

Evaluation of Dry/Wet Deposition of PCDD/Fs in Taiwan via Automated and Traditional Samplers

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Supplementary Material

1. Description of sampling sites

Feitsui Reservoir is the source of domestic water supply for the Taipei Metropolitan Area, which has a population of over five million. The reservoir with a storage capacity of 406 million m³ is approximately 170 m above sea level. The Feitsui reservoir has a surface area of 10.3 km², a mean depth of 40 m and a maximum depth of 114 m near the dam. The catchment area is 30 times greater than the reservoir surface area. Reservoir construction began in mid-1979 and was completed for water storage in mid-1987. In the northwest of the reservoir, there are two municipal wastes incinerators about 15 km from the reservoir. Those two incinerators could be the possible emission.

The Sun Moon Lake reservoir is located near the geographical center of the island. Prior to 1919, the lake surface was 727 m above sea level, with an original surface area of 5.4 km² and mean water depth of 4.6 m. Following the construction of a dam

which was completed in 1939, the water table rose by as much as 23 m (to reach 750 m above sea level) and the surface area of the reservoir expanded to 8.4 km². The Sun Moon Lake is a high-mountain lake which is far away from the municipal or industrial areas, a unique place to study the atmospheric deposition of anthropogenic pollutants. The catchment basin of the Sun Moon Lake is around 15 km², and the land use in the catchment area includes virgin forests, fruit farm, tea field, rice paddy and river. Over 60% of the catchment area is distributed as virgin forests, and around 15% of catchment area is categorized as cultivated land. Except for the householders around the Sun Moon Lake, there is not much human activity which discharges wastewater to this area. Hence, Sun Moon Lake reservoir is a relative natural setting for monitoring the atmospheric fallout of dioxin-like compounds.

Tsengwen Reservoir is the largest reservoir in Taiwan located upstream of Tsengwen River. Tsengwen Reservoir is a multipurpose reservoir with a primary function for supplying water for the southern Taiwan. The Tsengwen Reservoir scenic area is enclosed by precipitous green mountains. The endangered black-faced spoonbills come every winter as migrants and inhabit the downstream area near the estuary, where many other waterfowls are also found. A conservation area has been set up to protect the spoonbills. Reservoir construction began in mid-1967 and was completed for water storage in mid-1973. The Tsengwen River is a mountainous river in the tropical zone of southwestern Taiwan. The river (length of 139.5 km)

originates in the Wansui Mountain of Central Mountain Range (elevation: 2,440 m). It drains a watershed comprised of suburban, rural and agricultural zones with a total area of 1177 km². To In the southwest and northwest of the reservoir, there are two municipal wastes incinerators and two electric arc furnaces about 30~50 km from the reservoir. Those four facilities could be the possible emission sources.

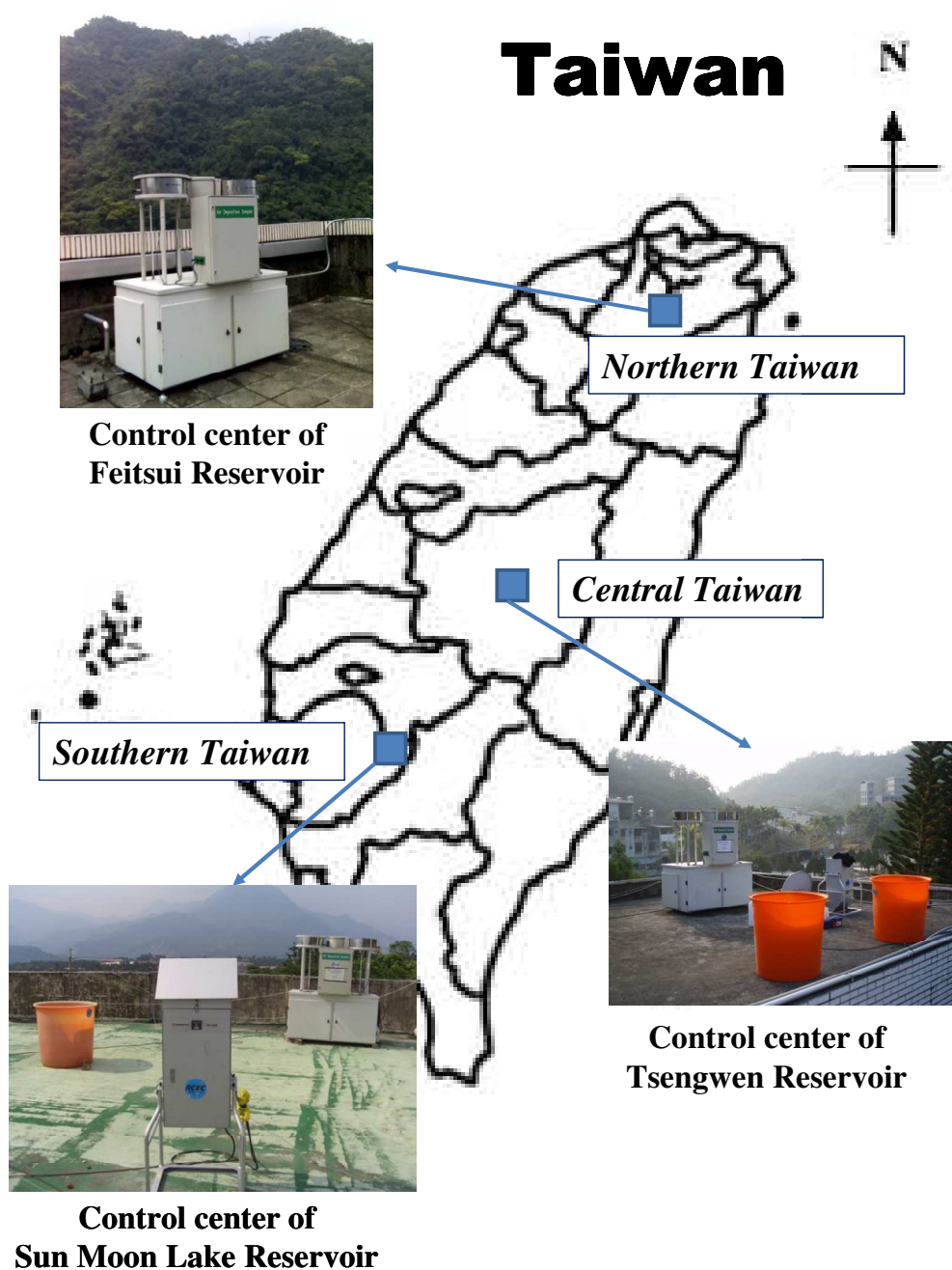


Figure S1 Relative locations of atmospheric sampling site in northern, central and southern Taiwan..

2 Quality control and data analysis

A laboratory blank and matrix spike sample (40~400 pg PCDD/Fs) were used in the analytical procedure for every eight samples for quality control. Method detection limits ($0.04\sim 1.3\text{ pg g}^{-1}$) were determined from the blanks and quantified as three times the standard deviation of the mean concentration in the blanks. In this study, the concentrations of all laboratory blank samples are less than 1.0 pg (PCDD/Fs). The mean recoveries of standards for all $^{13}\text{C}_{12}$ -2,3,7,8-chlorosubstituted PCDD/Fs range from 54% to 116%. The analyzed results are all within the acceptable 40-130% range, set by the U.S. EPA in Method 23. For data analysis, International Toxic Equivalent Factors (I-TEFs) are adopted to compare the potential toxicity of each PCDD/F congener in a mixture to the well-studied and understood toxicity of TCDD, the most toxic member of the group [20]. The I-TEF of each congener present in a mixture is multiplied by the respective mass concentration, and the products are summed to yield the 2,3,7,8-TCDD International Toxic Equivalence (I-TEQ) of the mixture.