

JOINT RESEARCH PROJECT

FINAL REPORT
For Japan-Korea Joint Research Project

AREA	1. Mathematics & Physics 2. Chemistry & Material Science 3. Biology ④. Informatics & Mechatronics 5. Geo-Science & Space Science 6. Medical Science 7. Humanities & Social Sciences
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1. Research Title:

Risk Assessment of Marine Environment in Korea/Japan Strait due to Floating Pollutant

2. Term of Research: From July 2009 To June 2011

3. Total Budget

a. Financial Support by JSPS: Total amount: 2,400 thousand yen

1st Year 800 thousand yen 2nd Year 1,200 thousand yen

3rd Year 400 thousand yen

b. Other Financial Support : Total amount: _____ thousand yen

4. Project Organization

a. Japanese Principal Researcher	
Name	Shigeru Tabeta
Institution / Department	The University of Tokyo / Department of Environment Systems
Position	Associate Professor
b. Korean Principal Researcher	
Name	Jong-Chun Park
Institution / Department	Pusan National University / Department of Naval Architecture and Ocean Engineering
Position	Associate Professor

c. List of Japanese-side Participants (Except for Principal Researcher)

Name	Institution/Department	Position
Se-min Jeong	University of Tokyo / Department of Environment Systems	Research Associate(FY2009), Assistant Professor(FY2010)
Shinichiro Hirabayashi	University of Tokyo / Department of Ocean Technology, Policy, and Environment	Assistant Professor

d. List of Korean-side Participants (Except for Principal Researcher)

Name	Institution/Department	Position
Hee-Su Lee	Pusan National University/ Dept. Naval Architecture and Ocean Engineering,	Graduate student

5. Number of Exchanges during the Final Fiscal Year*

a. from Japan to Korea

*Japanese fiscal year begins April 1.

Name	Home Institution	Duration	Host Institution
For Final Fiscal Year(FY2011) Total: _____ 0 _____ persons		For Final Fiscal Year(FY2011) Total: _____ 0 _____ man-days	
Numbers of Exchanges during the past fiscal years			
FY2009: Total _____ 4 _____ persons			
FY2010: Total _____ 4 _____ persons			

b. from Korea to Japan

Name	Home Institution	Duration	Host Institution
For Final Fiscal Year(FY2011) Total: _____ 0 _____ persons		For Final Fiscal Year(FY2011) Total: _____ 0 _____ man-days	
Numbers of Exchanges during the past fiscal years			
FY2009: Total _____ 2 _____ persons			
FY2010: Total _____ 2 _____ persons			

6. Objective of Research

Japan/Korea strait is very important area for physical distribution, fisheries, and other economic activities of both countries. The importance will increase in the future because Busan Port is establishing its position as a hub port of the region. On the other hand, the damages on marine environment due to anthropogenic pollutants from land and ships are becoming big anxiety. Actually, a big accident of oil leak from a tanker recently occurred near the coast of Korea, which causes serious damage on the marine ecosystem. Such environmental damage could affect the marine environment in the both countries because of the material transport due to ocean currents and spatial continuity of marine ecosystem. Therefore, the preservation of marine environment for the target area is an important issue which Japan and Korea should cope with under their collaboration.

The aim of the present research is to develop a method for risk assessment of marine environment in Korea/Japan strait due to floating pollutants. In order to conduct quantitative risk assessment, a simulation model will be developed to predict the behavior and fate of pollutants. The method of risk assessment based on the simulation results will also be developed. Furthermore, assessment method for the environmental risk in the ocean will be also proposed.

7. Methodology

For the purpose of quantitative risk assessment, simulation models are developed to predict the behavior of the pollutant. A 3-D primitive equation model is implemented for Japan/Korea Strait region. The developed model is applied to the numerical simulation on current around Japan/Korea strait to verify the accuracy of simulation.

In order to simulate the behavior of pollutant which has different density from the surrounding seawater, a model which can predict the behavior of buoyant plume in the ocean are developed. Most of ocean models employ hydrostatic approximation because the horizontal scale is usually much larger than the vertical scale in oceanic phenomena. In hydrostatic approximation, dynamic pressure is neglected and the momentum equation in vertical direction needs not to be solved. But for buoyant plume simulation, hydrodynamic pressure cannot be neglected and momentum equation of vertical direction must to be taken into account. Non-hydrostatic analysis requires so much computation time that it is usually difficult to calculate the current field in the wide ocean area by this approach. On the other hand, analysis assuming the hydrostatic approximation needs less computational time and usually gives reasonable results for large scale ocean phenomena such as tidal current. Then, a new type of ocean model for multi-scale analysis is developed, which conducts hydrostatic analysis for phenomena in wide area and non-hydrostatic analysis for the detail flow around the buoyant jet simultaneously.

The assessment method which includes both the environmental risk and economic feasibility is also investigated.

Division of labor

Japanese Team

- Study on the methodology for marine environmental risk assessment.
- Case study for the marine environmental pollution caused by leaking and diffusion of floating pollutant.
- Select the target pollutant for simulation through study of marine commercial traffic around Japan/Korea strait.
- Select the benchmarking example for verifying accuracy of simulation.

Korean Team

- Perform the numerical simulation on current around Japan/Korea strait and verify the accuracy.
- Case study for the marine environmental pollution caused by leaking and diffusion of floating pollutant.
- Study on the characteristics of the target pollutant for the simulation on the transportation and diffusion of the target pollutant.
- Perform the numerical simulation based on assumption scenario.