River Engineering

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Short Course
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Yogyakarta, Indonesia
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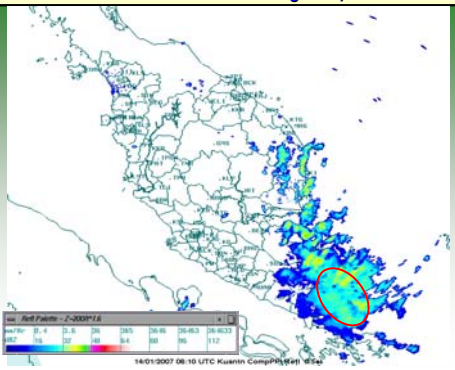
Objectives

Solutions to River Engineering Problems and Case-studies:

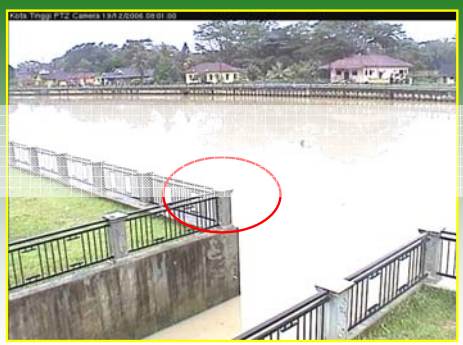
1. Kota Tinggi Flood;
2. Sediment Impact;
3. Flood Control;
4. River Engineering and Design;
5. River Engineering near Estuaries.

1. Case Study – Kota Tinggi Flood

Gema Radar Cuaca Pada Jam 12.40 tengahari, 14 Januari 2007



December 18, 2006



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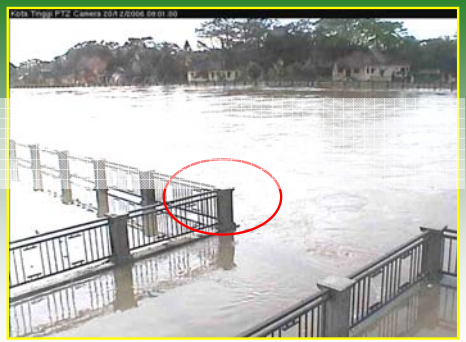


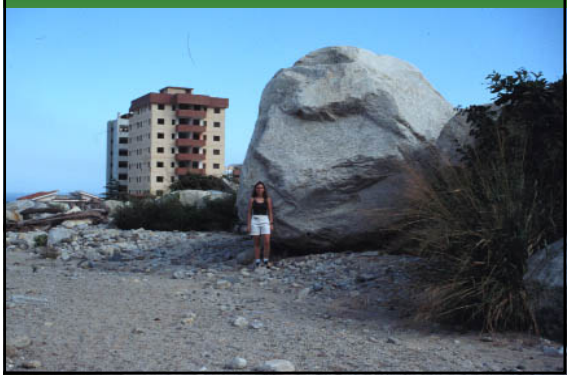
December 20, 2006

December 21, 2006

2. Case Study – Sediment Impact in Venezuela

Los Corales

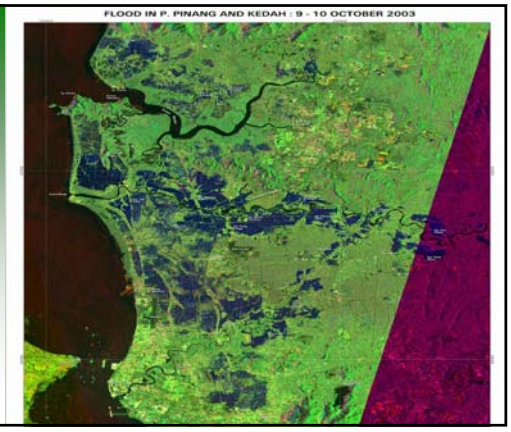
Los Corales

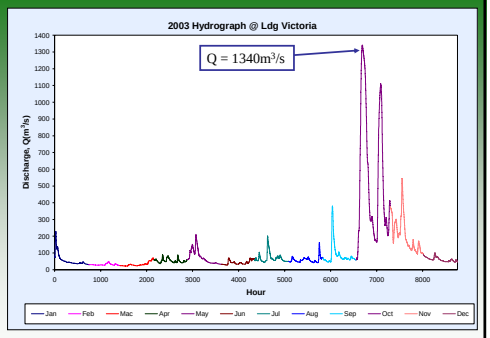


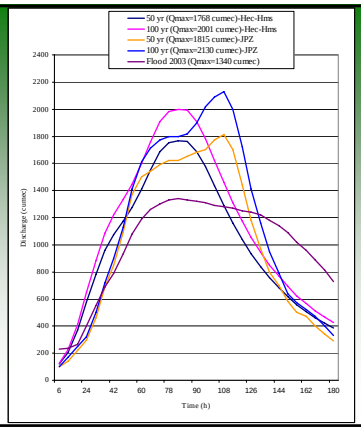
Los Corales

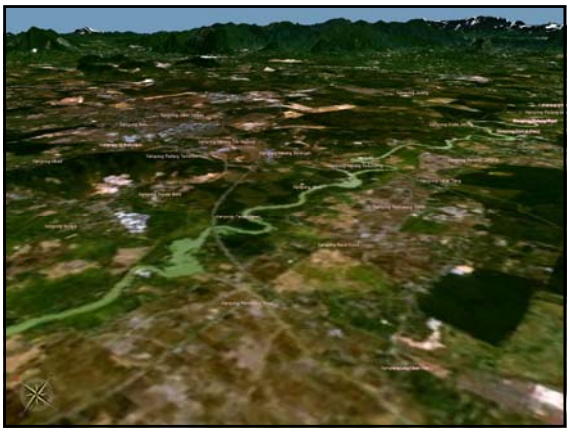
Los Corales

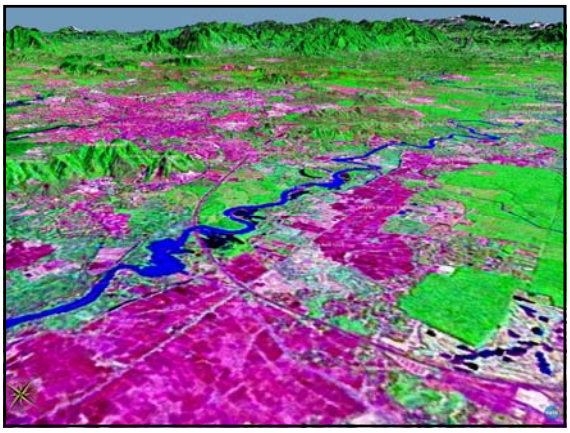
3. Case Study – The Muda River Flood



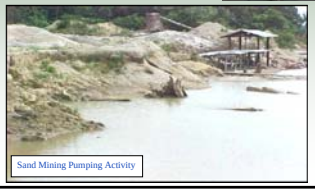

2003 Hydrograph @ Ldg Victoria
Q = 1340m³/s
Discharge, Q(m³/s)
Hour
Jan
Feb
Mac
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


50 yr (Qmax=1768 cumec)-Hec-Hms
100 yr (Qmax=2001 cumec)-Hec-Hms
50 yr (Qmax=1815 cumec)-JPZ
100 yr (Qmax=2130 cumec)-JPZ
Flood 2003 (Qmax=1340 cumec)
Discharge (cumec)
Time (h)

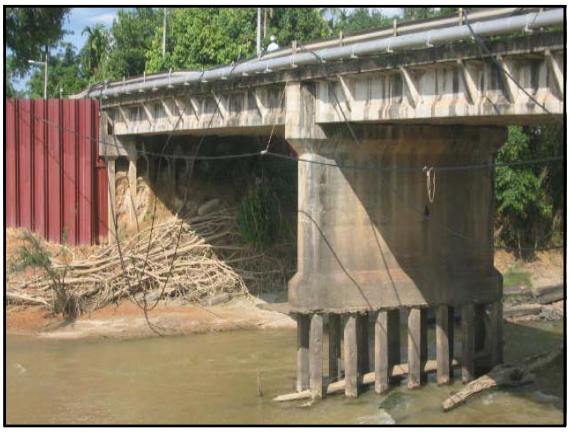




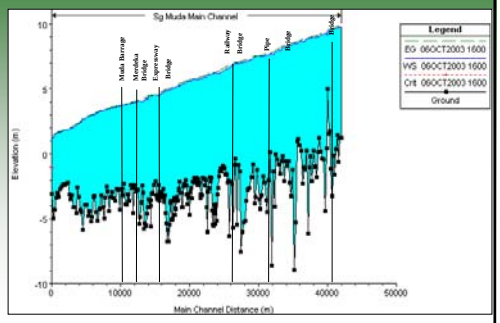
Sand and Gravel Mining



River Sand Mining



Longitudinal Flood Profile for Sg Muda (Q=1340m^3/s)

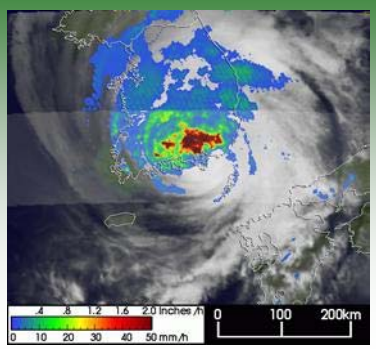


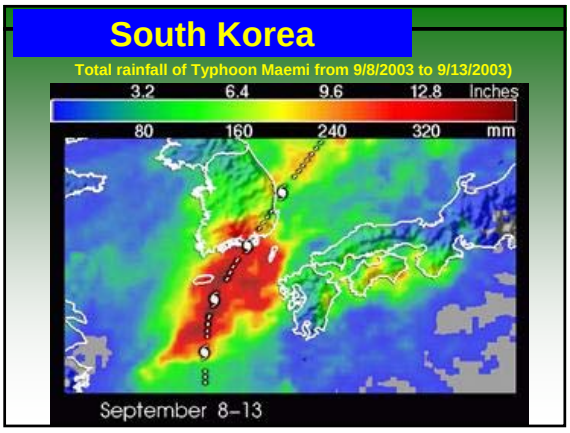
Off-stream Sand and Gravel Mining

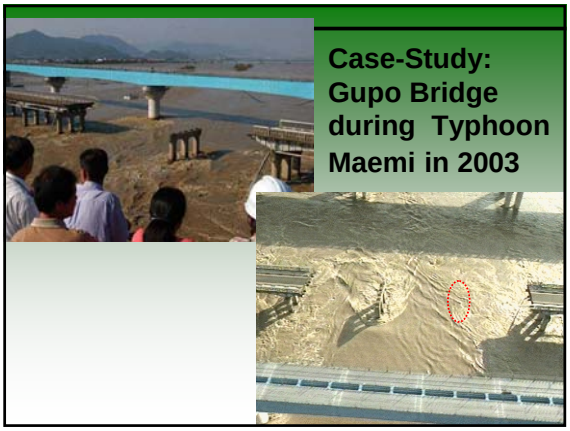
4. Case Study – Retrofit of the Gupo Bridge Piers

AGU Hydrology days 2005

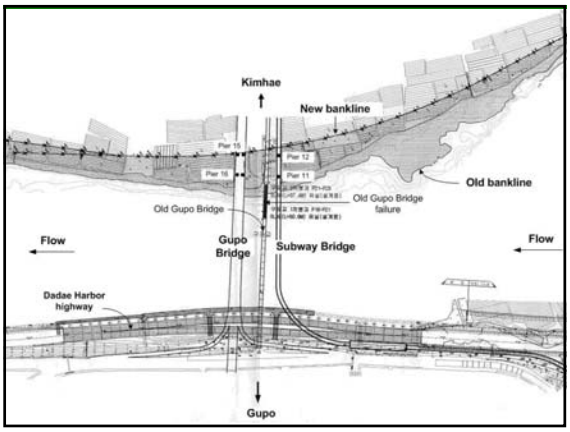
Rainfall distribution of Typhoon Maemi in Korea



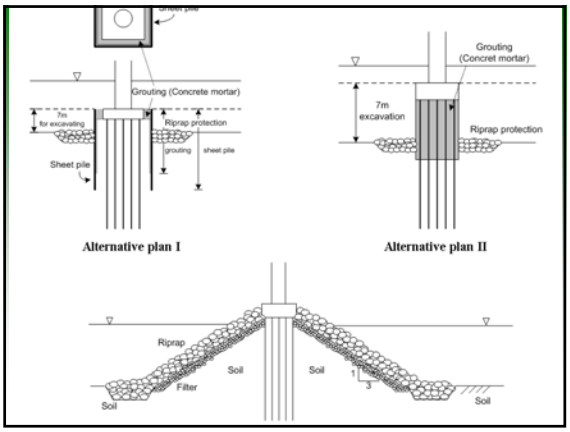

South Korea
Total rainfall of Typhoon Maemi from 9/8/2003 to 9/13/2003)
3.2
6.4
9.6
12.8
Inches
80
160
240
320
mm
September 8–13

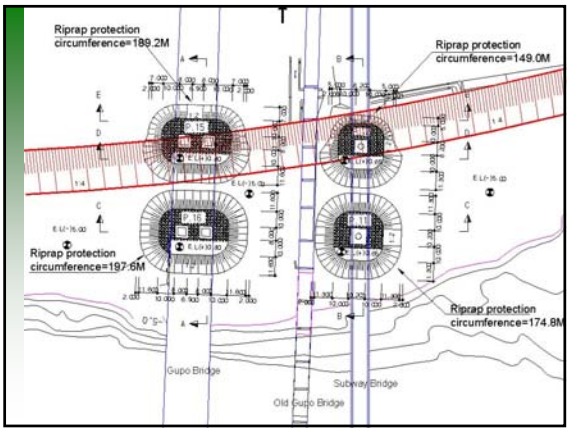

Case-Study:
Gupo Bridge
during Typhoon
Maemi in 2003

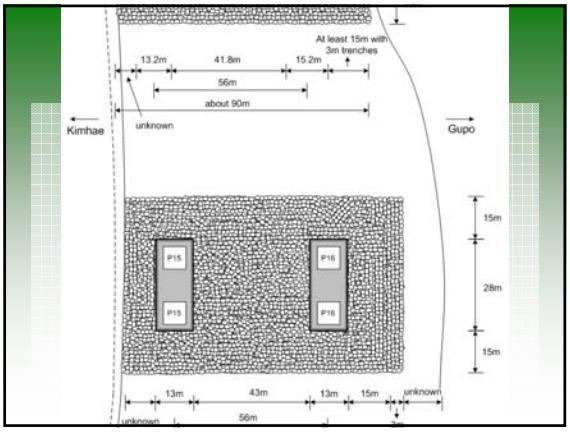
P10


Kimhae
New bankline
Old bankline
Old Gupo Bridge
Old Gupo Bridge failure
Flow
Gupo Bridge
Subway Bridge
Flow
Dadae Harbor highway
Gupo

P15


Grouting (Concrete mortar)
7m for excavating
Riprap protection
grouting
sheet pile
Sheet pile
Alternative plan I
Grouting (Concret mortar)
7m excavation
Riprap protection
Alternative plan II
Riprap
Soil
Filter
Soil
Soil
1
3
Soil


Riprap protection
circumference=189.2M
Riprap protection
circumference=149.0M
Riprap protection
circumference=197.6M
Riprap protection
circumference=174.8M
Gupo Bridge
Subway Bridge
Old Gupo Bridge


At least 15m with
3m trenches
13.2m
41.8m
15.2m
56m
about 90m
unknown
Kimhae
Gupo
15m
28m
15m
P15
P15
P16
P16
13m
43m
13m
15m
unknown
unknown
56m

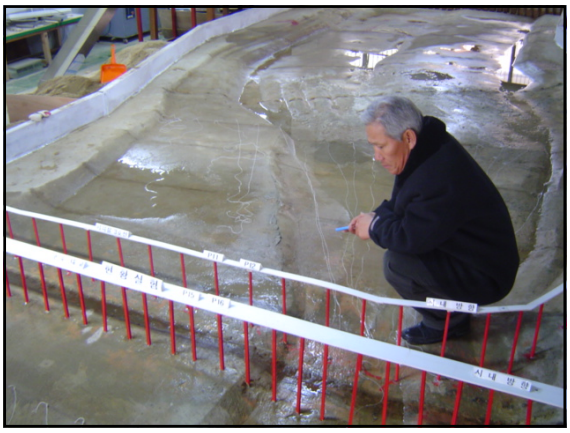
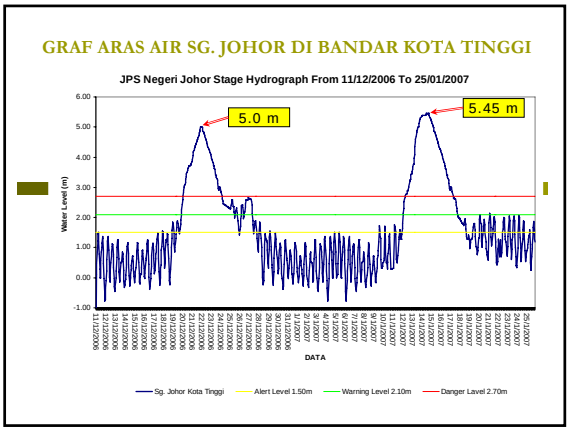


Figure 12. Experiment results with synthetic filters

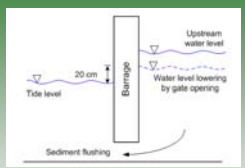
Figure 14. Gupo and Subway Bridge Piers before and after retrofitting construction

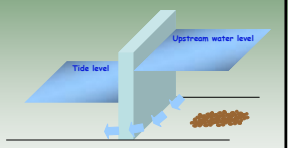
5. River Engineering near Estuaries


GRAF ARAS AIR SG. JOHOR DI BANDAR KOTA TINGGI
JPS Negeri Johor Stage Hydrograph From 11/12/2006 To 25/01/2007
5.0 m
5.45 m
Water Level (m)
DATA
Sg. Johor Kota Tinggi
Alert Level 1.50m
Warning Level 2.10m
Danger Lavel 2.70m

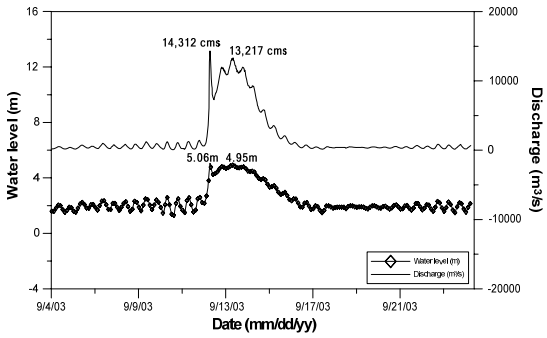
Nakdong River and NREB
Unsteady modeling for the upstream of NREB
Nakdong River
Gupo bridge
Pusan city
NREB

Quasi-steady state model

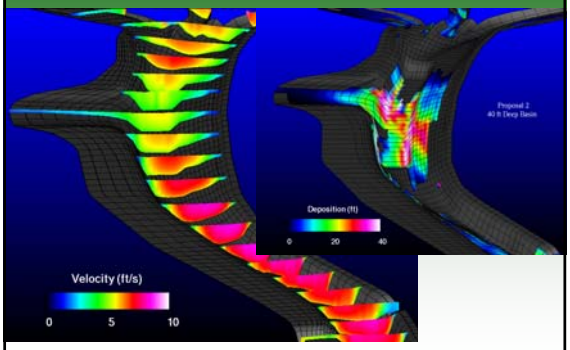




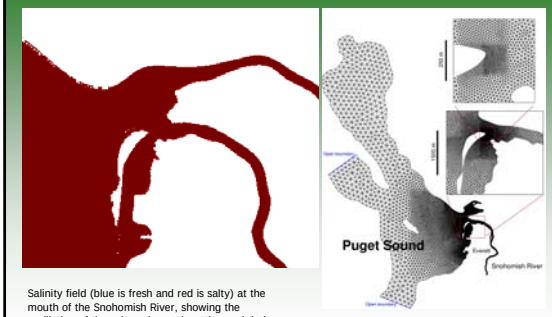
Water stage and discharge graph at Gupo bridge



Example 3-D Model Mississippi



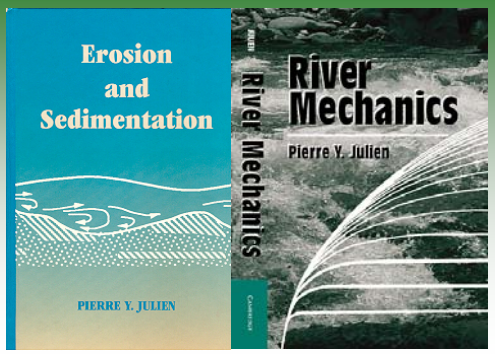
Example of Estuarine flow dynamics using SUNTANS



Salinity field (blue is fresh and red is salty) at the mouth of the Snohomish River, showing the oscillation of the salt wedge and wetting and drying of the intertidal regions

Courtesy - B. Wang

Erosion and River Mechanics Textbooks



Thank You!
pierre@engr.colostate.edu