Continental-Oceanic Mutual Interaction: Global-scale Material Circulation through River Runoff

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The main purpose of this session is to promote discussion on mutual interaction between Continental zone and Oceanic zone. The global-scale material circulation induced by River runoff through oceanic general circulation as major topic on Continental-Oceanic Interaction, where the ENSO / IOD influence into continental climate as major topics on Oceanic-Continental Interaction. Numerical simulation and field observation of radionuclide transport from continental zone into ocean and its potential impact is also important topics of this session.

10:35 AM - 10:45 AM

Land-Ocean Mutual Interaction: Sediment Transportation Processes in Coastal Zone Induced by Abukuma River Mouth Runoff

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Keywords:River-ocean interaction, Integrated atmosphere-land-ocean model, Sediment transportation of radionuclides, Lagrangian particle tracking model, Near-shore bathymetry influence

1. IntroductionModeling of a contact zone between a river coming from potentially contaminated basin and an ocean is especially sensitive case for Land-Ocean coupling interaction due to significant risk of major environmental disaster which can occur in the case of contamination of the coastal zone. Therefore, it is of great importance to study and develop integrated modeling approach to comprehend the complex interaction processes in the contact zone in order to minimize disaster risk potential, which can consequently cause undesirable social and economical costs.2. ObjectivesThe focus of this study is to promote relevant numerical simulation on Land-Ocean coupling modeling approach applicable for the bay and estuary zone affected by river inflow and associated sediment transportation from the Abukuma river basin in Japan. By conducting several field observations, we found interesting and unusual temporal and spatial distribution of radionuclides within the coastal zone near the river mouth. Sediment transportation processes which have led to the distribution as well as influence of near-shore bathymetry to sediment dispersion are of close interest for the study. Calculation was conducted by
simulating stages and conditions for mechanisms of sediment transport in the coastal zone, from initial
deposition onto river bed to final deposition onto ocean floor, with special focus on processes which are
occurring during high water periods. 3. Model Description

The modeling approach has been studied by combining river mouth runoff boundary conditions by using Lagrangian particle tracking model for
simulating sediment transportation, with coupled atmosphere-ocean-land model (MSSG model, JAMSTEC)
which used fine resolution grid, and associated downscaling techniques for oceanic boundary conditions
(JCOPE2 model, JAMSTEC) which used coarse resolution grid. We have simulated two different cases, at
first circulation of ocean itself in non-equilibrium quasi stationary state, where its dynamics was
induced only by its own temperature and salinity data differences among adjacent cells, and at second
response of the ocean circulation to inflow from the river outlet, simulated under various boundary
conditions and external effects. ETOPO1, 1 Arc Minute Global Relief Model was chosen as initial
database for bathymetry data, while World Ocean Atlas 2005 database was chosen as initial 3D database
for temperature, salinity, pressure, and velocity field data. Incompressive Navier-Stokes equation and
Yin-Yang grid were used in the calculation of the flow field. 4. Conclusions and follow up

The study is continuous part of the PhD study of the first author, so the results are about to be improved as the
course will continue. So far, results neither confirmed nor denied the hypothesis that near-shore
bathymetry may have important role in spatial dispersion of radionuclides, so the question still remains
open and subject for discussion. Our assumption is that using fine resolution grid within the contact
zone between two different fluids should give us better insight into the problem, while simultaneously
proper downscaling of outer oceanic boundary conditions and proper coupling with sediment
transportation model are needed to be done in order to maintain satisfactory level of simulated physics
of processes during the calculation. In follow up of the study, we will try to simulate hydrograph based
water wave rather than constant inflow from the river mouth, as well as try to put ocean side into initial
dynamic state rather than non-equilibrium quasi stationary state. Also, more focus will be aimed to the
physical processes behind mechanisms of radionuclide transportation from the basin towards the river
mouth. Acknowledgements

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