



**Development of a Real-time Wireless Internet Data Acquisition
System for Typhoon and Flood Disaster Prevention**

2004. 2. 13

**Woonkwang Yeo, Ph.D.
Professor, Myongji Univ., Korea**

Movitation

❖ The damages by consecutive typhoons (2002 & 2003)

1. Typhoon RUSA (2002)

- The most powerful typhoon to Korea since typhoon Sarah in 1959.
- 28,100 houses and 85,000 hectares of farmland ruined by typhoon RUSA
- Forcing 70,000 people to flee their homes



Date	August 31, 2002
Air Pressure	960hPa
Wind speed	35m/s
24hr Max Rainfall	880mm (Kangnung, Korea)
Economic Loss	5,147 billion won
Human Loss	246

❖ The damages by consecutive typhoons (2002 & 2003)

2. Typhoon MAEMI (2003)

- The most powerful typhoon to Korea since the records began almost 100 years ago
- The declaration of special disaster zones; 14 major cities and provinces, 156 smaller cities and districts, and 1,657 towns and villages



Date	September 12, 2003
Air Pressure	950hPa
Wind speed	60m/s (Jeju, Korea)
24hr Max Rainfall	452.5mm (Namhae, Korea)
Economic Loss	4,781billion won
Human Loss	132

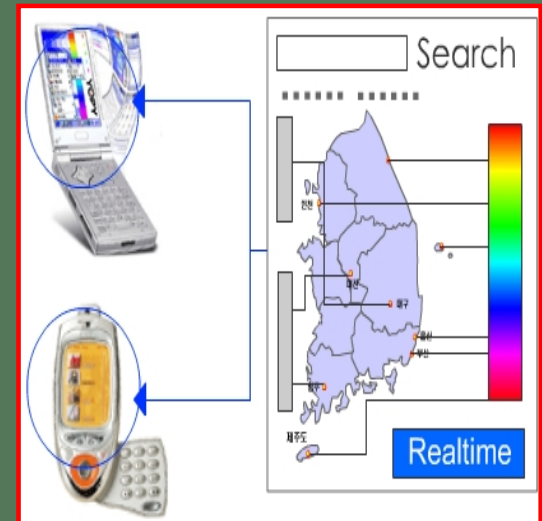
❖ The presence of powerful mobile & Internet infrastructures

The number of Internet users : 26,270,000
(55.1% of total population)

The households using Internet : 10,400,000
(70% of total household)

Mobile telecommunication service users : 32,520,000
(70% of total population)

(Ministry of Information and Communication, 2002)



25

50

75

100(%)

An Advanced Disaster Warning System

- ❖ Development of an efficient real-time disaster warning system for typhoons and floods using advanced mobile & Internet technologies.



System Setup

❖ Synchronized real-time data collection from multiple sites

👉 **Old dedicated wireless telemetering (VHF)**

❖ Each node 1 sec took

❖ 250 nodes 250 secs took \doteq 4 mins 10 secs

👉 **Wireless Internet telemetering (PCS)**

❖ Each node 5 ~ 10 secs took

❖ 250 nodes 5 ~ 10 secs took

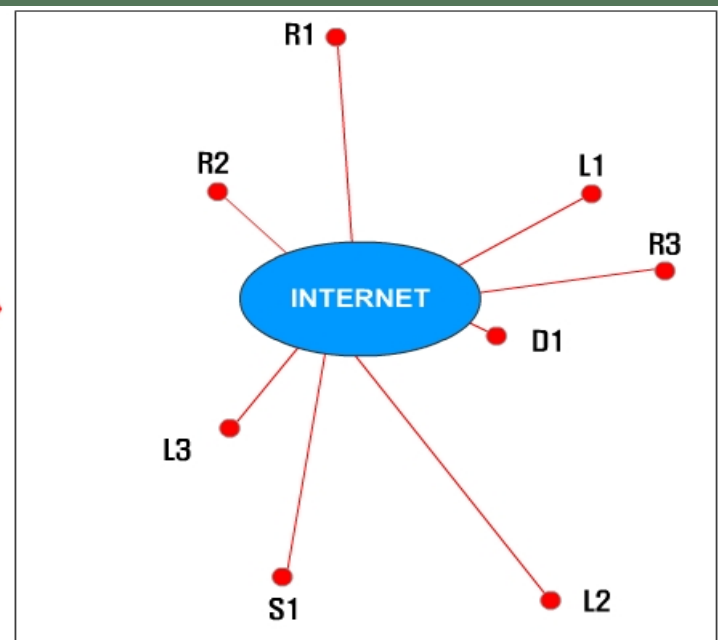
❖ mobile & Internet characteristics

☞ Ubiquitous nature

❖ anywhere

❖ anytime

❖ anydevice



❖ The realtime monitoring through the WEB (www.datapcs.co.kr)

한국건설기술연구원 KICT KOREA INSTITUTE OF CONSTRUCTION TECHNOLOGY
시험하천 실시간 수문관측 및 유량계측 시스템 MINISTRY OF CONSTRUCTION & TRANSPORTATION
건설교통부

계측 모니터링

- 시스템 상태 모니터링
- 수위 정보 모니터링
- 강우량 정보 모니터링
- 유량 정보 모니터링
- 수치 자료 보기
- 계측 데이터 백업

자료 검색

수위 우량 유량

조회 시작

년 월 일 시 분
 2003 05 1 0 0

조회 종료

년 월 일 시 분
 2003 05 10 0 0

한평교 관측소 압력식 수위계 [m]

최대값 1.83
 최소값 0.0
 평균값 0.56
 표준편차 0.32

한평교 관측소 부자식 수위계 [m]

최대값 1.76
 최소값 0.0
 평균값 0.52
 표준편차 0.32

한평교 관측소 음파식 수위계 [m]

최대값 1.81
 최소값 0.0
 평균값 0.56
 표준편차 0.32

Realtime Monitoring Map

▶ 원하는 지점을 클릭하여 사이트별 선택하세요.

Present Operating Site
 Past Operated Site

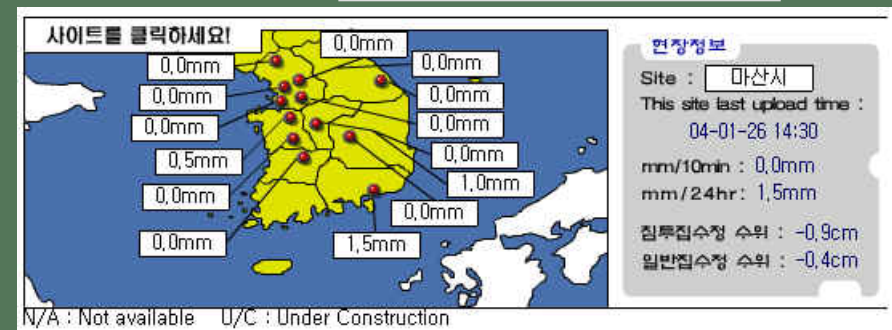
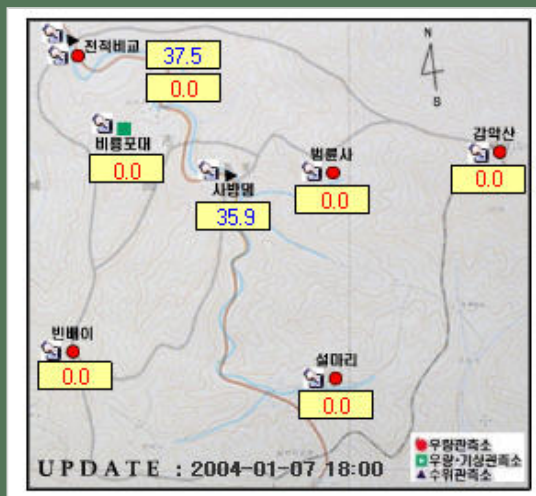
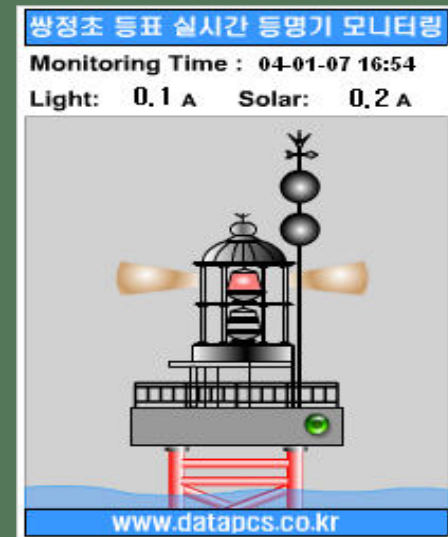
서울 (Seoul)

- 중랑천 정동교 수위계측
- 천호/트램 강변북로 세교계측

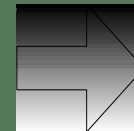
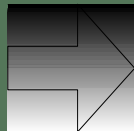
수위

TIME	Rail	Dual	Wat	Wat
1/7 14:20	0.0	0.0	15.4	23.73
1/7 10:40	0.0	0.0	16.02	31.77
1/7 07:20	0.0	0.0	20.34	36.1
1/7 04:00	0.0	0.0	17.87	36.71
1/7 00:40	0.0	0.0	16.63	33.01
1/6 21:00	0.0	0.0	15.4	31.77
1/6 17:20	0.0	0.0	13.95	26.68
1/6 14:00	0.0	0.0	14.16	18.17
1/6 10:40	0.0	0.0	16.1	33.01
1/6 07:20	0.0	0.0	16.63	37.95
1/6 04:00	0.0	0.0	18.48	38.81
1/6 00:00	0.0	0.0	19.1	36.71
1/5 20:40	0.0	0.0	19.72	38.19
1/5 17:20	0.0	0.0	18.48	32.39
1/5 14:00	0.0	0.0	15.4	19.41
1/5 10:40	0.0	0.0	21.57	38.81
1/5 07:20	0.0	0.0	18.48	38.57
1/5 04:00	0.0	0.0	17.25	38.81
1/5 00:00	0.0	0.0	18.48	38.57
1/4 20:40	0.0	0.0	19.72	36.71

❖ The realtime monitoring through the Flash banner



❖ The personalized warning messages using SMS



❖ The realtime monitoring using WAP service



DATAPCS

1. Coastal monitoring
2. River monitoring
3. Disaster monitoring
4. Frontier



1. Bridge scour
2. Stage measurement
3. Rainfall
4. Pump station



1. Pier 7
2. Pier 16
3. Pier 18
4. Pier 29

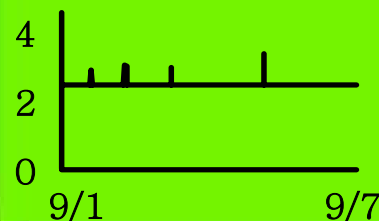


UT: 2002/ 9/ 5 17:00

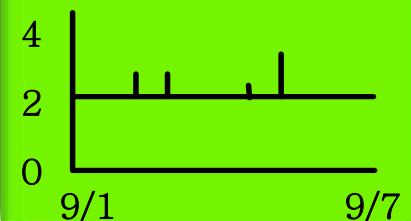
Pier 7 Stage : 2.2 m



P7 Stage [m]



P16 Stage [m]



Real implementations

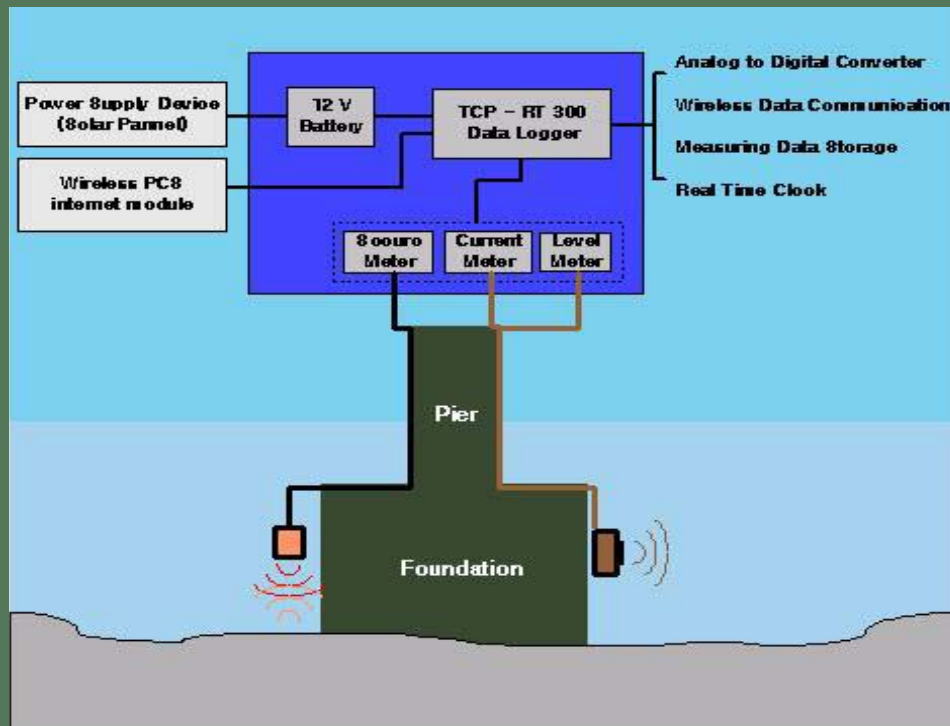
☞ The Korea coastal observation system

- Provide various coastal information required to reduce natural disaster damages
- Detection of early typhoon movements
- Less power hogging and more compact and anywhere deployable system



❖ Bridge scour monitoring in flood condition

👉 The real-time bridge scour monitoring system



Setup



Data

- Excellent tool for figuring out the bridge scour trends in short and long time scales.

❖ Mobile webcam for remote surveillance

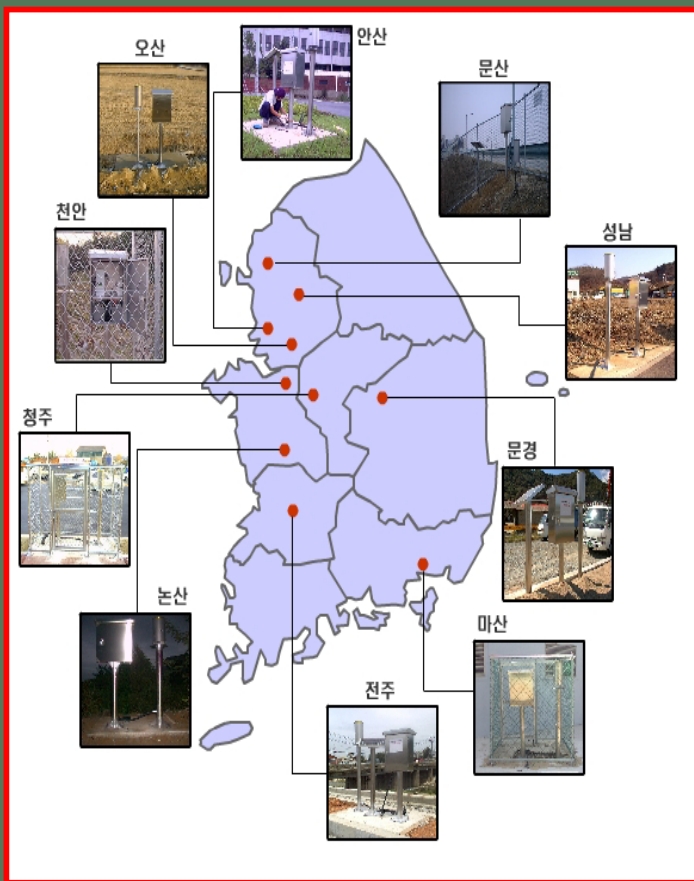
▶▶ 영상관측소 - 전적비교

Captured time 2003-08-24 16:48



Remote observation of flooding scenes

❖ Urban runoff reduction monitoring system



❖ Urban flash flood monitoring

River stage measurement
in Changdong bridge, Seoul



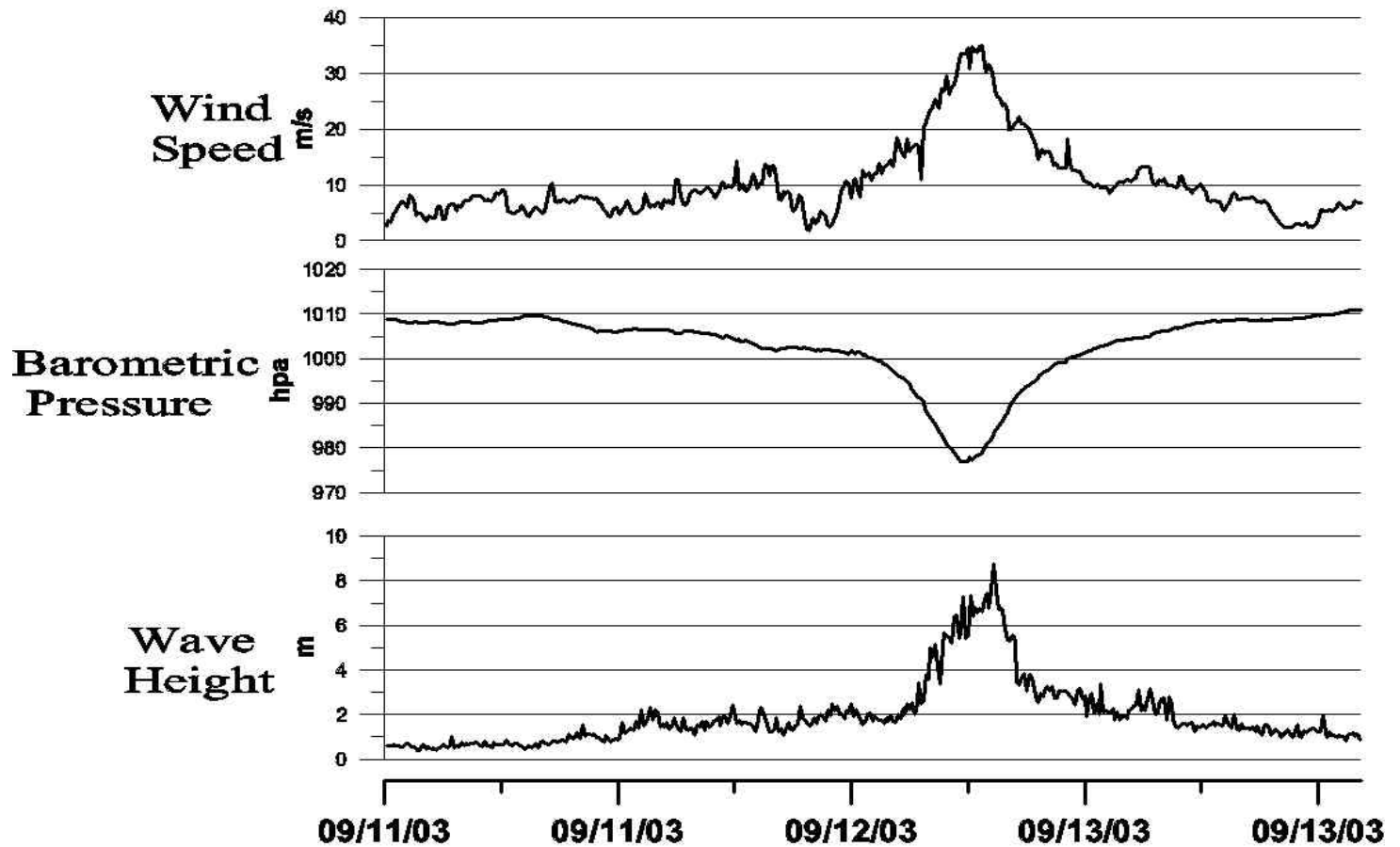
River stage measurement
in Gumi bridge, Seongnam



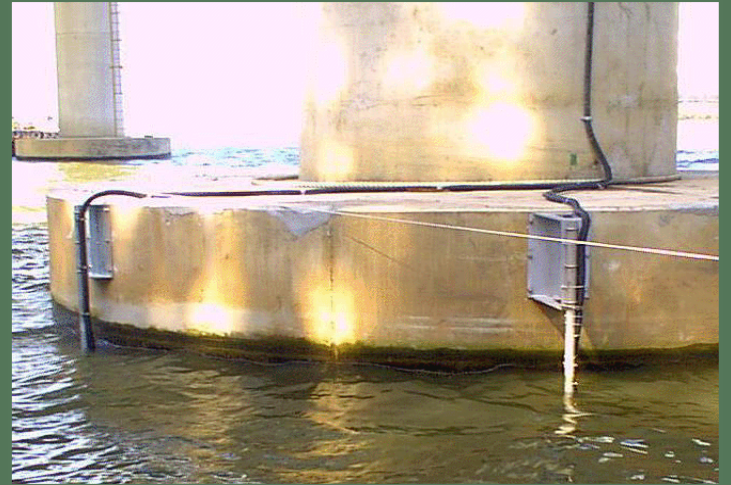
Conclusions

- ❖ **A very efficient real-time disaster warning system developed based on mobile & Internet technologies.**
- ❖ **The system can integrate all stations in a single friendly frame; Internet.**
- ❖ **The outcome exhibits many possibilities for other real-time monitoring purposes.**

Thank you for attention



The weather and wave conditions measured at a coastal observation station (Typhoon MAEMI)



RealTime RealSolution
DATA PCS

Home RHMRC 안내 사업그룹 연구그룹 실시간 정보 데이터검색 자료실 Community

실시간 수문 계속 연구 커뮤니티


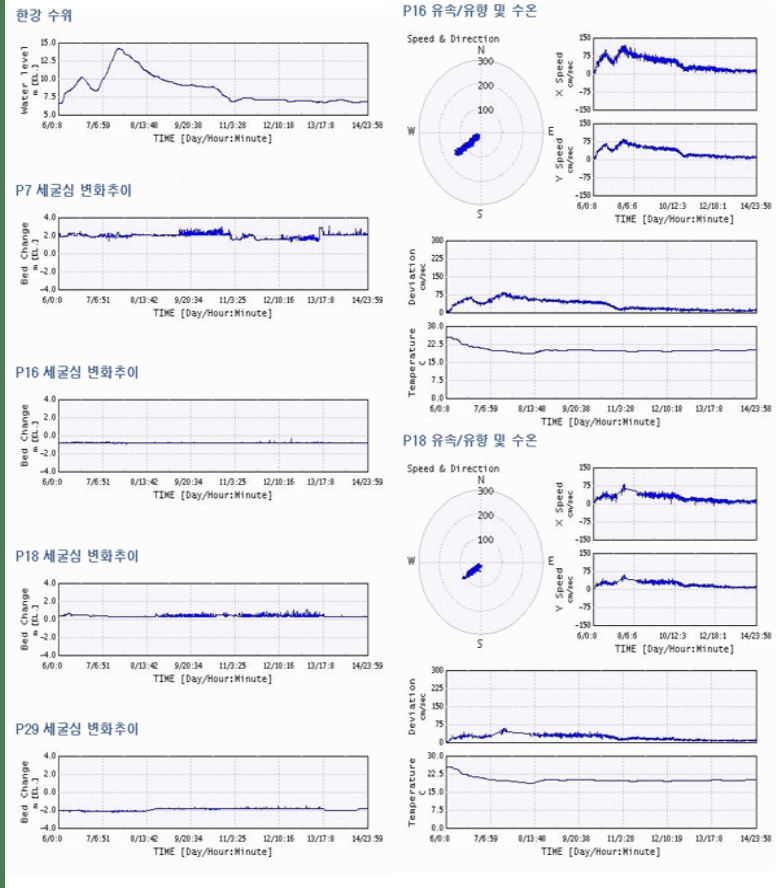
Realtime Hydrological Measurement Research Community

Hydrology is that branch of physical geography which is concerned with the origin, distribution, and properties of the waters of the earth.

프로젝트 개요
Introduction

- 과업명 : 실시간 세굴 모니터링 시스템
- 과업현장 : 강변북로 연결도로(천호대교 북단 - 토평동) 건설공사 현장
- 과업기간 : 2003년 7월 1일 ~ 2003년 8월 31일
- 과업대상 : RAMP-A P7
- 과업의 필요성 :

본 과업의 대상지역은 강동대교와 천호대교 사이의 만곡부에 위치한 곳으로 상류로부터 유입되는 유수의 흐름변화로 인한 교각 및 호안에 세굴이 발생할 것으로 예상되는 지역이다.
- 설치 위치

The scour monitoring homepage (www.hydrology.co.kr)



국립방재연구소

Monitoring of Runoff Reduction in the infiltration facilities.

Home

모니터링

자감시설

침투통

실시간 모니터링

Analysis

모바일 서비스

Community

National Institute for Disaster Prevention

"우수" 다스리면 소중한 자원입니다.

우수유출 저감 모니터링

Monitoring of Runoff Reduction in the infiltration facilities.



로그인

아이디:

비밀번호:

로그인

회원으로 가입하기

방문하신 분은 총 1080 명입니다.

국립방재연구소

NIDP for your Safety
National Institute for Disaster Prevention

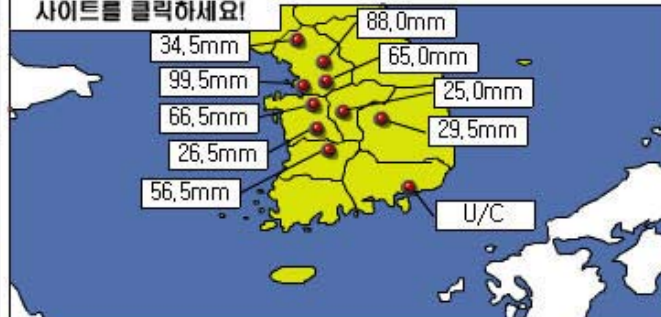
▶▶ 보도 자료



::관련보도 (KBS 9시 뉴스)

▶▶ Real time Site Window

사이트를 클릭하세요!



N/A : Not available U/C : Under Construction

현장정보

Site : 오산시

This site last upload time :
03-08-27 17:30

mm/10min : 1.5mm

mm/24hr : 65.0mm

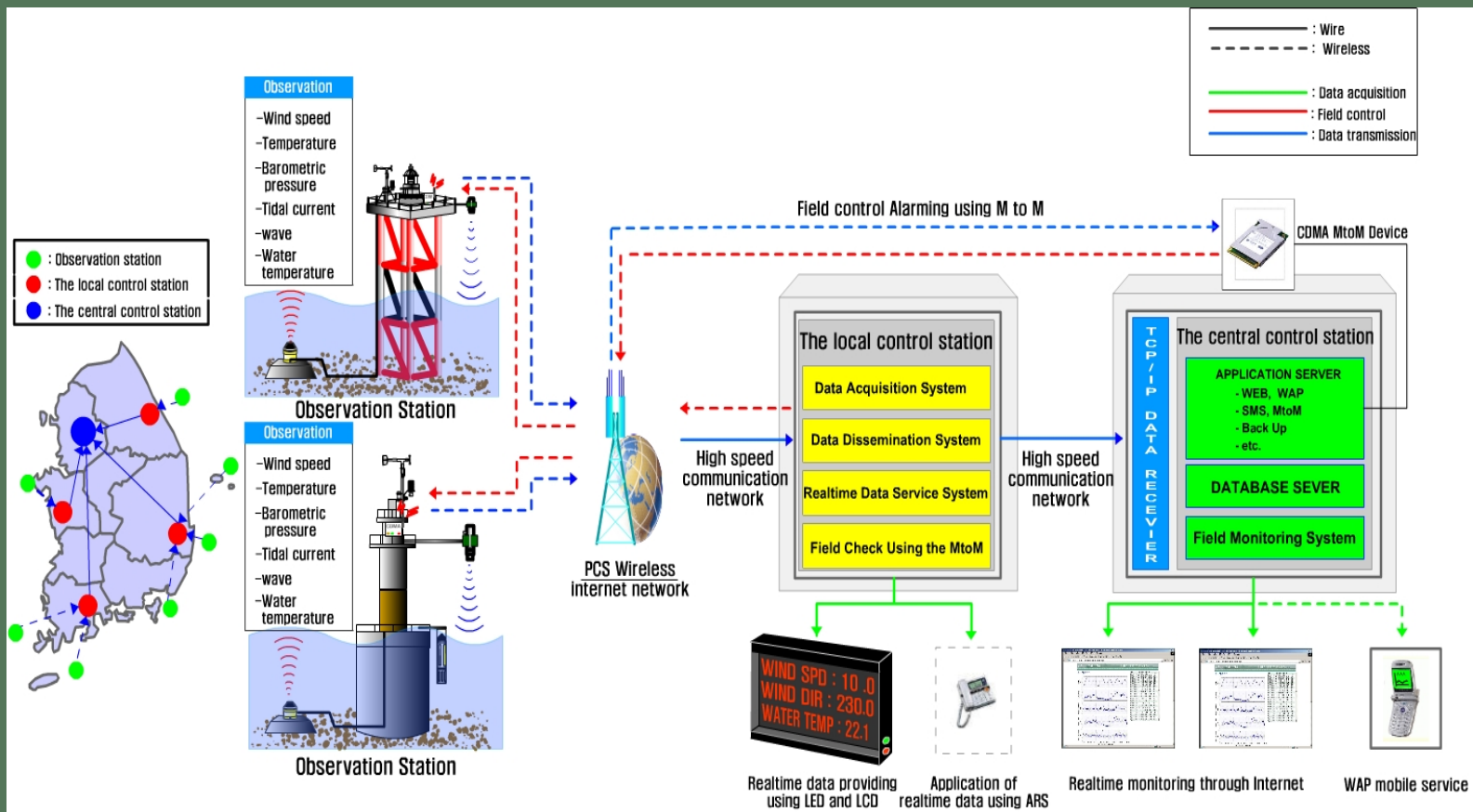
침투집수정 수위 : 9.0cm

일반집수정 수위 : 9.1cm

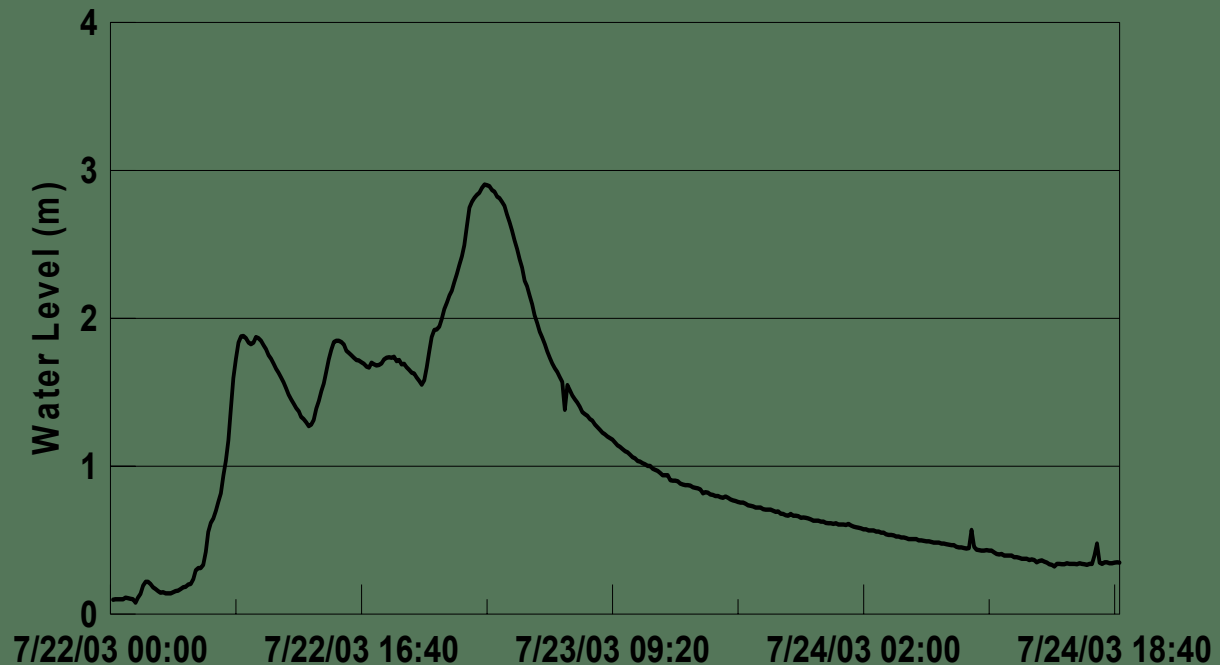
▶▶ Notice

- ▶ [2003-08-27] [청주]운영 소프트웨어/데이터로거 PIC 교체
- ▶ [2003-08-26] [청주]지점 강우량 표시 오류
- ▶ [2003-08-26] [홈페이지 출력방법] 여백을 조정해야합니다.
- ▶ [2003-08-20] 청주농고앞 우수유출 모니터링 시스템 센서교체 완료
- ▶ [2003-07-15] 강우량계의 유지관리

❖ An advanced real-time disaster warning system

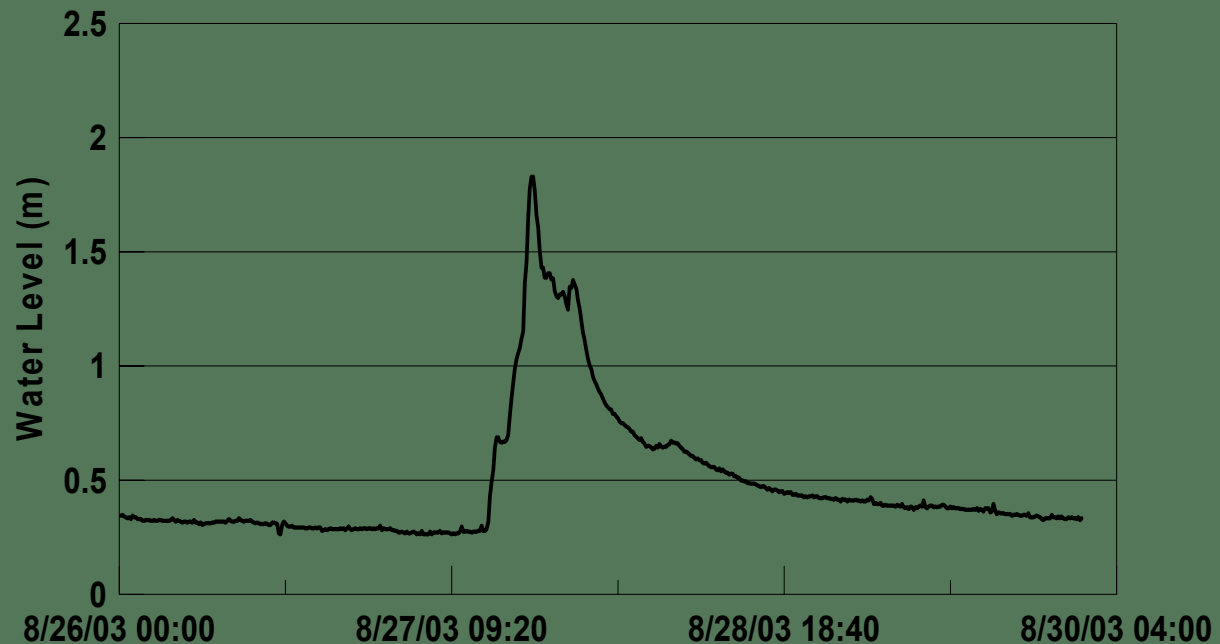


❖ The water level variation at Changdong bridge



- Increased flow due to urbanization and industrialization.
- Unexpected flood level increase and shortened time of arrival

❖ The water level variation at Kumi bridge



- The shortened arrival time due to giant Apt. complex
- Decreased storage capacity of upstream watershed