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Chemical characteristics of summer rainwater at an urban site in South Korea

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In this study, we investigated the chemical characteristics of rainwater and evaluated the correlation among rainwater quality factors for seven precipitation events from June 2020 to August 2020. Rainwater samples ($n = 84$) were collected every 50 mL at Pukyong National University, Busan, South Korea. Values of pH and electrical conductivity (EC) were measured in the field, and concentrations of water-soluble cations (Na^+ , Mg^{2+} , K^+ , Ca^{2+} , and NH_4^+) and anions (Cl^- , NO_3^- , and SO_4^{2-}) were determined using ion chromatography. For all rainwater samples, the pH ranged from 3.63 to 5.59, with mean pH = 4.78, and the measured mean EC was 30.54 $\mu\text{S}/\text{cm}$, indicating that the precipitation was acidified in Busan, South Korea. A strong negative correlation ($r = -0.83$) was found between the pH and EC values. The major ionic components of rainwater were $\text{SO}_4^{2-} > \text{NH}_4^+ > \text{NO}_3^-$, which are predominantly attributed to anthropogenic forces in the study area, such as emissions from vessels and fossil fuels. Anion concentrations of rainwater samples were SO_4^{2-} (average concentration: 2.15 mg/L) $> \text{NO}_3^-$ (1.43 mg/L) $> \text{Cl}^-$ (1.04 mg/L) and showed a strong positive correlation with EC values ($r = 0.81$) and a negative correlation with pH values ($r = -0.72$) of rainwater samples. The average concentrations of cations (NH_4^+ (1.56 mg/L) $> \text{Ca}^{2+}$ (1.31 mg/L) $> \text{Na}^+$ (0.63 mg/L) $> \text{K}^+$ (0.57 mg/L) $> \text{Mg}^{2+}$ (0.29 mg/L)) were relatively lower than those of anions. Cation concentrations showed no significant correlation with the values of EC ($r = 0.29$) and pH ($r = -0.21$). The result of this study indicates that acidic precipitation occurs even in summer with relatively low concentrations of air pollution and strong rainfall intensity.