

Water Quality Control in the Seto Inland Sea

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As for water quality control in the coastal sea area in the Seto Inland Sea in Japan, the Japanese Ministry of the Environment has stations at 124 sites throughout the Inland Sea to carry out the monitoring of the water quality for the "Comprehensive Regional Survey of Water Quality in the Seto Inland Sea" since 1978.

- Water monitoring in each site has been carried out 4 times a year since 1978.
- The monitoring sites were located in thirteen sea areas and channels in the Inland Sea.
- 14 items of the upper and lower layers: Temperature, Depth, Transparency, Salinity, Water Temperature, PH, DO, COD, NH₄, NO₃, Total Nitrogen, PO₃, Total Phosphorus, Chlorophyll-a

Our working group carried out monitoring in the surface and bottom in the Inland Sea two times responding to a request by the Ministry of the Environment to give the verification of the water quality control, and compared the water quality and a change in heavy metal concentration in the surface bottom sediment by the Multivariable Analysis.

First, the writer divided the water data on the Seto Inland Sea into the "Stratification" by the qualitative variable, and the result of the "Analysis of Variance" by the Multivariable Analysis which analyzes the matter whether the mean of the quantitative variable is different in every "Stratum" had already been announced at Stockholm Water Symposium / EMECS 3 in 1997.

Next, when a red tide occurrence was predicted, the writer proposed it at EMECS 6 in Thailand in 2003 that the new "Method for Principal Variable Selection" was quantitative to the usual method for Principal Component Analysis being qualitatively, by comparing it with the case of the usual method of Principal Component Analysis and the new "Method for Principal Variable Selection."

This time, the writer used the data on the "Comprehensive Regional Survey of Water Quality in the Seto Inland Sea" as a method for quality control in the coastal sea area in the Inland Sea, and analyzed it with a technique of the "Structural Equation Modeling" which was an application model for the Multivariable Analysis.

Second, the writer composed the “Confirmatory Factor Analytical Model” for the two Latent Variables (the physical matter & the organic matter) that it was represented by the physics quantity (temperature etc.) and the organic substance (DO etc.) about the population observation data on the upper and lower layers, and then it paid attention to the Structural Means for the Latent Variable that the upper and lower layer population is not observed, and proceeded with the analysis. The “Confirmatory Factor Analytical Model” was verified to confirm the observed variable and the constancy of the factor when the two population data on the upper and lower layers were analyzed at the same time. There was a difference in the mean of the Latent Variable (the upper and lower layer), or it confirmed again how much the difference was. There was a difference in the mean of the Latent Variable (the upper and lower layers), or it confirmed again how much the difference was. The five composition models which included a change in the four seasons through a year in the population data on the upper and lower layers were verified. The results were as follows.

1) About one of the four seasons:

There was a case in the group of summer that it was found out the significant difference for the upper and the lower layer group in the Structural Means (the Latent Variable) model, and the groups of spring, autumn and winter had not a significant difference, and it had supposed the water conditions of the Inland Sea where the model for the Latent Variables (the physical matter & the organic matter) became stable in the upper and lower layers.

2) About the year:

As it was found out that significant difference with the Structural Means (the Latent Variable) model between the upper layer and the lower layer group, the guidelines that the forecast of a red tide occurrence and an uncertainty thing were the helps to regulate environmental pollution as a future subject were believed.