and tidal stream (direction and speed at the depth of 30 m) was monitored by an Acoustic Doppler Current Profiler (ADCP) at all times during the voyage, and the number of ships at the periphery of the sailing route was recorded by using an Automatic Identification System (AIS).
Results: The total amount of PAHs was measured in each sample and found to range between 30.4—120.2 ng/L. The highest concentration was observed in sample #3, which was collected along the eastern shore of Taiwan. Ten different PAHs were detected in total, and acenaphthylene was observed in all samples. The three highest PAHs (26.1—67.2 ng) concentrations of acenaphthylene were observed in sample #4—6. In sample #1—3 and 8, naphthalene (23.0— 52.0 ng) was the highest compound. Benz(a)anthracene (3.3—27.8 ng) was found in sample #1, 3, and 5—7, and was the highest PAHs in sample #7. The chemical composition of PAHs varied considerably after passing the center of the South China Sea, and benzo(a)pyrene, the most toxic compound in 16 PAHs, listed by USEPA, was detected in sample #7—8 (2.3—2.4 ng).
Discussion: Sample #3 collected along the eastern shore of Taiwan showed the highest total PAHs concentration and the nearby sample of sample #4 exhibited the lowest. The difference in the total amount of PAHs in these two samples was about four times. According to the ADCP, the current from Taiwan to the sea lane apparently changed to the opposite direction, namely from the Pacific Ocean to mainland China, at the border of sampling areas sample #3 and sample #4. Such a significant distinction in local ocean drift caused this big difference in the total amount of PAHs in the two adjacent samples. As a result, the degree of contamination in the enclosed sea coastal area is likely to be influenced by the presence of a pollutant source such as a big city or an upstream industrial belt, rather than by the depth of the sea. The high density of ships observed by AIS along the sea lane suggested that exhaust smoke from those ships was also responsible for the pollution.

The contribution of atmospheric deposition of nutrients to the Yellow Sea

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Atmospheric deposition is one of vital paths for chemical substance into the ocean, and an important source of nutrients, such as nitrogen, phosphorus and iron. Using the data of the total suspended particles (TSP) and size-segregated particles, Air Pollution Index (API), the deposition fluxes of aerosols and nitrogen over the Yellow Sea and Qingdao coastal seas were estimated, and the impacts of the dust weather on the seasonal varieties and spatial distributions of the aerosols and nitrogen were also discussed.
In 2002-2007, the dry deposition fluxes of aerosols and total nitrogen (TN) over the Yellow sea attenuated with longitude from west to east, and were about 544.2-1400.1 mg/m^2/month and 9.17-23.6 mg N/m^2/month respectively. The wet deposition fluxes of TN varied between 16.5-436.1 mg N/m^2/month. The ratio of dry deposition to total deposition for TN was about 33%. The wet deposition fluxes of total inorganic nitrogen (TIN) was 15.0-393.9 mg N/m^2/month, contributed more than 66% of TN. The ratio of dry deposition to total deposition for TIN varied between 1.5-63%. The wet deposition of nitrate and ammonium were about 1.6-9.5 and 3.0-17.3 mg N/m^2/month, respectively. The average ratios of dry deposition of nitrate and ammonium to total deposition were 28% and 18% respectively.
The levels of dry deposition fluxes of aerosols and nitrogen over the Yellow Sea were about 1482.9-2641.0 mg/m^2/month and 9.19-16.6 mg N/m^2/month during dust period, respectively. They were about 2558.5 mg/m^2/month and 16.1 mg N/m^2/month over Qingdao coastal seas. The impact of the dust weather on the dry deposition of aerosols mainly focused on the coarse particles with the diameters above 3.3μm. The effect of dust weather on ammonium was larger than on nitrate.
River and atmosphere are both important sources for nutrients in the Yellow Sea. Compared with riverine input, the contribution of atmospheric deposition to total inputs of NO_3^-+NH_4^+ from the two sources was about 31.1%-35.5%.

Evaluation of water quality change and inflowing pollutant loads in the Gwangyang Bay of southern coast, Korea

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The Gwangyang Bay, located in the south sea of Korea, is a semi-enclosed bay with dimensions, 17 km from east to west and 9 km from south to north. The total area is about 230 km^2 and depth is between 20 and 30 m. Geographically, the Gwangyang Bay has two main water discharges (2.3 billion tons per year) from Seomjin river and Sueo river. Near the bay there are nationally recognized industrial complexes such as POSCO Gwangyang steelworks, Yeosu petrochemical industry stations, Yulchon industrial station, Yeosu thermal power plant, Hadong thermal power plant and Gwangyang Port.

Because of the geographical standout and the industrial uses, environmental impact assessments have been continuously carried out to predict marine environmental variations of eutrophication, red tide outbreak, appearance of oxygen-deficient water masses, fish population, and so on. However, the assessments have been based on the data observed in the limited areas near the industrial complexes (for the most part, near POSCO Gwangyang steelworks and Yeosu petrochemical industry stations). Therefore, the quantitative analysis such as QWASI (Quantitative Water-Air-Sediment Interaction fugacity model) on inflowing pollutants loads into the Gwangyang Bay has been hardly carried out. Moreover, the calibration-verification process of the water quality modeling has been restrictedly conducted because the observed data of inflowing pollutants loads were not sufficient.

In this study, in order to setup a reliable management system of water quality, the inflowing pollutant loads and water discharges from the five rivers (Seomjin river, Sueo river, Gwangyang-west river, Sangam river and Daepo sea wall) into the Gwangyang Bay were measured and estimated. The fresh water discharge from the five rivers into the Gwangyang Bay in dry season were estimated 20,864.7□10^3 m^3/day, 222.9□10^3 m^3/day, 217.2□10^3 m^3/day, 126.5□10^3 m^3/day, and 96.1□10^3 m^3/day, respectively. In addition, the inflowing pollutants loads are defined by river discharge multiplied by water concentration, and six types of pollutant loads were estimated, COD (Chemical Oxygen Demand), SS (Suspended Solids), TN (Total Nitrogen), TP (Total Phosphorus), DIN (Dissolved Inorganic Nitrogen), and DIP (Dissolved Inorganic Phosphorus). As a result, the inflowing pollutant loads of COD, SS, TN, TP, DIN and DIP into the Gwangyang Bay in dry season were estimated 26,926 kg/day, 80,418 kg/day, 24,227 kg/day, 555 kg/day, 8,203 kg/day, and 212 kg/day, respectively. Those estimated pollutant loads are compared with the previous results, which were obtained from the limited observations; hence, a wider spatial variation of each pollutant load is obtained.

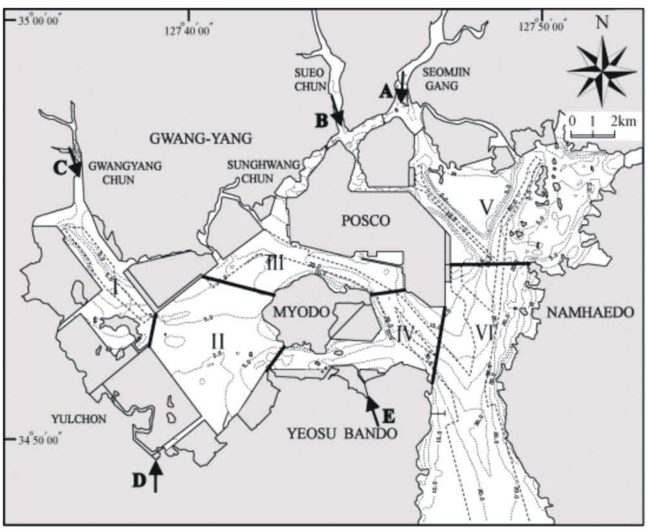

Fig.1 The map shows bathymetry, inflowing point of river discharges and divided area in the Gwangyang Bay

Design and application of artificial neural network predicting model of assessment index in coastal marine ecosystem

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Due to the overexploitation of marine ecological resources and the worsening of environmental pollution, our typical marine ecosystem has been seriously damaged, with local (regional) water ecosystems imbalance and biodiversity sharp decline. So the development of marine ecosystem assessment will provide an important basis for decision-making for the effective protection of marine ecological environment and sustainable exploitation and utilization of marine ecological resources. Ecosystem health assessment is not only a focus but also a difficult point in ecology studied at present; with promising development and application, it has a great deal of questions existing at the same time (for instance, the concept and definition of health, evaluation criterion, etc). According to the assessment index system that has already been set up, by using MATLAB7.0 neural network toolbox, set up artificial neural network (ANN) with mapping predicting model to various kinds of physical and