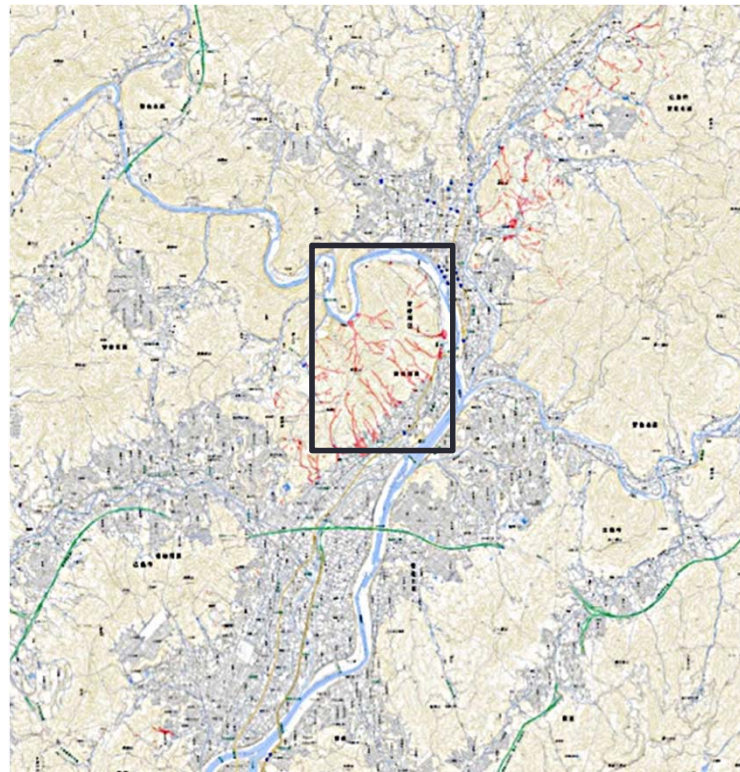
2時



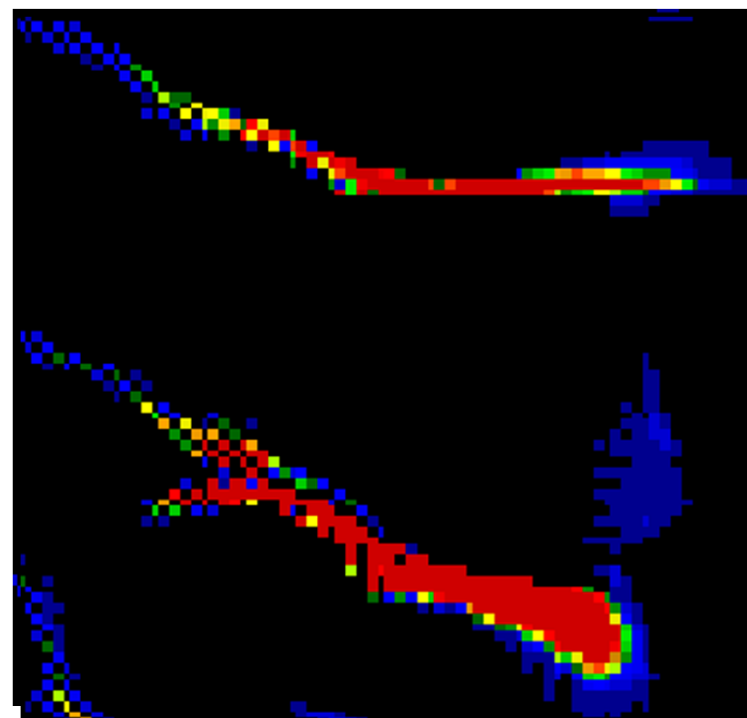
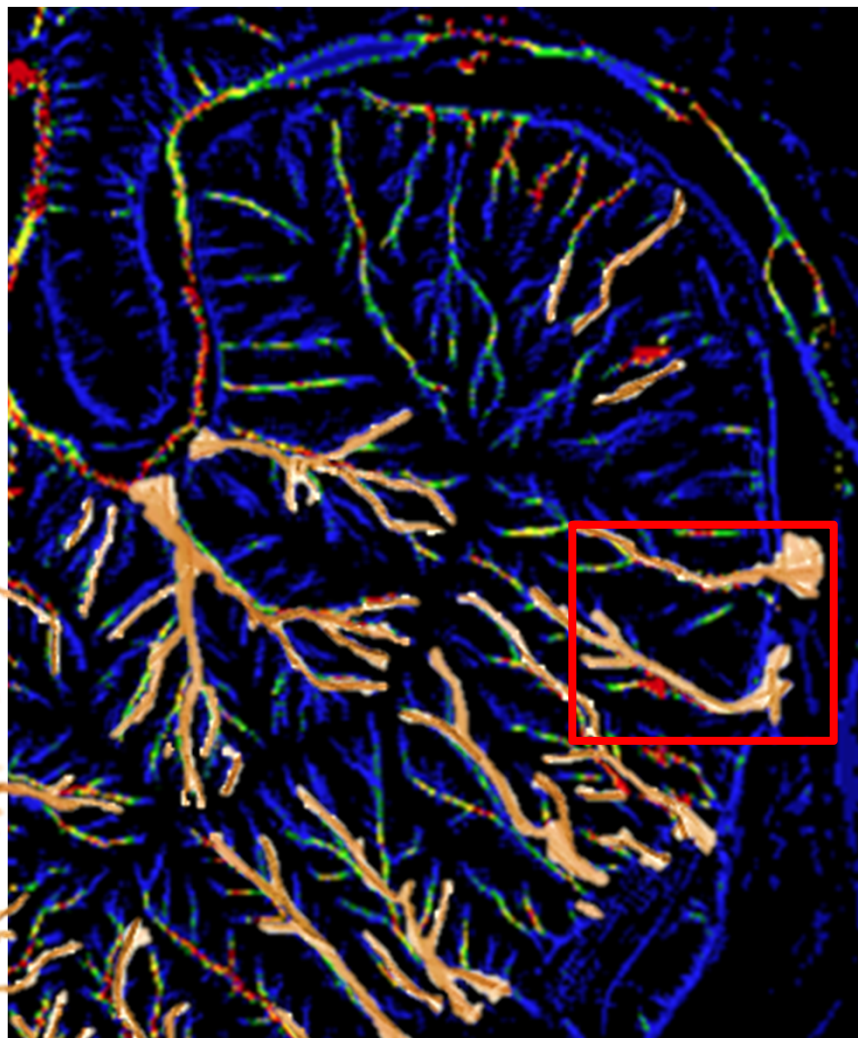
Numerical Prediction of Debris Flow Occurrence using Observed Raifall (with low threshold)



2時

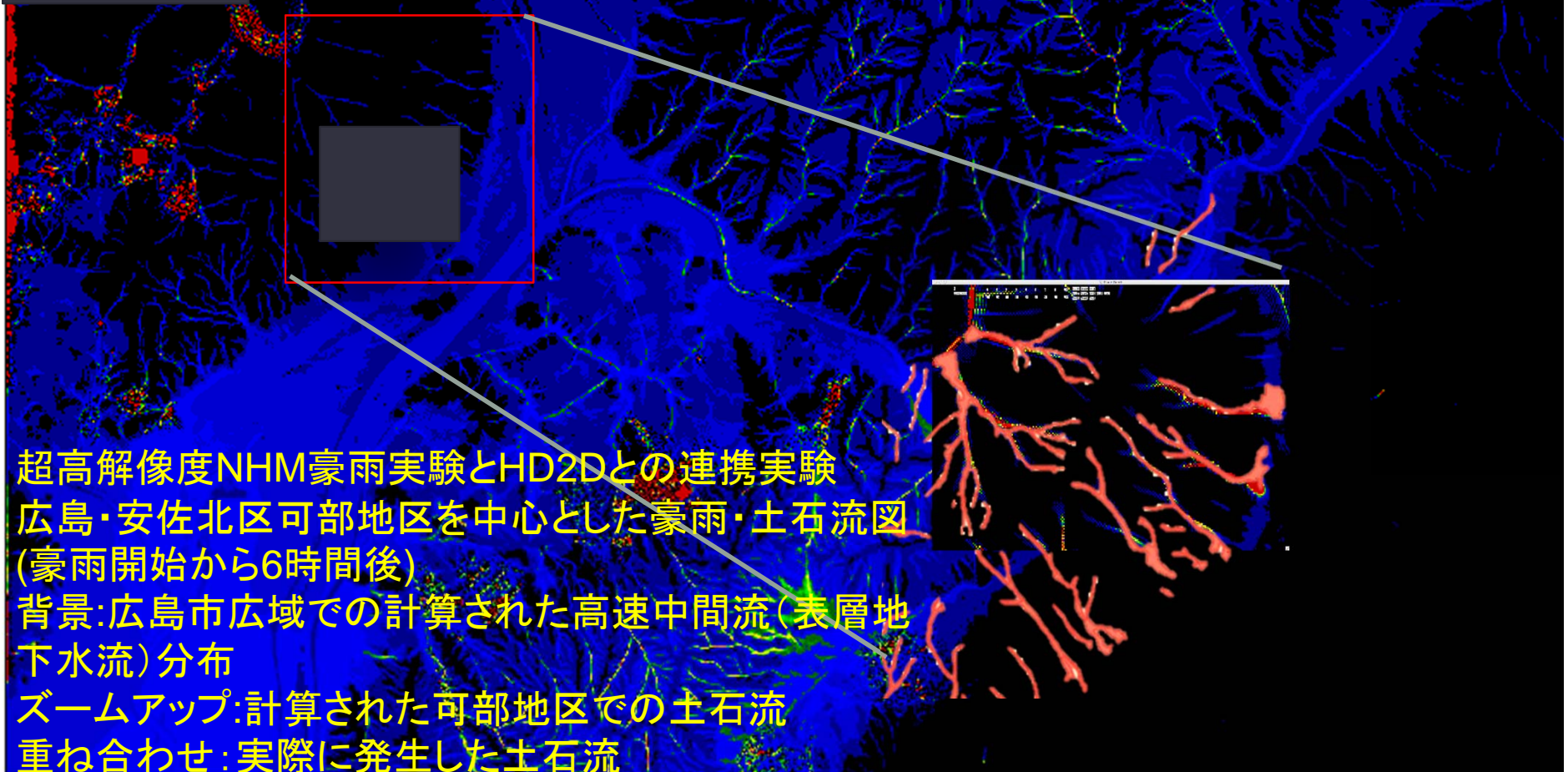


Deposition zone



2時50分

Numerical Simulation of Debris Flow, using projected rainfall by Super-high-resolution NHM rainfall with 250 m (Oizumi, Saito, etc),
Rainfall 6 hours after the initial rainfall, rapid subsurface flow,
Zoomed area – calculated Kabe Debris flow : brown zone as real occurred zone



Pos.: 1
Time: 0.0000

Z	S	D	U	L	R	N	P	10M	Xrot+	XrotE+4\$	Wto	Quit
up	lo	T+	T-	S+	S-	V+	V-	10P	Yrot+	YrotE+4\$	Zrot+	ZrotE+4\$

0,0000 1,0000 2,0000



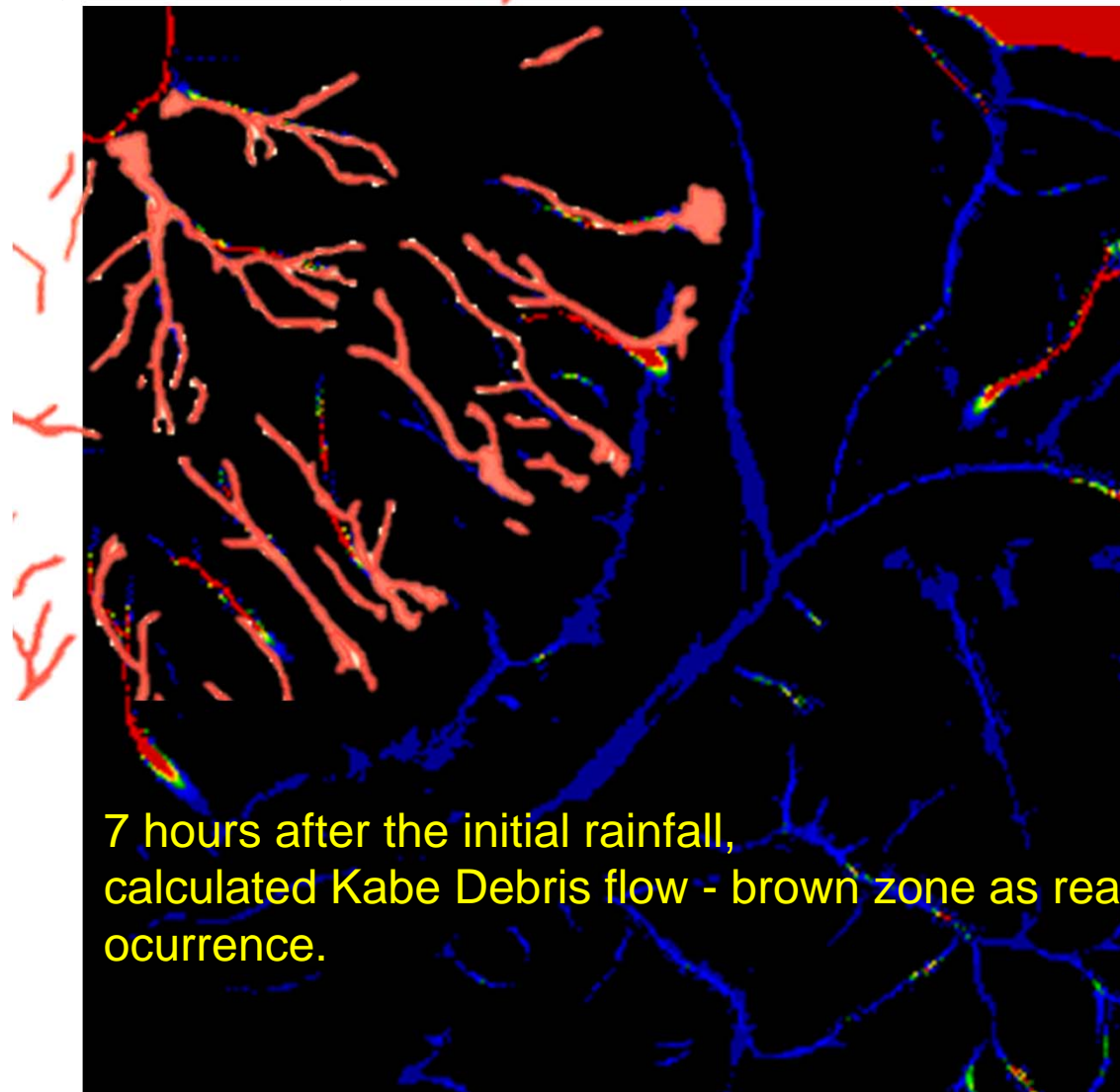
超高解像度NHM豪雨実験とHD2Dとの連携実験

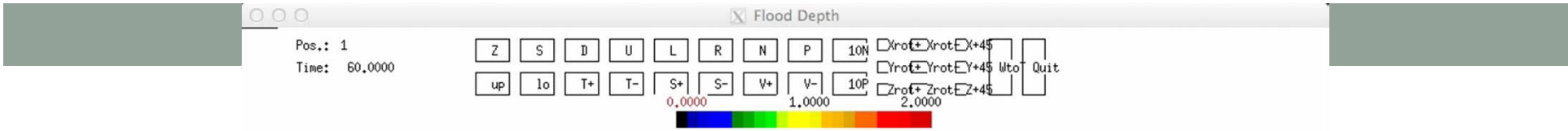
広島・安佐北区可部地区を中心とした豪雨・土石流図(豪雨開始から7時間後)

別ケース(発生条件の変更)での計算

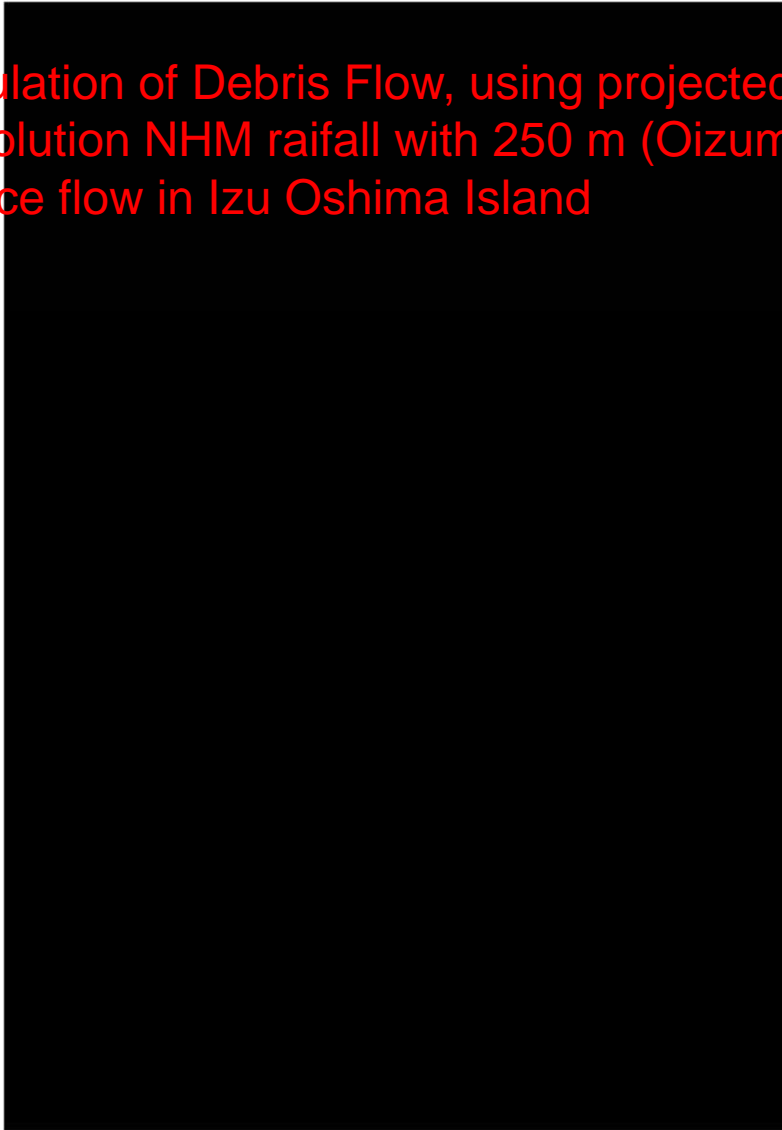
ズームアップ:HD2Dで計算された可部地区での土石流

重ね合わせ:実際に発生した土石流





Numerical Simulation of Debris Flow, using projected rainfall by Super-high-resolution NHM rainfall with 250 m (Oizumi, Saito, etc), Rapid subsurface flow in Izu Oshima Island



Superhigh Resolution N-Model with 250 m (Oizu)

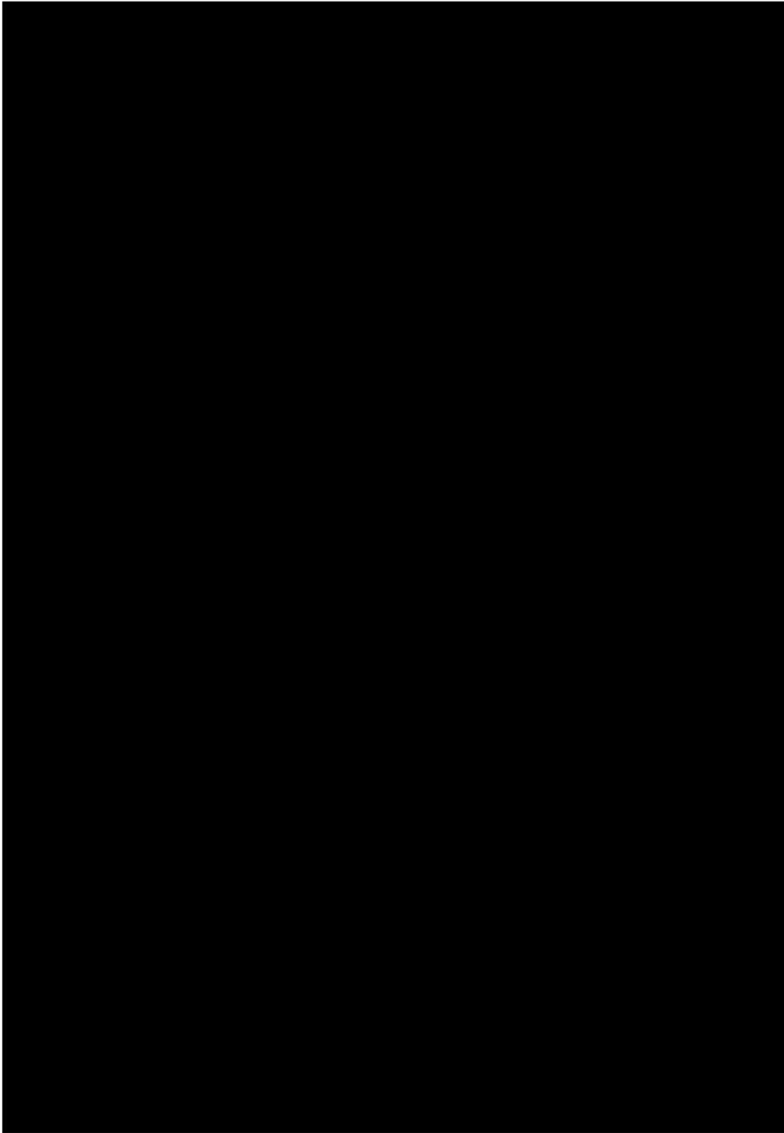
Rapid subsurface flow in Izu Oshima Island

Windows title bar: Flood Depth

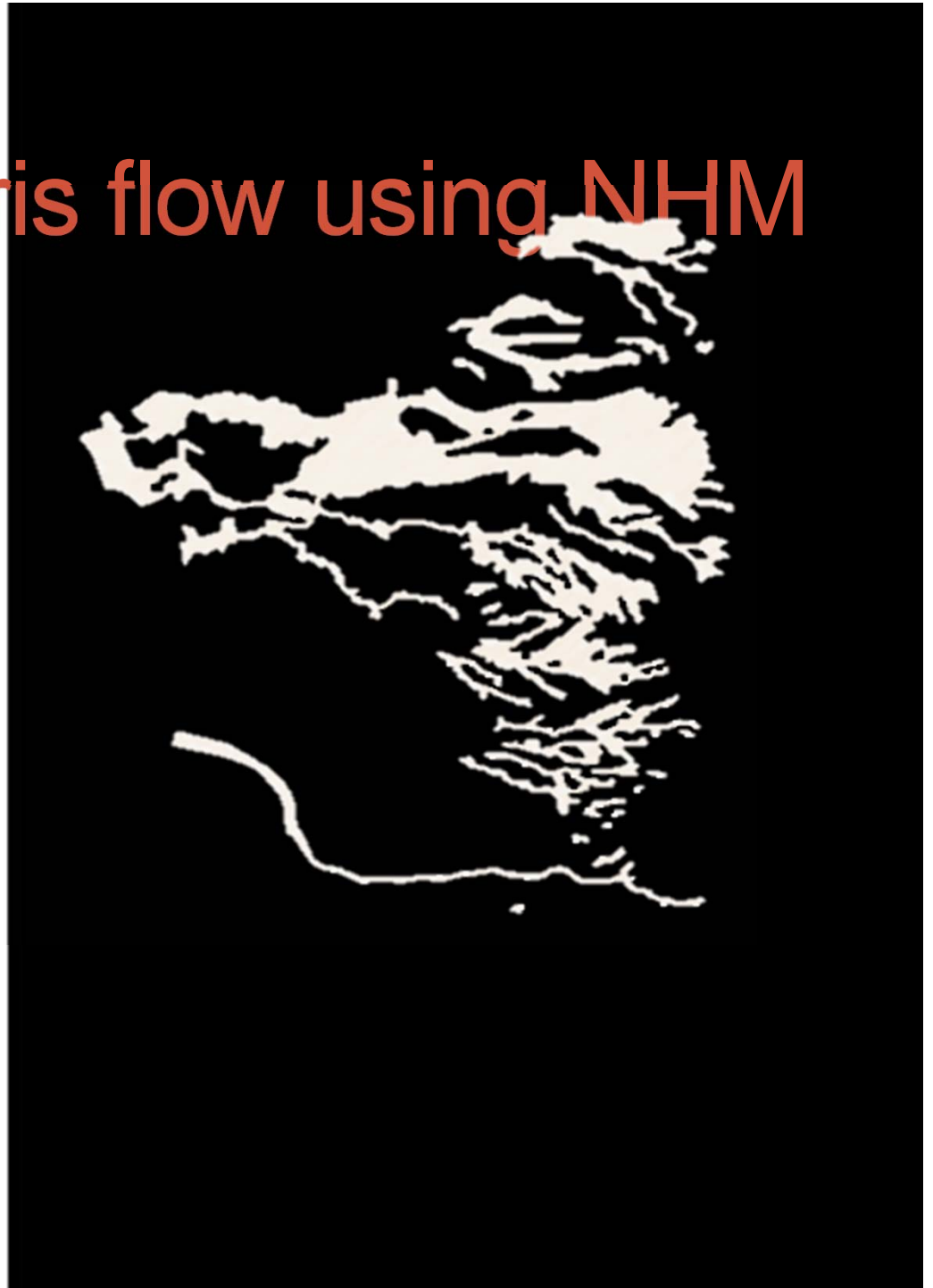
Pos.: 1
Time: 0.0000

Z	S	D	U	L	R	N	P	10M	Xrot	Xrot+45	Mto	Quit
up	lo	T+	T-	S+	S-	V+	V-	10P	Yrot	Yrot+45	Zrot	Zrot+45

0.0000 1.0000 2.0000



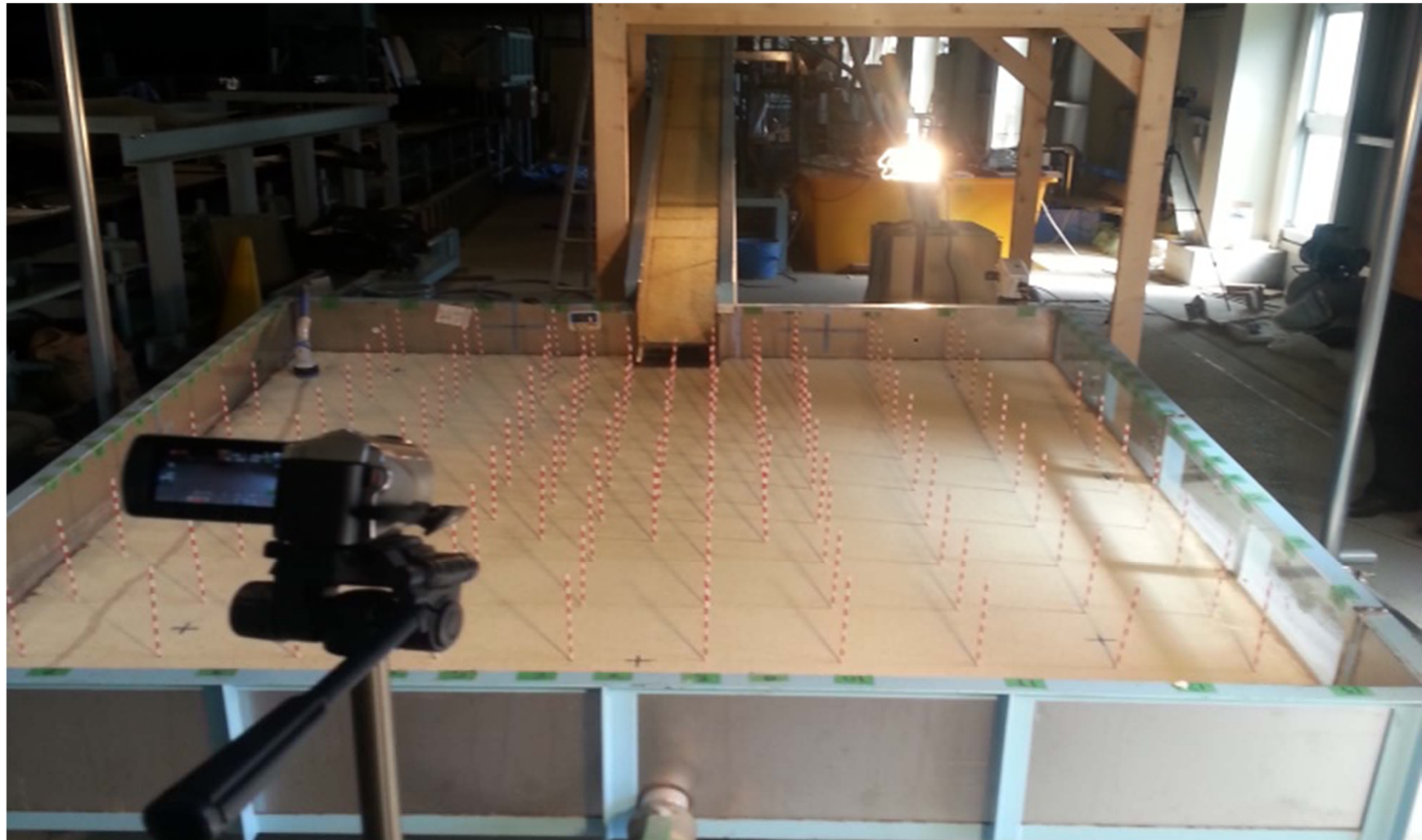
Calculated debris flow using NHM

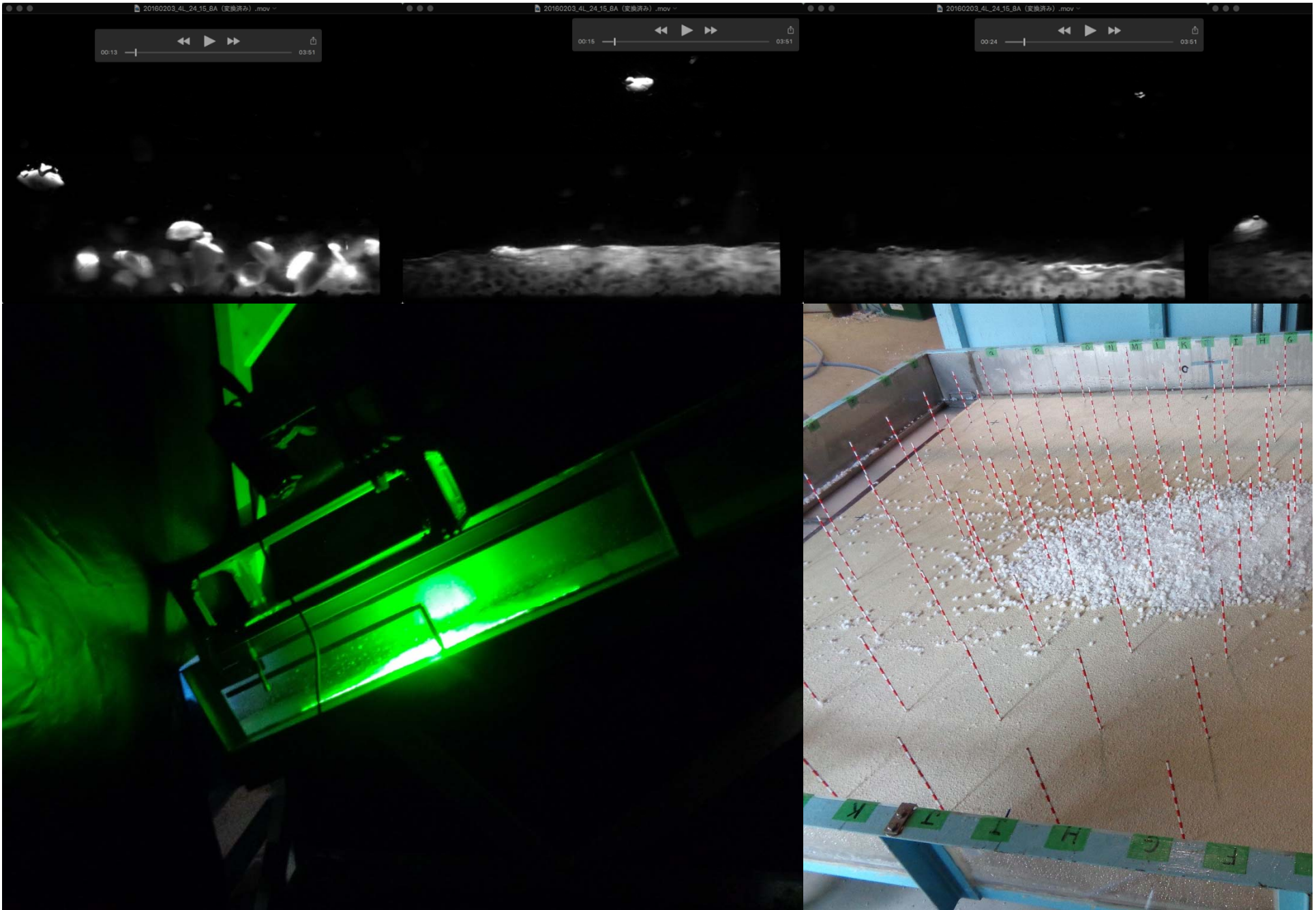


土石流発生実験 Debris Flow Experiments



土石流発生実験 Debris Flow Experiments









ant terminal



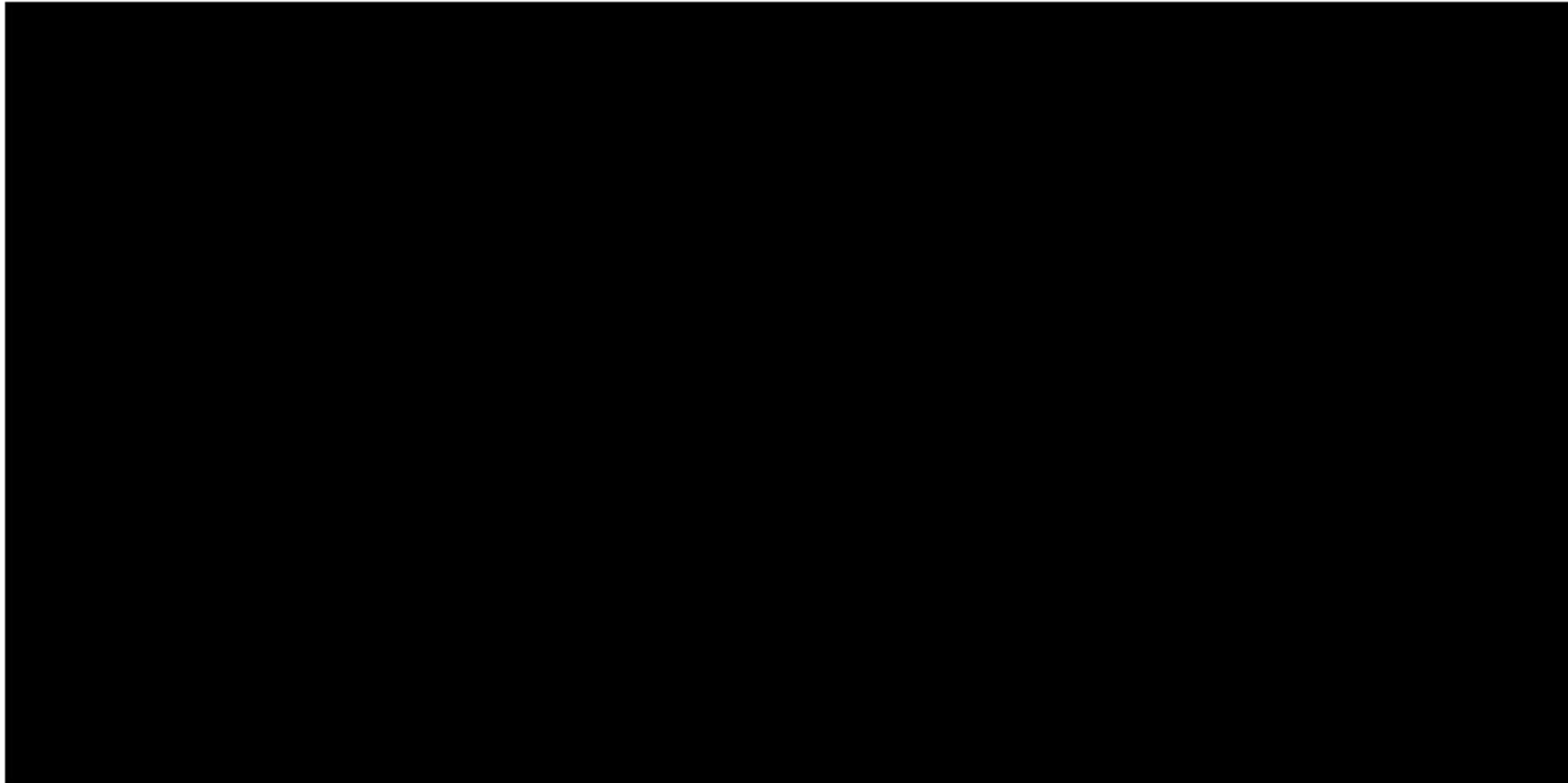

阿蘇山周辺表面流土石流解析(表面流)

○ X Flood Depth

Pos.: 1
Time: 0.0000

Z	S	D	U	L	R	N	P	10N	Xrot+XrotE+4\$		Quit
up	lo	T+	T-	S+	S-	V+	V-	10P	Yrot+YrotE+4\$ Wto		
									Zrot+ZrotE+4\$		

0.0000 1.0000 2.0000



阿蘇山周辺表面流土石流解析(高速地下水流)

○○○ Flood Depth

Pos.: 1
Time: 0.0000

Z	S	D	U	L	R	N	P	10N	<input type="checkbox"/> Xrot+ XrotE+4\$	<input type="checkbox"/>
up	lo	T+	T-	S+	S-	V+	V-	10P	<input type="checkbox"/> Yrot+ YrotE+4\$	Wto Quit
									<input type="checkbox"/> Zrot+ ZrotE+4\$	

0.0000 1.0000 2.0000

