Examination and systematization of predispositions to floods in the Heavy Rain in July 2018

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Introduction

Though predispositions to floods have been mentioned in the studies of river engineering, geography and geomorphology, the relationship between flood and topography / geology is dealt with as self-evident in most of them. Hence, this study focuses on the predispositions to floods.
The floods in the Heavy Rain in July 2018, especially those of the Oda River (the Takahashi River System) are the subjects of this study. The purposes of this study are (1) to create a database on the floods, (2) to examine predispositions for each space scale, taking into account the influence of artificiality, (3) to acquire knowledge contributing to high accuracy of flood risk assessment.

Fields & Methods

In the Chugoku district, 3 denudation surfaces are seen. And, the plains on the Setouchi side have been formed by the rivers flowing down from the Chugoku mountains. These rivers are characterized by weathering granitoids distributed upstream.
The Oda River is a first-class river which joins the Takahashi River in Kurashiki city. Since the Oda River has a gentler river bed than that of the Takahashi River, it is affected by the backwater from the Takahashi River.
The Association of Japanese Geographers has released the map of the flood points caused by the heavy rain on the Web (http://ajg-disaster.blogspot.com/). The characteristics of the river channels on the flood points on this map (mainly those of the Oda River) were investigated and compiled into a matrix.
On 9 dike break points of 4 rivers, the aerial photos were interpreted, and the classification maps of flood landforms were created.
Besides, the downstream change graph of the river bed height, the bed slope…etc. of the Oda River were created.

Results

Many dike break points lie in the administrative sections of the prefectures, and raised beds are seen on 9 of the 10 points in the tributaries to the Oda River. There are sluice gates on 2 dike break points and 5 slope failure points reported in the Council for Social Infrastructure (2018). At the outer bank of the large river curve in Fukuhara, where the overflows and the slope failures were occurred this time, dike breaks were also occurred in the past.
Although alluvial ridges have been regarded as safe against floods, the largest dike breaks occurred on the alluvial ridge.
The downstream change graphs show that floods didn’t occur in a downstream section of a weir with a relatively steep river bed but occur in a further downstream section where a river bed becomes gentle.

Discussion

On the point scale, a sluice gates and a raised bed section is one of the predispositions to floods. From comparing dike break points and non-dike break points, it is suggested that steep slope gradient affects dike break, too. And it is necessary to update the flood risk assessment on alluvial ridges.
On the section scale, compared the downstream section of a weir with a steep river bed, the further

downstream section with a gentle bed is dangerous.
On the regional scale, it is considered that the bed slope difference of the Oda River and the Takahashi River is affected by the denudation surfaces. It is also one of the predispositions that granitoids is widely distributed in Chugoku district.
Regarding artificiality, it turned out that the river maintenance has not kept up. However, there is the more serious issue that the Mabi-cho area, where many floods occurred this time, has become a bedroom town. Therefore, it is necessary to reconsider how to use land.

References

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Keywords: the Oda River, raised bed river, alluvial ridge, crevasse splay, channel slope

	地点	種類	確かさ 海津ほか	直後写真	確かさ 総合	支流名	岸	河道植生	砂州	河床材料	河道幅 (m)	低水路幅 水面幅(m)	狭窄 (m)	/河道幅 (広)	堤防高 堤外地	堤防高 堤内地	横幅 堤内地	傾斜 堤内地
小田川	4	破堤	ほぼ正確	×	△	尾坂川	左	草（2014）	上216-85mに（2014）	砂	27	(7)	-	-	2.1	1.7	9	0.189
	5	破堤	ほぼ正確	×	△	-	左	草（2007）	-	-	142	(30)	-	-	6.3	3.1	17	0.182
	6	破堤	ほぼ正確	×	△	-	右	～草（2014）	下15m左岸，固定化（2014）	砂	155	(35)	-	-	5.1	2.6	22	0.118
	7	破堤	ほぼ正確	×	△	-	左	草（2014）	-	砂	180	(20-37)	100	0.42	5.7	2.5	13	0.192
	8	破堤	ほぼ正確	○	○	（水路）	左	-	-	-	5	2	-	-	1.3	1.8	9	0.200
	9	越水	ほぼ正確	○	○	-	右	草（～樹木）	両岸	砂	181	38-47	-	-	7.3	（山）	-	-
	10	破堤	不正確	○	○	大武谷川	右	～草	-	-	13	1-2	-	-	1.5-2.1	2.2	8	0.275
	11	破堤	ほぼ正確	○	○	-	左	草～樹木	左（内）岸に30m	砂	206	58	28	0.14	5.8	4.0	12	0.333
	12	破堤	ほぼ正確	○	○	真谷川	左	草（～樹木）	-	-	37	1-2	-	-	6.0	5.4	13	0.415
	13	越水	ほぼ正確	○	○	-	右	草～樹木	樹林化中州	砂	233	複数本	-	-	7.8	3.4	13	0.262
	14	破堤	ほぼ正確	○	○	高馬川	右	草	-	-	13	7	-	-	1.5	4.0	14	0.286
	15	破堤	ほぼ正確	○	○	高馬川	左	草	-	-	13	7	-	-	3.0	5.8	13	0.446
	16	破堤	ほぼ正確	○	○	-	左	草～樹木	樹林化中州	砂	217	複数本	-	-	8.2	6.0	18	0.333
	17	越水	ほぼ正確	○	○	-	右	樹木	樹林化中州	砂	227	複数本	-	-	7.2	2.6	16	0.163
	18	破堤	ほぼ正確	○	○	末政川	右	～草	-	-	12	1-2	-	-	1.6	-	-	-
	19	破堤	ほぼ正確	○	○	末政川	左	～草	-	-	12	1-2	-	-	2.1	-	-	-
	20	破堤	ほぼ正確	○	○	末政川	右	～草	-	-	30	1-2	6	0.20	5.1	6.5	18	0.361
	21	破堤	ほぼ正確	○	○	末政川	左	～草	-	-	32	1-2	6	0.19	5.5	6.2	19	0.326
高梁川	1	破堤	-	○	○	-	右	樹木多い	右（内）に80m	砂	240	65	70（緩やか）	-	10.3	3.0	11	0.273
	2	破堤	-	○	○	-	右	樹木多い	右（内）	砂	190	80	同上	-	9.7	2.2	9	0.244
砂川		破堤	ほぼ正確	×	△	-	左	草～樹木（2007）	右岸(2007)	砂	58	5	-	-	4.5	4.5	15	0.300
旭川		破堤	ほぼ正確	×	△	-	左	草～（2007）	80m下から(2007)	粗砂～	175	116	80m下から54減	0.31	5.3	-	-	-
芦田川		破堤	不正確	○	○	吉野川	右	～草	-	-	9	0-1	-	-	0.3	1.9	8	0.238
賀茂川		破堤	不正確	○	○	-	右	～草	右岸に17m	砂	37	16	-	-	-	2.5	10	0.250

Fig. 1 A part of flood point matrix.

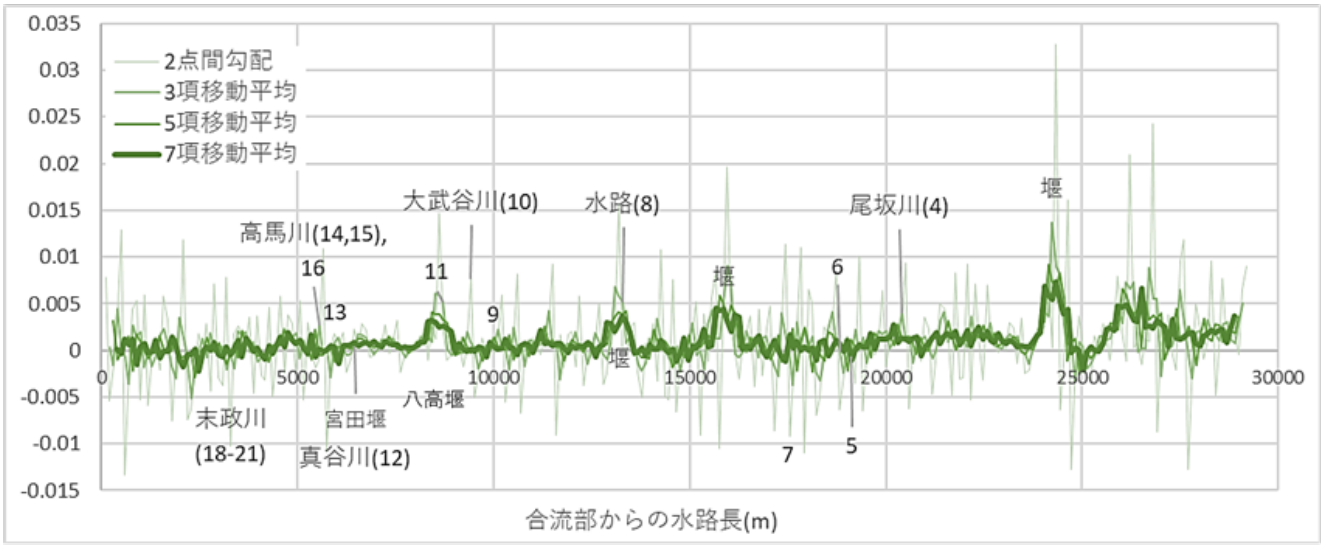

Fig. 2 The downstream change graph of the river bed slope.

