Radar Information to Mitigate Flood Disaster

24 January 2006

Dr. NAKAO Tadahiko, FRICS

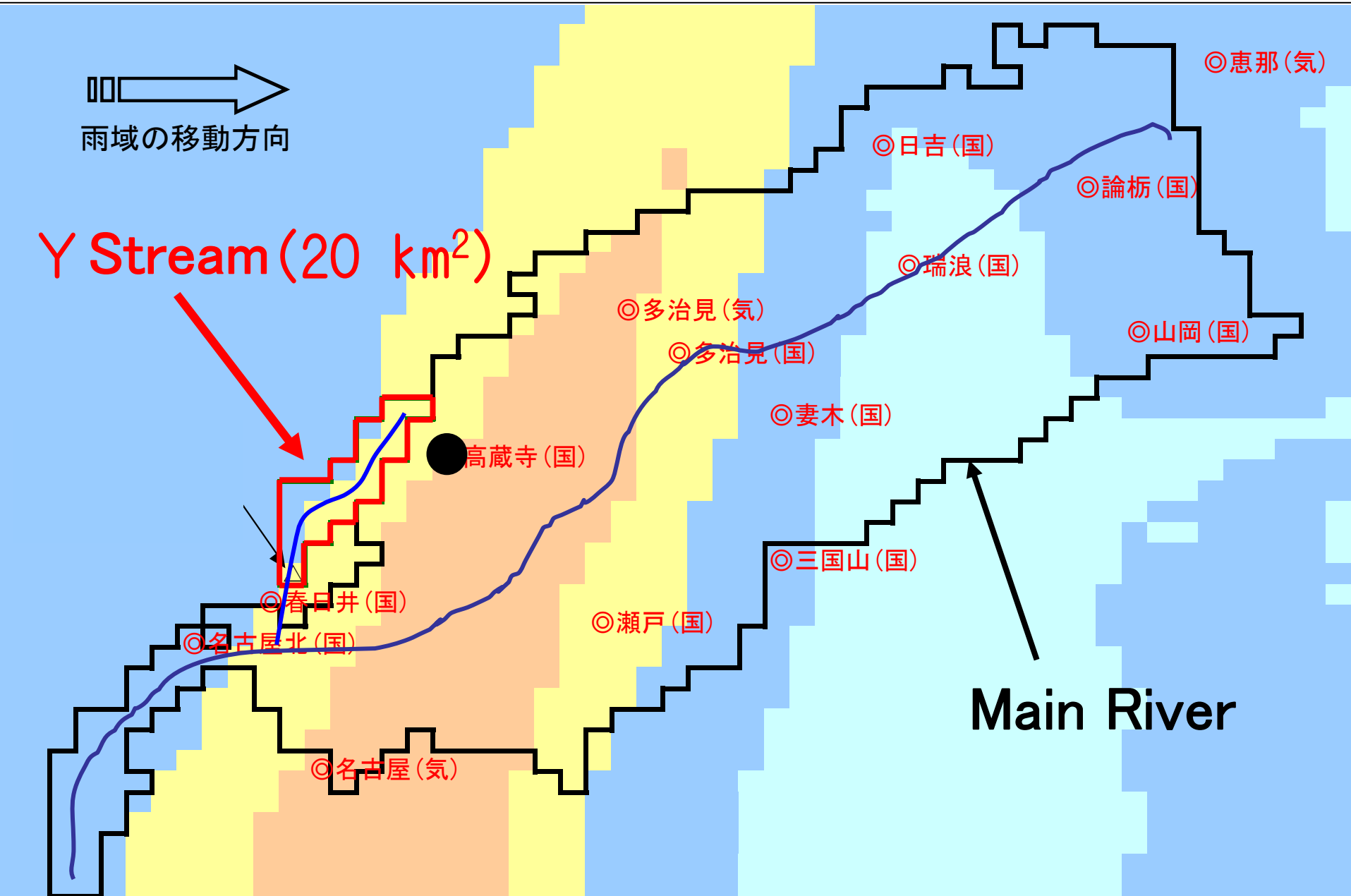
Flood Forecasting should:

- Be issued
  - For specific location(s),
  - Within limited time allowance; and
- Disseminated
  - To the all people concerned
  - Especially including vulnerable people, so that
- Take advantage of
  - Recent technologies available, as well as
  - History-stemmed skill and know-how.

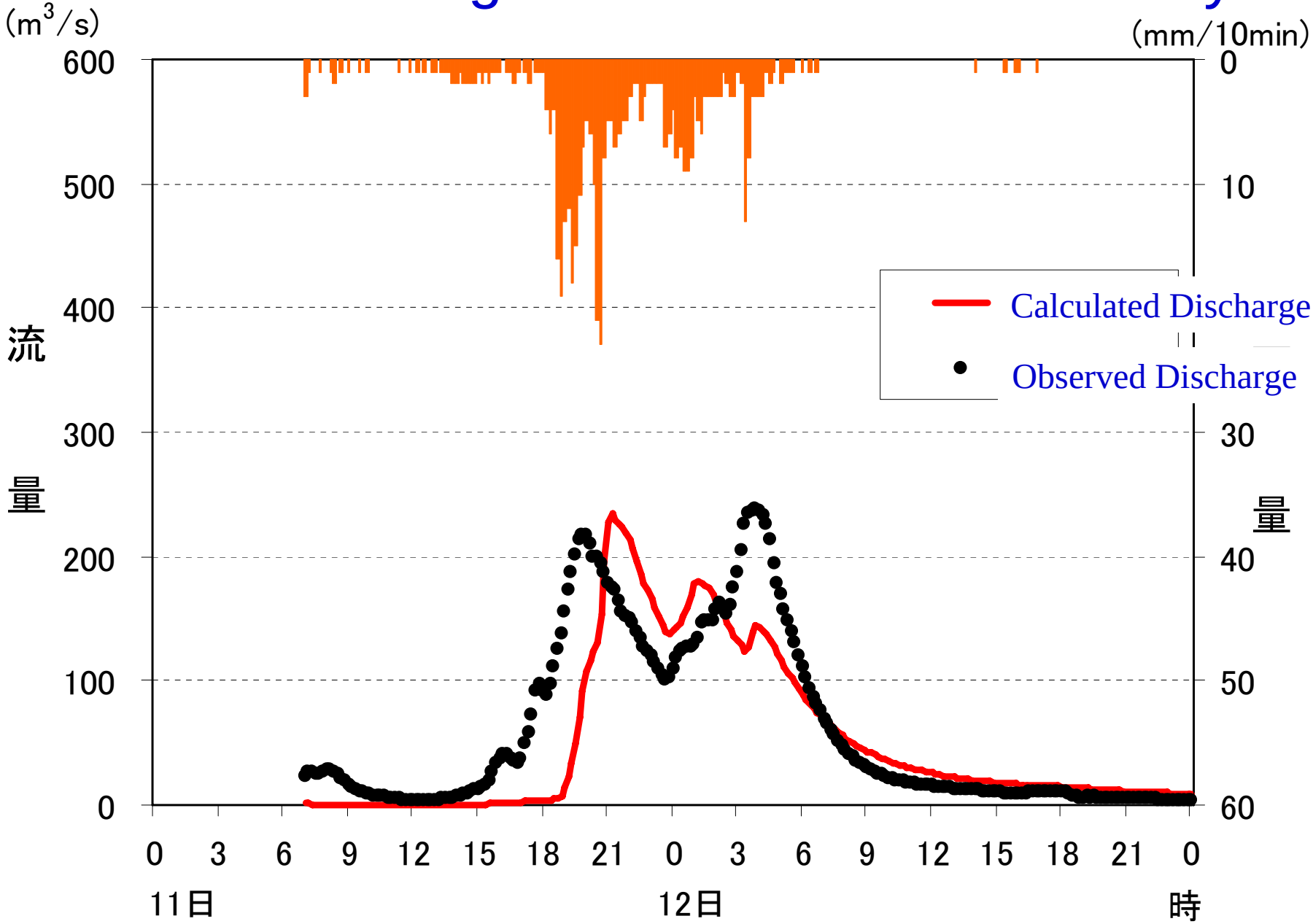
Radar Raingauge System

- Calibrated on-line and real-time, Radar raingauge system will give more suitable data to be input to Flood forecasting systems.
- Radar is especially effective for small streams, where only a few, if any, ground rain gauges are usually installed.
- Rainfall forecasting is to be made for short period using radar data.

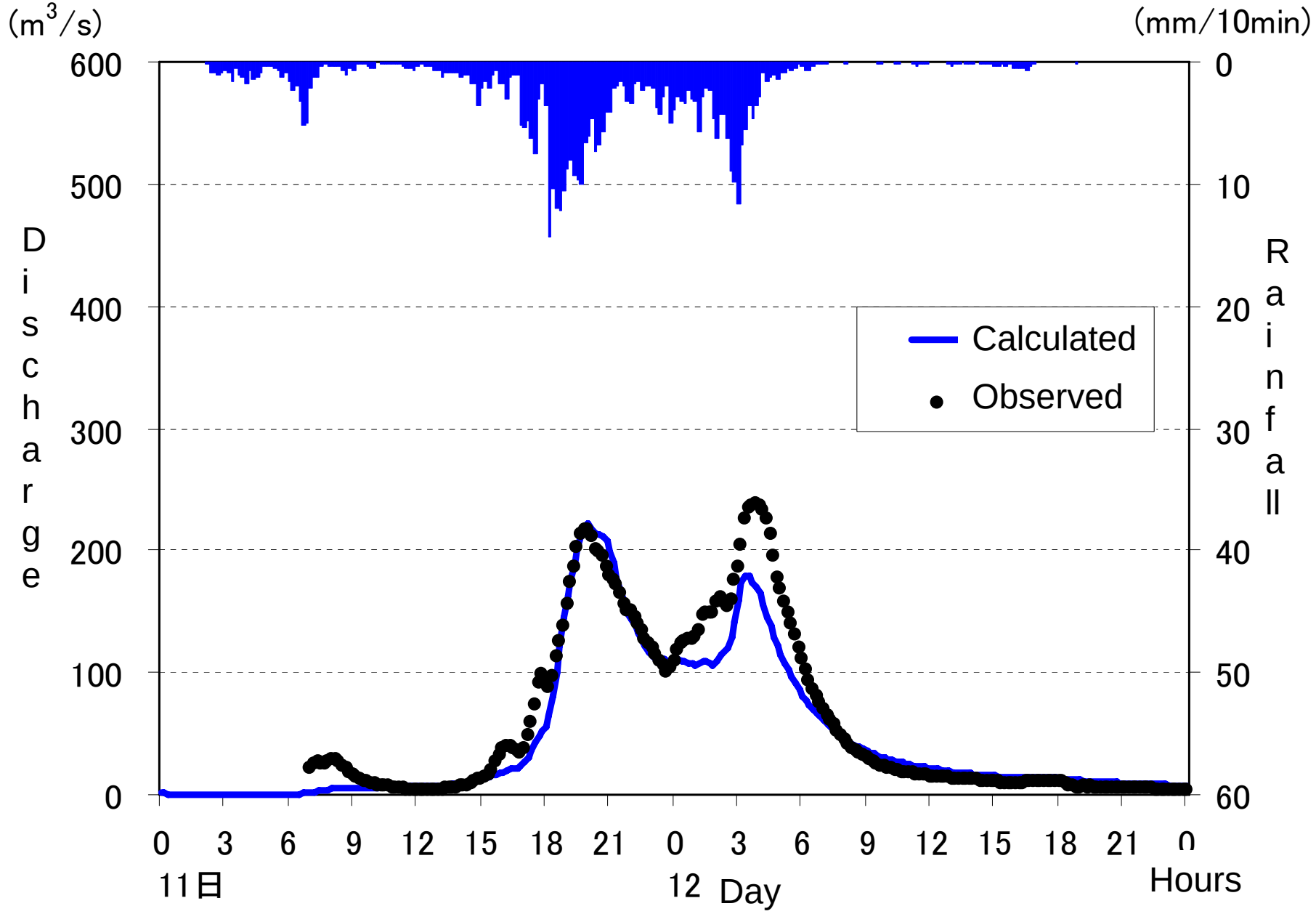
Runoff Estimation for a Small Stream



Based on the ground rainfall in the vicinity



Result based on the Radar Rainfall



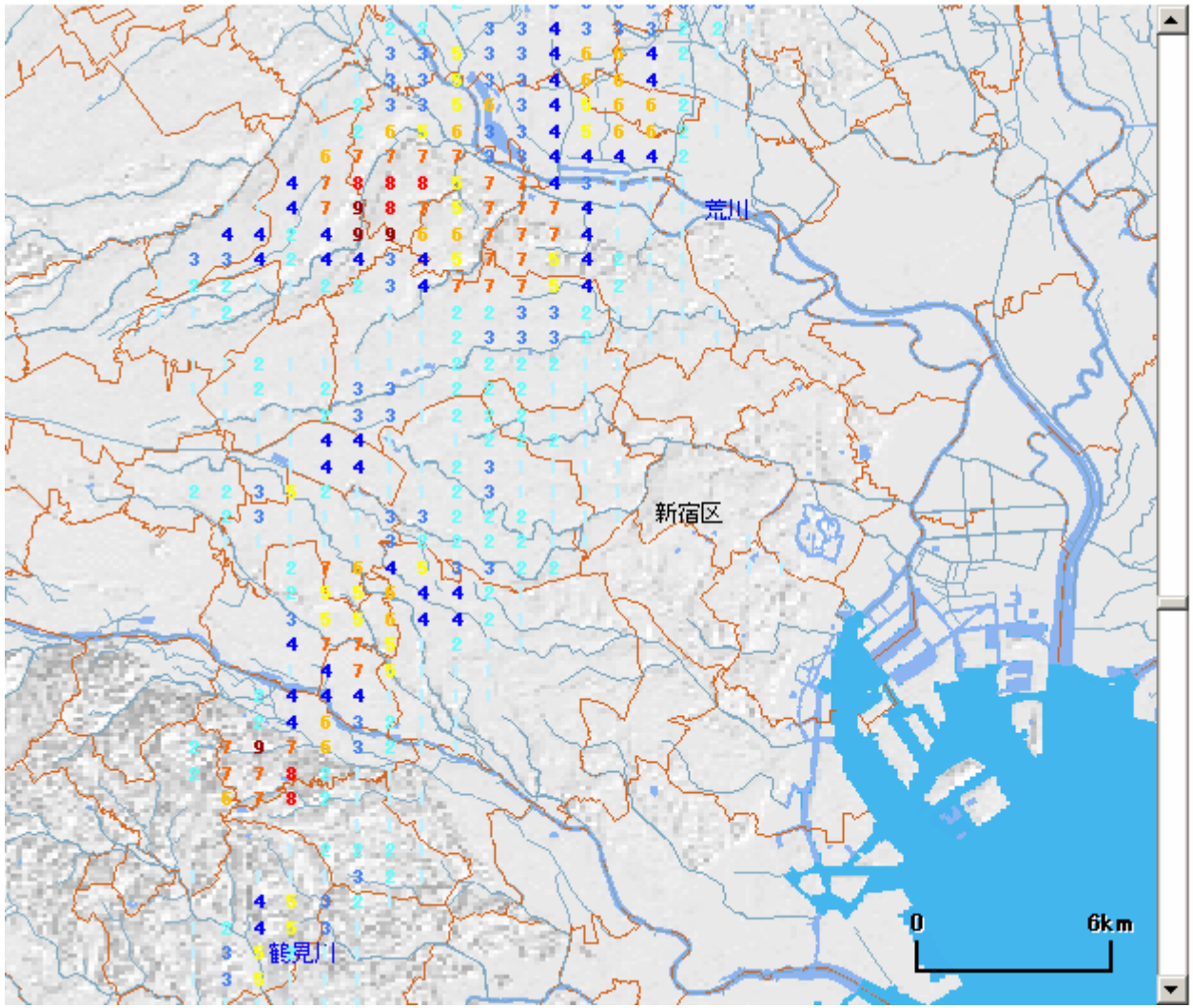
Lead Time

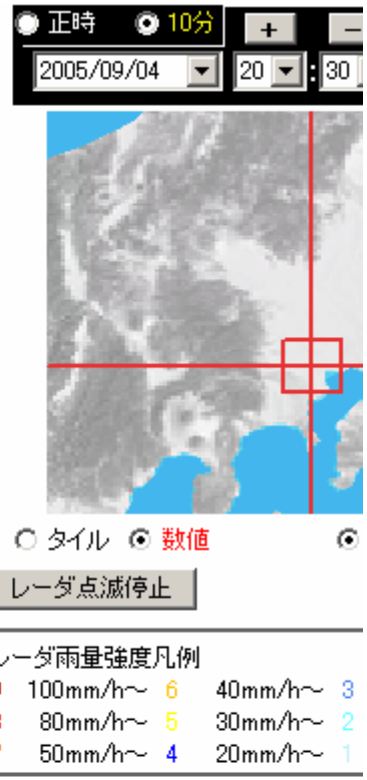
- Data Collection: within 10 minutes
- Calculation: Negligible for small streams
- Decision making: Matter of Training
- Dissemination: Many problems
  - Do Receivers come on the phone?
  - Congestion inside the Facsimile machine.
  - Loud speaker is not audible: masked by noise of rain.
  - Flooding is occasionally out of minds of Receivers.
- Evacuation: 2 hours?
- Rainfall prediction is deadly necessary for small streams. → Radar

Case of Thunder Storm in Tokyo on 4 September 2005

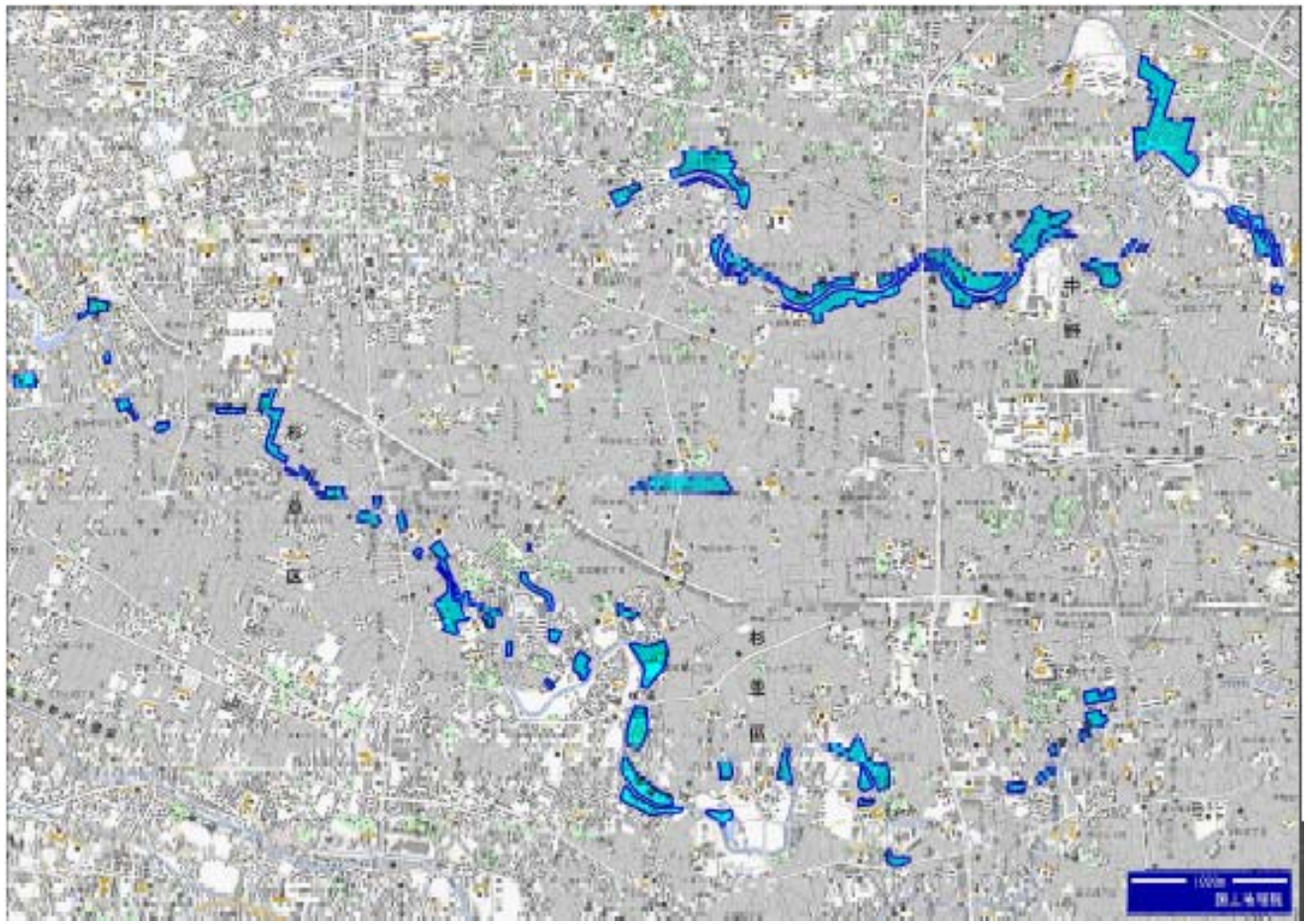
- Prediction was difficult because of rapid development.
- Speed of the “Core” of the rain band was predicted fairly well.
- Direct use of digital result longer than 2 hours is yet to be recommended.
- Frequent updating based on newly observed data is necessary.
- There seems still a possibility of improvement of forecasting technique.

Tokyo on 4th September 2005





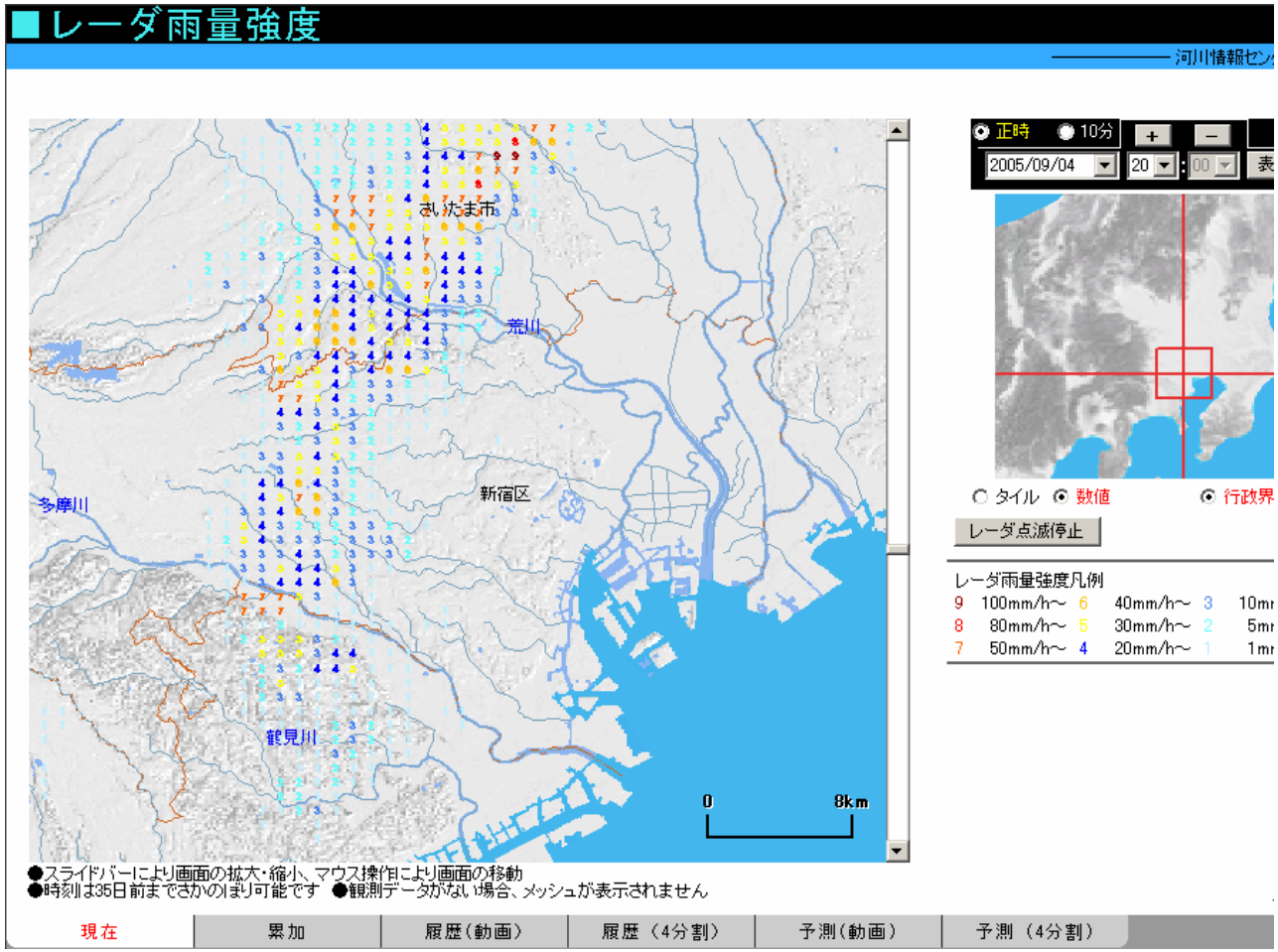
Inundated Area



According to GSI

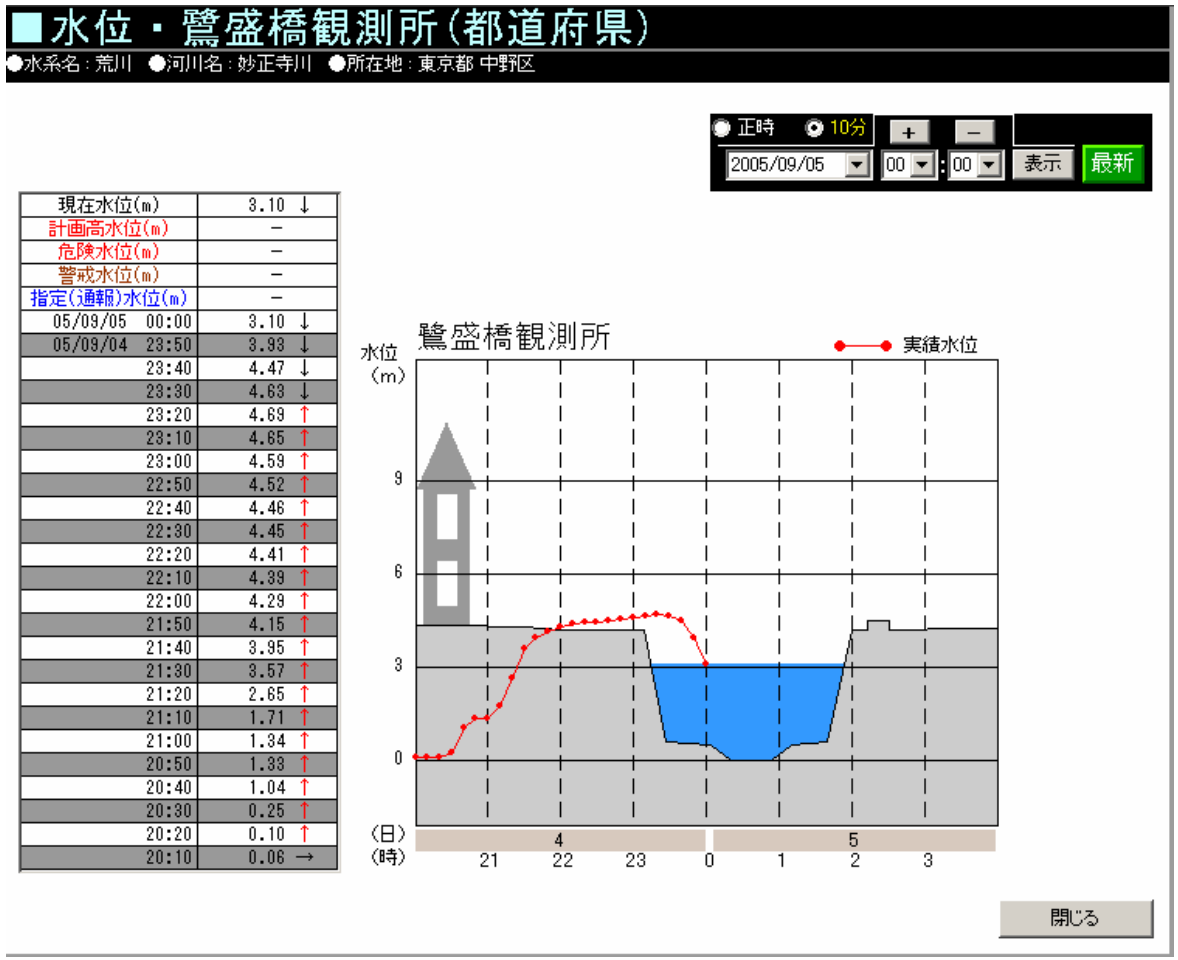
Radar Image at 20:00

Thunder Storm without particular Distinction?

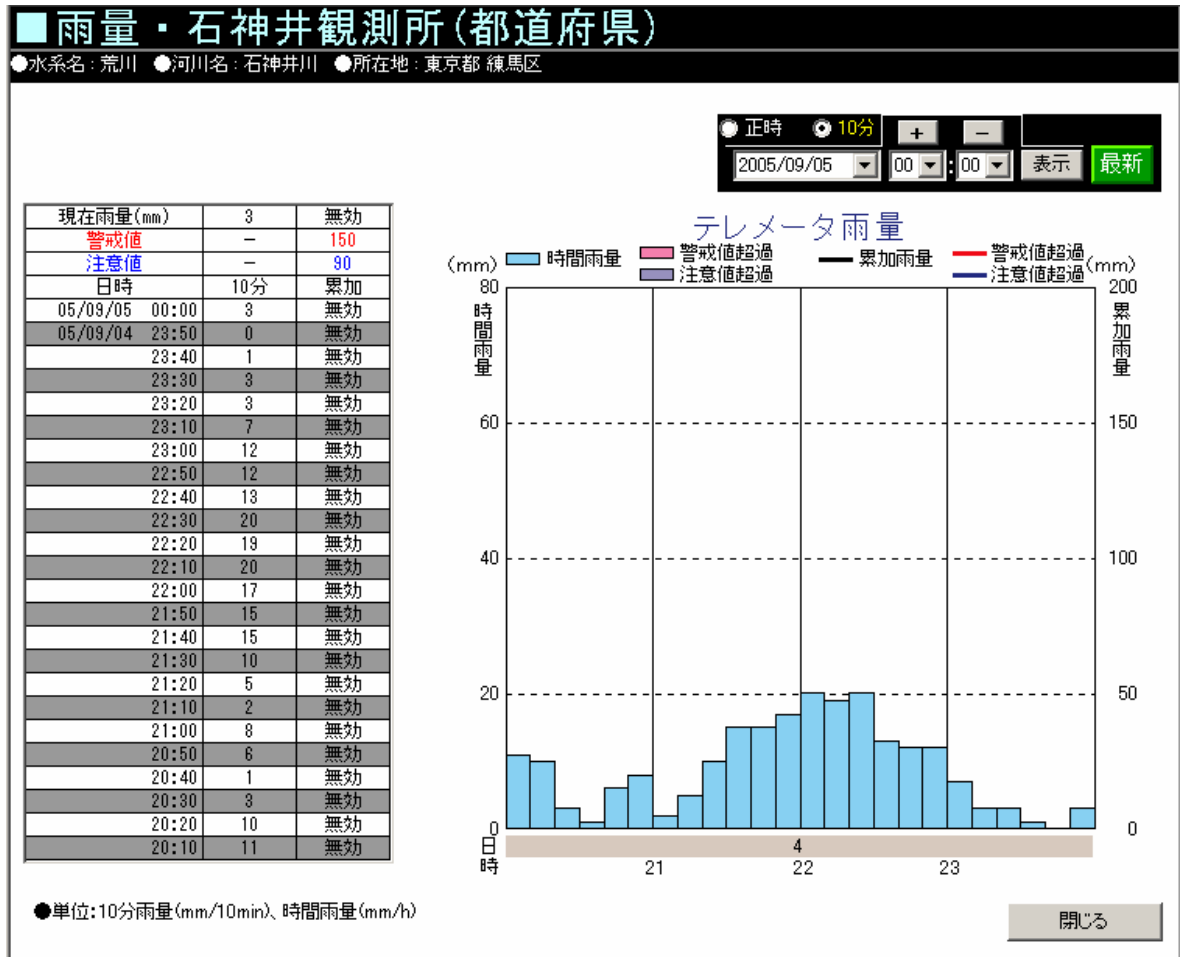


Rapid Uprising of the River Stage

Inundation started at around 22 o’clock.



Hyetograph at Shakujii



現在雨量(mm)	3	無効
警戒値	−	150
注意値	−	90
日時	10分	累加
05/09/05 00:00	3	無効
05/09/04 23:50	0	無効
23:40	1	無効
23:30	3	無効
23:20	3	無効
23:10	7	無効
23:00	12	無効
22:50	12	無効
22:40	13	無効
22:30	20	無効
22:20	19	無効
22:10	20	無効
22:00	17	無効
21:50	15	無効
21:40	15	無効
21:30	10	無効
21:20	5	無効
21:10	2	無効
21:00	8	無効
20:50	6	無効
20:40	1	無効
20:30	3	無効
20:20	10	無効
20:10	11	無効

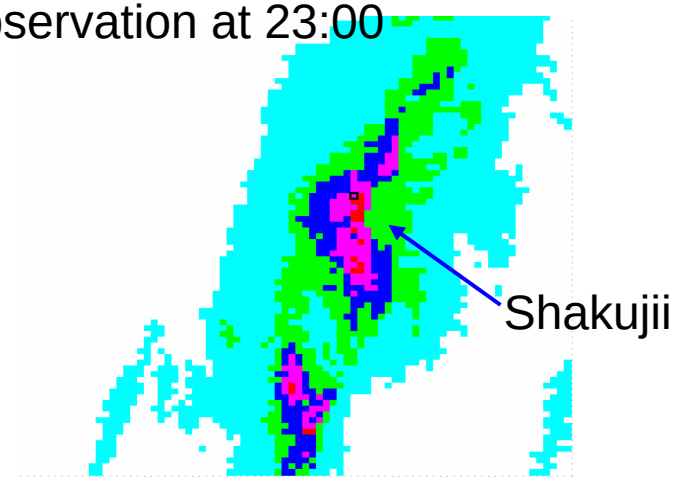
Result of Rainfall Calculation

	Nerima				Shinjuku				Shakujii			
	テレメータ	レーダ雨量計予測			テレメータ	レーダ雨量計予測			テレメータ	レーダ雨量計予測		
	地上雨量	1時間先	2時間先	3時間先	地上雨量	1時間先	2時間先	3時間先	地上雨量	1時間先	2時間先	3時間先
9月4日 12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	1	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	1	2	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	3	0	0	0	0	0	0	8	7	1	0
21	17	1	0	0	0	0	4	0	39	13	0	0
22	59	59	1	0	0	0	0	0	68	19	2	0
23	60	14	32	2	28	1	4	0	97	49	3	0
9月5日 0	33	63	0	42	21	34	0	10	18	35	3	0
1	4	16	53	0	5	10	3	0	6	12	8	0
2	0	1	4	20	1	3	3	2	1	5	2	27
Correlation Coefficient		0.73272	0.24481	0.2133		0.57293	0.3996	0.53379		0.83302	0.26389	−0.1385

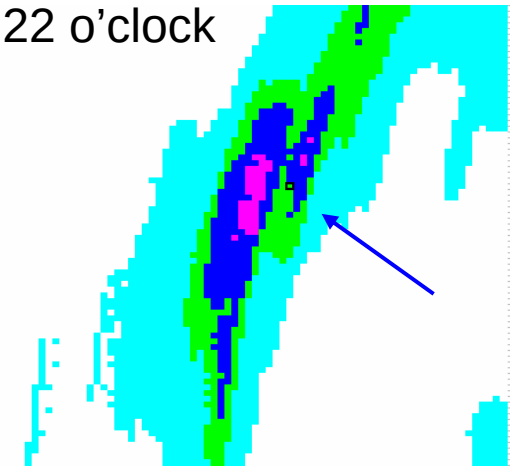
Ground 1 hour 2 hours 3 hours

A Result of Calculation

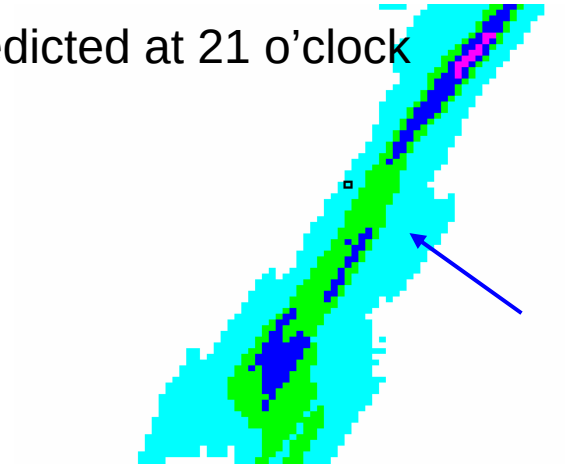
Observation at 23:00



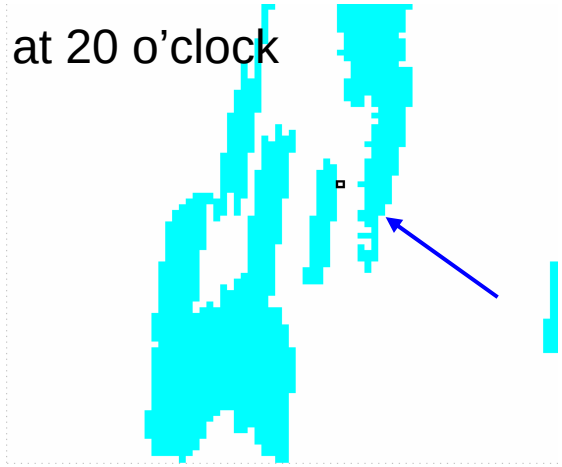
Predicted at 22 o’clock



Predicted at 21 o’clock

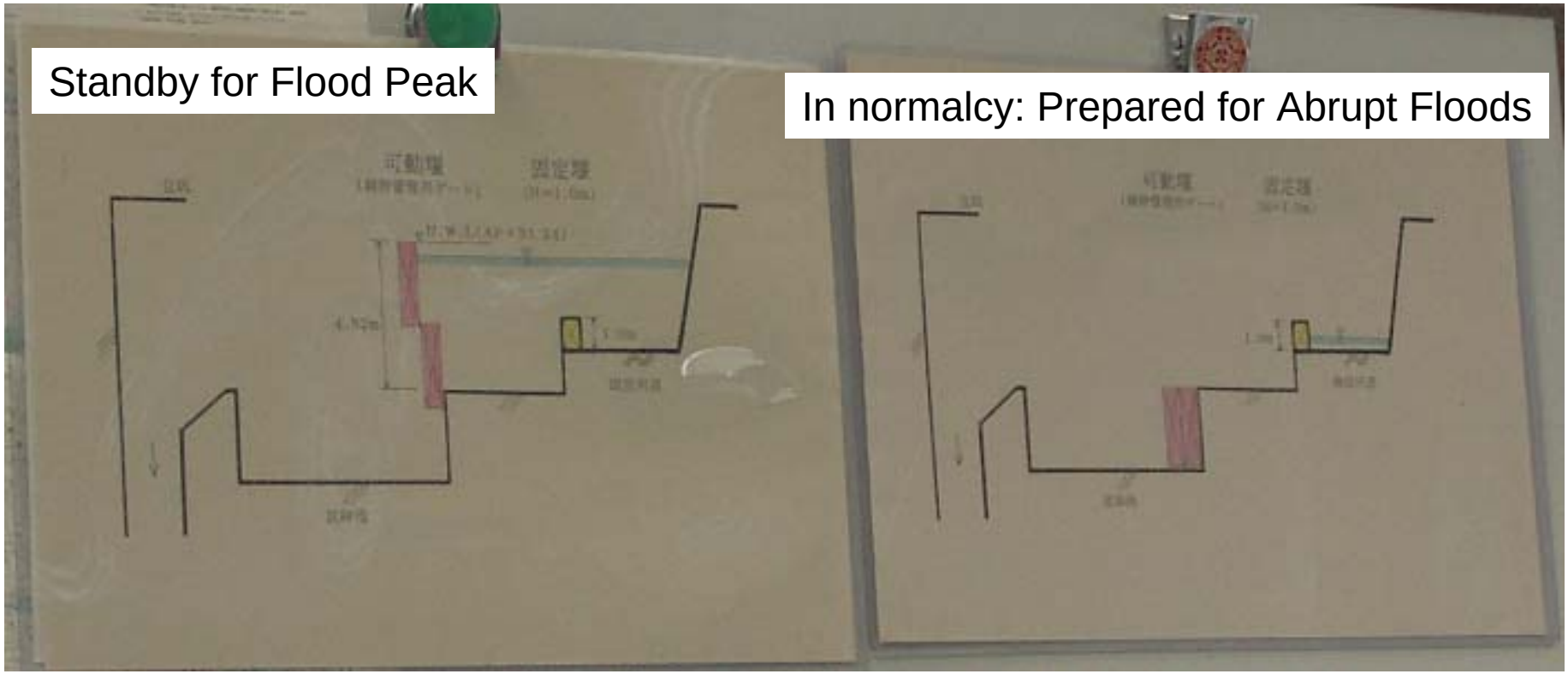


Predicted at 20 o’clock



Operation Rule of a Flood Control Facility

In normalcy: Gate is open for abrupt floods, some storage volume may be consumed.
After arrival of operators: Gate is closed to secure the storage volume.
During peak of a flood: Gate is opened to make flood control.



C O N C L U S I O N

1) Radar Technology is helpful to mitigate flood damages. This is available to people thanks to recent advancement of IT&C. Still research should yet to be made to improve the result.

2) Disclosure and prompt dissemination of information like this should be sought further.

3) Measures to enhance awareness and understanding of the general public should be taken. Flood hazard map may be a candidate.

Thank you for Listening.

nakao@river.or.jp