CHAPTER 4

CONCLUSION

An investigation of the chemical compositions of rainwater collected by bulk and wet-only collectors was carried out during August 2005 to July 2006 at Mea Hia Research Center, Chiang Mai University, in northern Thailand. The purpose of this study was to compare the chemical compositions of rainwater which collected from both collectors. 122 rain samples were collected from both and were analyzed for EC, pH and ion composition. The results showed that the rainwater in Chiang Mai was typically acidic with a volume-weighted mean pH of 5.5. The highest pH value of bulk and wet precipitations was 6.3 in August 2005, while the lowest values of those (4.7 and 4.6, respectively) were observed in March 2006. The mean EC values were 0.69 and 0.65 mS/m for bulk and wet-only samples, respectively. The maximum detected EC values for bulk (3.54 mS/m) and wet-only samples (3.39 mS/m) were in March 2006, whereas the minimum of those (0.32 and 0.30 mS/m, respectively) were in July 2006. The relative VWM concentrations of anions and cations in a descending order were $SO_4^{2-} > NO_3^- > Cl^-$ and $NH_4^+ > Ca^{2+} > H^+ > Mg^{2+} > Na^+ > K^+$. The percentages of total cations and anions were approximately 64 and 36, respectively. The percentage of fractional contribution of each cation to the total cation concentration indicated that approximately 29% (18.8 μeq/L) and 33% (17.1 μeq/L) found to be contributing from NH_4^+ in bulk and wet-only samples, respectively. Among anions, SO_4^{2-} was the most abundant with a VWM concentration of 11.1 μeq/L (18%) and 9.2 μeq/L (17%) in bulk and wet-only samples, respectively. Most of ion concentrations in both bulk and wet-only precipitations were much higher in dry season than in rainy season.

Comparison of sampling devices, RCB test showed that the amount of rain precipitation from both collectors were not significantly different (p=0.05), while the paired sample t-test revealed that ion concentrations (with the exception of Na^+, K^+ and Mg^{2+}) in bulk samples were significantly higher ($p<0.01$) than those in the wet-only samples, while ionic deposition in $\mu mol/m^2$ unit of those ion were significantly different at 99% confidential level, except H^+, Cl^-, K^+ and Mg^{2+}. Scatter plot between each of ion concentrations obtained from bulk and wet-only samples showed high correlation. Multivariate Analysis of Variance revealed that the chemical compositions of bulk and wet-only depositions were not significantly different (p=0.01). So, it can be deduced that bulk collector can be used instead of wet-only collector at this study site.

Among 122 rain samples of this study, 42 bulk and 31 wet-only samples were qualified for both R_1 (ion balance) and R_2 (conductivity balance). SO_4^{2-} and NO_3^- were accounted for the most of acidity and their relative contributions were about 40% and 60%, respectively. The dominating neutralizing components in the collected samples were NH_4^+ and Ca^{2+}. Enrichment factor analysis based on Na^+ indicated that SO_4^{2-}, K^+ and Ca^{2+} were enrich, revealing significant influences of local sources with exception more than half of Cl^- content and small part of Mg^{2+} which came from marine source. Sea salt fraction calculation for both samples revealed that about 70% Cl^- and 14% Mg^{2+} were from marine origin.

Factor analysis was also determined to explain the sources of the pollutants in precipitation. The first factor represented the combustion process (SO_4^{2-}, NO_3^-, Cl^- and H^+) and agricultural activity and soil (NH_4^+, K^+ and Ca^{2+}). The second factor indicated

the contribution of sea salt (Cl^-, Na^+ and Mg^{2+}). The third one could be categorized as soil re-suspension and combustion activities (Ca^{2+} and K^+).