A Case Study of Phytoforensics at a PCE-Contaminated Site in Taiwan

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Background/Objectives. Phytoforensics is a novel technique based on the physiological characters of plants. If contaminants exist in groundwater, nearby trees could uptake contaminated groundwater into the xylem and accumulate the compounds. Therefore, the concentration of contaminants in the trees could represent the groundwater-contaminated situation. Phytoscreen means that we take the tree cores from different trees at a contaminated site, analyze the VOCs in the tree samples, and describe the pollutants discributions. Furthermore, the pollutants or elements of the pollutants could be incorporated into tree rings, and thus record the history of contamination. Last year, we tested phytoforensic methods in a PCE-contaminated site in Chiayi, Taiwan, and established standard sampling and analytical procedures for phytoforensics and phytoscreening. This year, we further extended the range of survey, trying to identify the locations of pollutant plume and hot spots.

Approach/Activities. This current study collected 32 tree core samples around the boundary of a tetrachloroethylene (PCE)-contaminated site in Minsyo industrial park in Chayi County, Taiwan. In 2010, Taiwan Environmental Protection Administration declared the site was contaminated by PCE. The highest PCE concentration in soil was about 11,000 mg/kg (4.4 m ~ 5.6 m bgs). The groundwater was also PCE contaminated with an average concentration of 92.4 mg/L. This study selected four tree species for comparisons, including *Lagerstroemia speciosa*, *Bischofia javanica*, and *Terminalia catappa*. Tree cores of two different lengths were collected for different purposes. The short tree cores were for observing the VOCs transported with uptake water from the soil, whereas the long cores were analyzed by ITRAX® for Cl detection.

Results/Lessons Learned. Among the 32 tree core samples, PCE was detected in 13 of them. The highest PCE concentration in tree core was 30,439 ppbv, and the location of that tree was different from the hot spot identified previously, which indicated that there were perhaps two PCE hot spots in this site. Not only the trees around the factory releasing PCE showed traces of the pollutant, so did trees east of the factory. As the furthest tree with a trace of PCE is about 200 m away from the factory, we consider that there may exsit two or more PCE sources in that site. In this study, we defind the plume extent and the hot spots. At the conclusion of the current project, we will be able to estimate the PCE release time and deduce DNAPL mobile situation.