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GEMS/Water水質指標を用いたライン川からの汚濁負荷影響評価

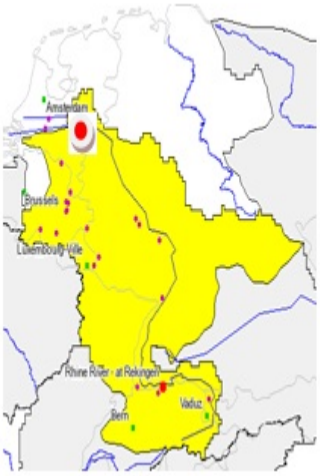
Impact Assessment of Loading from Rhine River using GEMS/Water WQI

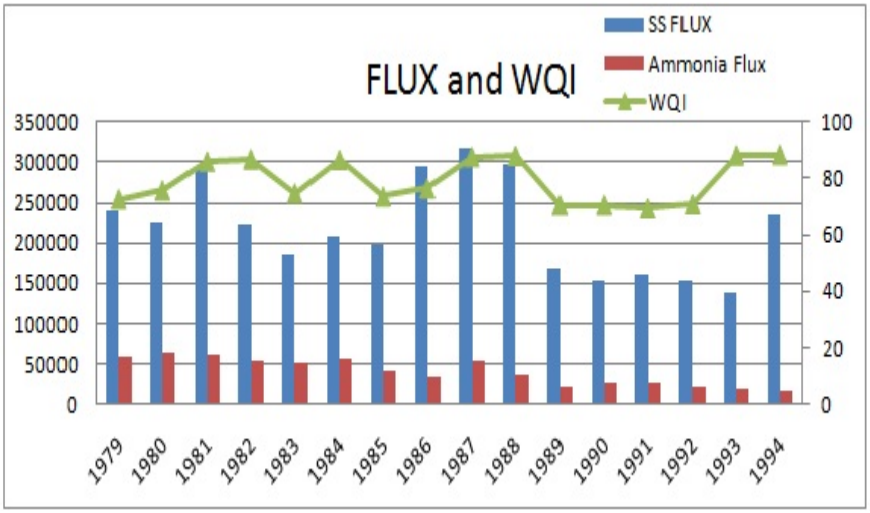
寺本 智子[1*], 山敷 庸亮[1], 寶 馨[1]

Tomoko Teramoto[1*], Yosuke Yamashiki[1], Kaoru Takara[1]

[1]京都大学防災研究所

[1]DPRI, Kyoto University





1 Background and Purpose

Closed waters and coastal waters where are widely distributed in the land and ocean have high primary production and high biodiversity. In addition, major cities of the world are concentrated in those areas, and economic activity is also much higher than inland. Therefore, to preserve these areas will lead to not only the protection of biodiversity but also supporting economic activity in coastal areas.But, rapid population growth and land use change in river basin is causing the quantitative or qualitative environmental impact, such as loss of life caused by poor oxygenation or eutrophication in the coastal environment.

In order to predict the future environment of closed or coastal areas, it is important to capture the long-term quantitative and qualitative changes in the environment in these areas, and to understand its dynamics.

In this study, there are three purposes: (1) Estimating nutrient loading from land zone throughout international river basin using the GEMS/Water (Global Environment Monitoring System/Water) Datasets for the purpose of estimating the gross nutrient or SS loading to the marine environment ,(2) Calculating WQI for the purpose of evaluation of water quality that flows into the sea from river,(3)Comparing nutrient or SS loading and WQI for propose of knowing the relationship between nutrient or SS loading and single indicator of water quality (WQI) .

2 Method

(1) Estimating Flux

We use two datasets, one is water quality data using GEMS/Water Datasets and the other is runoff data using GRDC (Global Runoff Data Centre) Datasets.

First, we analyzed to water quality statistically and extract abnormal value. Then we estimated Flux by multiplying the concentration and runoff.

(2) Calculating WQI

A composite index was developed to assess source water quality across a range of inland water types at global scale. We have statistic application of WQ indices developed by GEMS/Water Program.

The approach for calculating WQI are three steps:(1) Selecting benchmarks (guidelines or standards) that are appropriate in assessing global water quality for human health,(2) Selecting parameters that have an appropriate benchmark and have reasonable global coverage(20% of countries or regions),(3) From this list, selecting only stations that measure parameters consistently on an annual basis (Each parameter is measured at least 4 times per year at stations that have measured a minimum of 4 parameters per year)

After that, water quality variables compared to appropriate guidelines; results combined to produce a single number. Higher WQI indicate that good water quality

Result

We choose Rhine River and picked a station near the sea named German Frontier. We have estimated Suspended Solid (SS) and NH4-N loading using GEMS/Water datasets and GRDC discharge datasets and calculated WQI using Ammonia, Iron, Chloride, Sodium, Sulphate and Zinc in Rhine River from 1979 until 1994.

It has been observed that the SS and Ammonium loading from Rhine River has significantly decreased from late1980s to 1990s by loading estimation.

On the other hand WQI increase significantly in 1988 but after 1992, WQI has been decreasing slowly.

The main cause of WQI decreasing was the rising of ammonia and chlorine concentration.

WQI decreasing in 1988 until 1992 might be because the measurement frequency was much less than before.

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