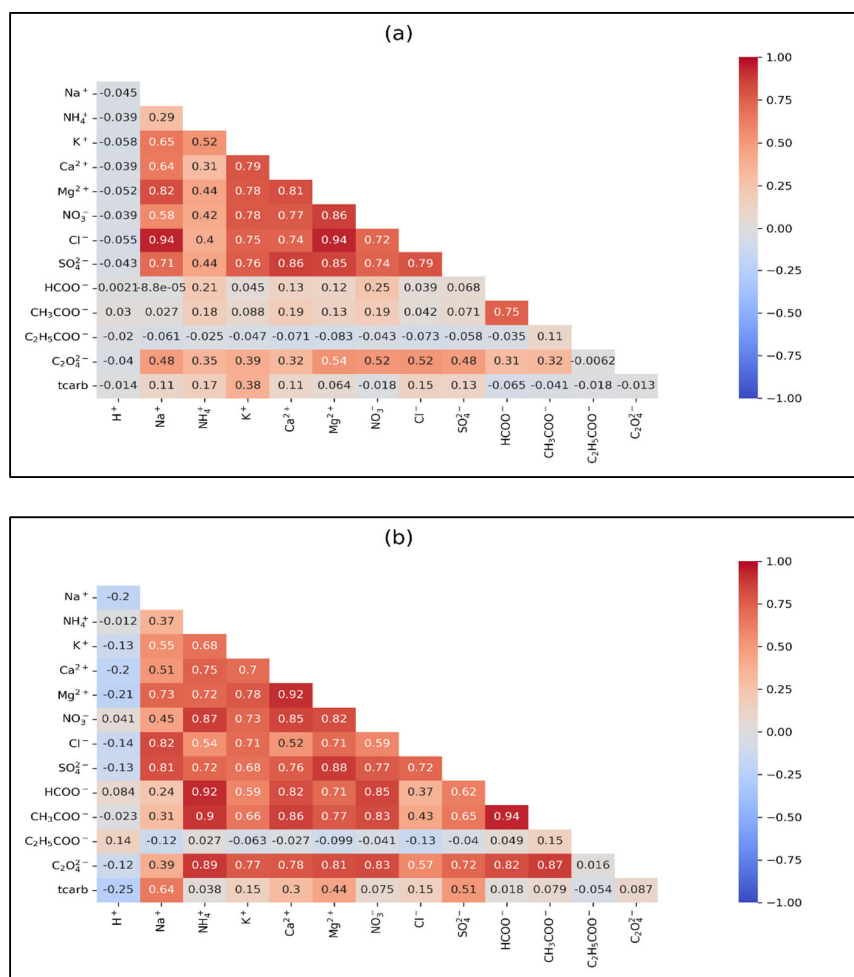
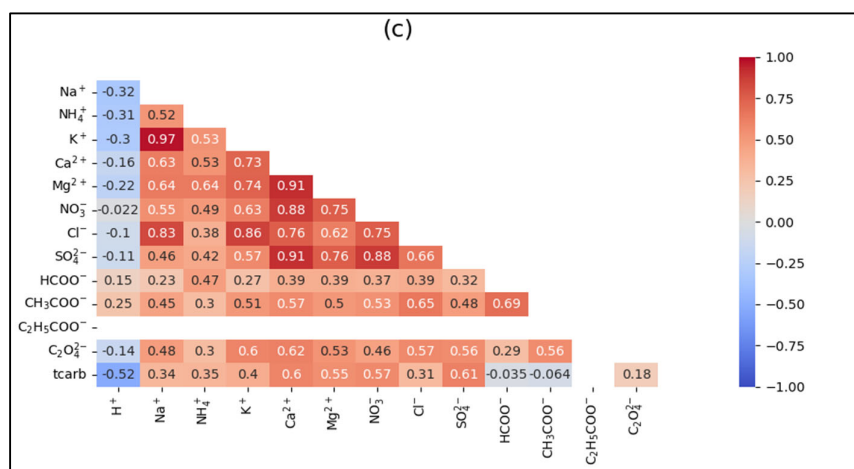


## Supplementary Materials:

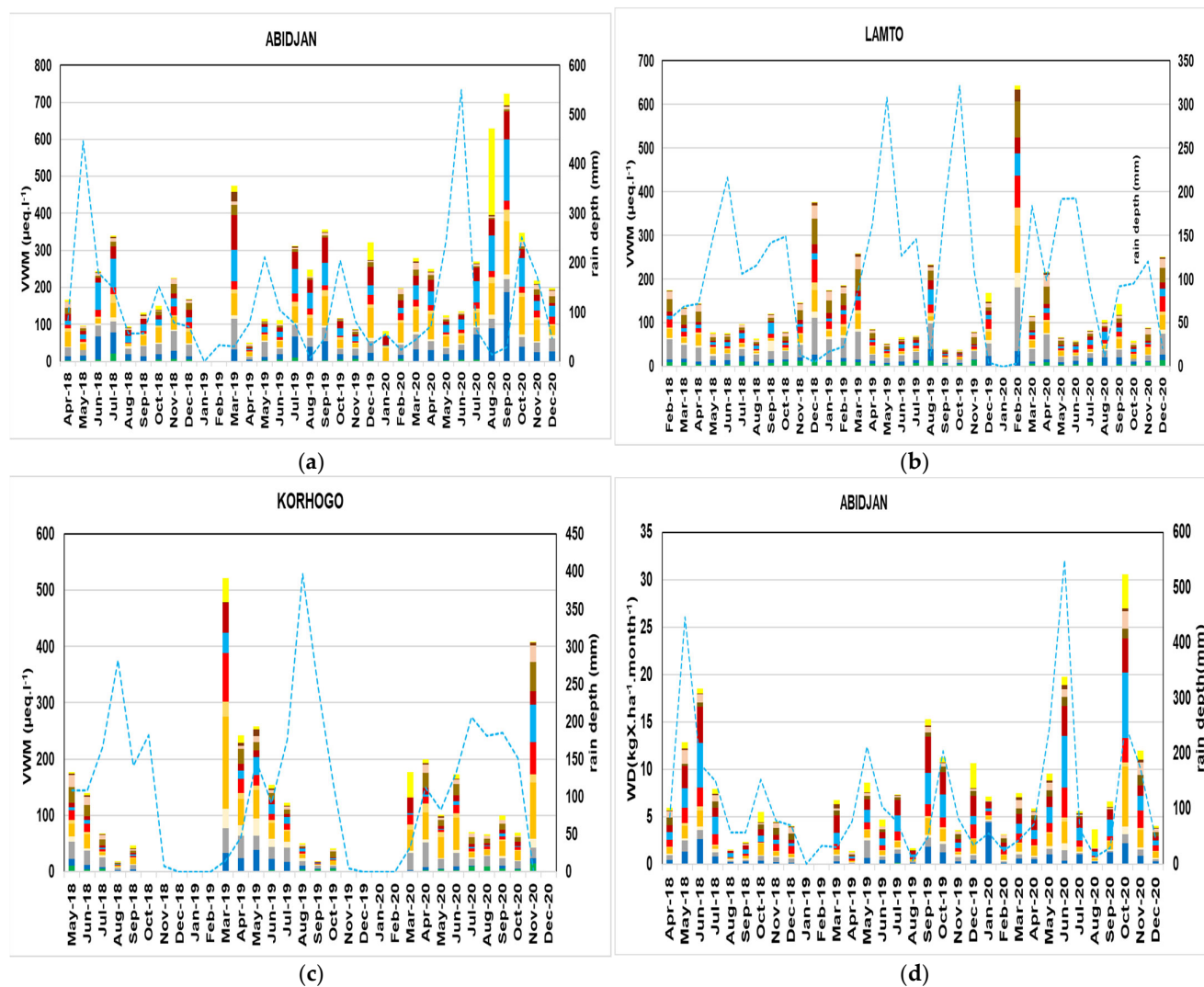
# The Chemical Characteristics of Rainwater and Wet Atmospheric Deposition Fluxes at Two Urban Sites and One Rural Site in Côte d'Ivoire

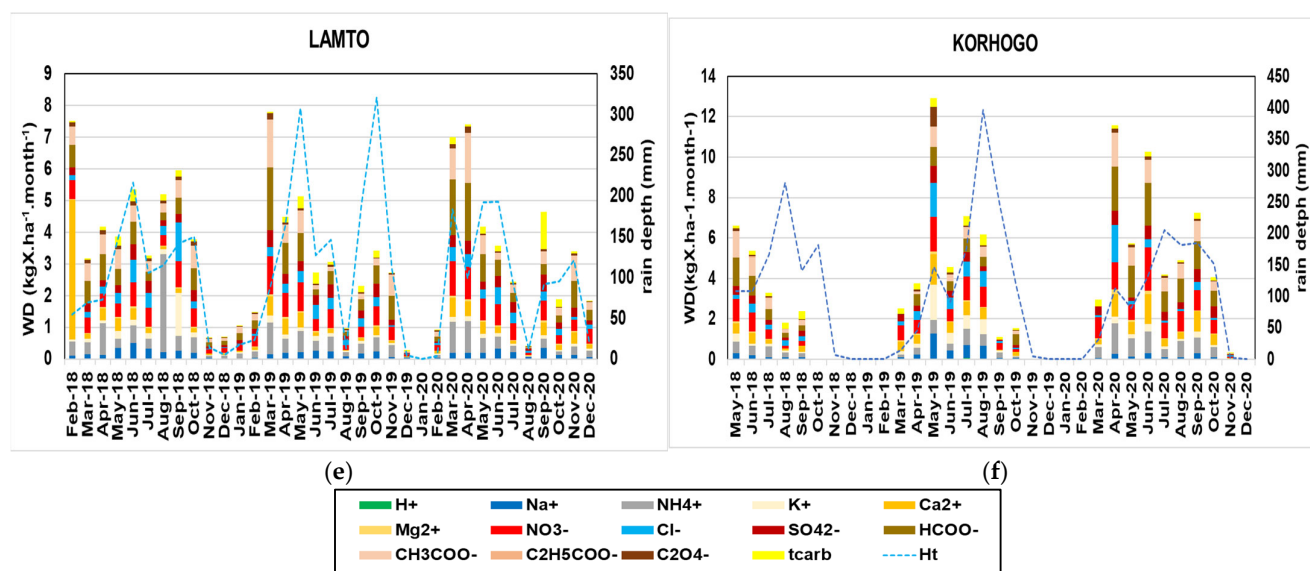
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**Figure S1.** Spearman matrix correlation of rainwater Volume Weighted Mean (VWM) concentrations ( $\mu\text{eq L}^{-1}$ ) for Abidjan(a), Lamto (b) and Korhogo(c)

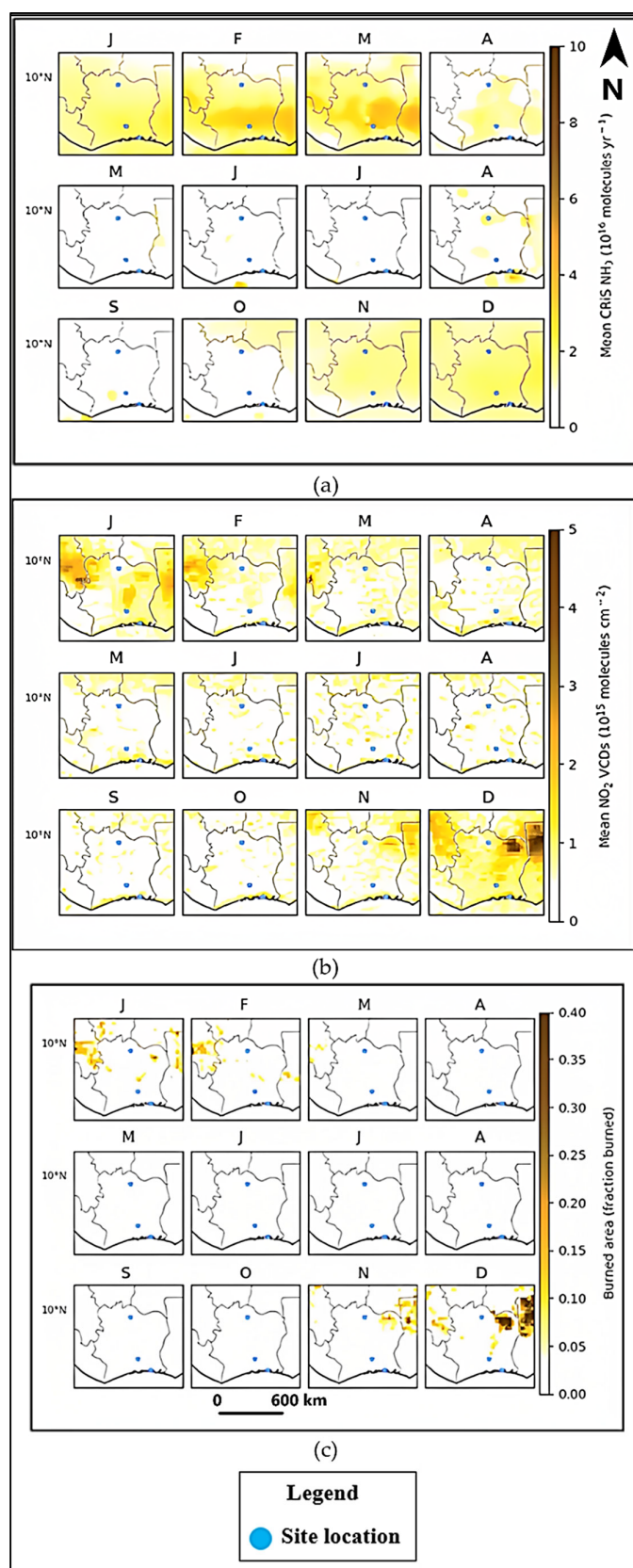




Notes: \* X corresponds to the different ionic species in rains analyzed by ionic chromatography

\* tcarb = total carbonates species calculated from this equation  $\text{tcarb} = 10^{(\text{pH}-5.505)}$  [1].

**Figure S2.** Monthly Volume Weighted Mean (VWM) concentrations of major ions ( $\mu\text{eq L}^{-1}$ ) at Abidjan (a), Lamto (b) and Korhogo (c) and monthly Wet Deposition (WD) fluxes ( $\text{kgX ha}^{-1} \text{yr}^{-1}$ ) at Abidjan (d), Lamto (e) and Korhogo (f).



**Figure S3.** Monthly mean Vertical Column Densities (VCD) of  $\text{NH}_3$  from CRiS (upper panel), tropospheric VCD of  $\text{NO}_2$  from OMI (middle panel), and burned area from MODIS (lower panel) averaged over 2018-2020. Note that the means for  $\text{NH}_3$  do not include April–July 2019

#### S4. Calculations and Statistics

Annual and monthly Volume Weighed Mean (VWM) concentrations in  $\mu\text{eq L}^{-1}$  for each ion are calculated using methods described by [2,3]:

$$\text{VWM} = \sum_{i=1}^N C_i \cdot P_i / \sum_{i=1}^N P_i \quad (\text{S1})$$

Where  $C_i$  in  $\mu\text{eq L}^{-1}$  is the concentration of a given chemical element for each rain event,  $P_i$  is rainfall depth for each rain event in mm.  $N$  is the number of rain events.

The annual and monthly Wet Deposition fluxes (WD) for all ionic species are expressed in  $\text{kg ha}^{-1} \text{yr}^{-1}$  are calculated using the following equation [4]:

$$\text{WD} = (\text{VWM} / c_i) \times M_i \times P_t / 100,000 \quad (\text{S2})$$

Where VWM is the volume weighted mean concentration in  $\mu\text{eq L}^{-1}$ ,  $c_i$  is the ionic charge,  $M_i$  in  $\text{g mol}^{-1}$  is the molar mass of each species and  $P_t$  in mm is the annual or monthly rain depth.

The  $\text{H}^+$  concentrations are calculated from measured pH values using the equation:

$$[\text{H}^+] = 10^{-\text{pH}} \quad (\text{S3})$$

Sea Salt Fraction (SSF) and Non Sea Salt Fraction (NSSF) to ionic concentrations in rainwater and corresponding enrichment factors (EF) are calculated according to the method suggested by many authors [5,6].

$$\text{EF}_{\text{marine}} = [\text{X}/\text{Na}^+]_{\text{rain}} / [\text{X}/\text{Na}^+]_{\text{sea}} \quad (\text{S4})$$

$$\text{EF}_{\text{crustal}} = [\text{X}/\text{Ca}^{2+}]_{\text{rain}} / [\text{X}/\text{Ca}^{2+}]_{\text{crustal}} \quad (\text{S5})$$

Where  $X$  is the concentration of the ion of interest,  $\text{Na}^+$  is used as the element of reference for marine source [1] and  $\text{Ca}^{2+}$  is selected as a reference element from crustal origin [7].

$$\text{SSF}(X) = (X/[\text{Na}^+])_{\text{sea}} \times [\text{Na}^+]_{\text{rain}} \quad (\text{S6})$$

$$\text{NSSF}(X) = [X]_{\text{rain}} - \text{SSF}(X) \quad (\text{S7})$$

Where  $\text{SSF}(X)$  is the marine part of the chemical element  $X$  in  $\mu\text{eq L}^{-1}$ ,  $[\text{Na}^+]_{\text{rain}}$  is the concentration of  $\text{Na}^+$  in rain ( $\mu\text{eq L}^{-1}$ ) and  $[X]/[\text{Na}]_{\text{sea}}$  is the ratio of species  $X$  to  $\text{Na}^+$  in seawater [8].  $\text{NSSF}(X)$  is the non-marine part of the chemical element  $X$  in  $\mu\text{eq L}^{-1}$  and  $[X]_{\text{rain}}$  is the specific concentration of species  $X$  in  $\mu\text{eq L}^{-1}$ .

The potential Acidity (pA) is defined as the sum of all nitrate, sulfate, formic, acetic, propionic and oxalic VWM concentrations, supposing that all these ions are associated with  $\text{H}^+$  [9]

$$\text{pA} = \sum \text{anions} = [\text{SO}_4^{2-}] + [\text{NO}_3^-] + [\text{HCOO}^-] + [\text{CH}_3\text{COO}^-] + [\text{C}_2\text{H}_5\text{COO}^-] + [\text{C}_2\text{O}_4^{2-}] \quad (\text{S8})$$

The Neutralization Factor (NF) [10,11] is:

$$\text{NF}_{x_i} = \frac{[x_i]}{([\text{NO}_3^-] + [\text{SO}_4^{2-}] + [\text{HCOO}^-] + [\text{CH}_3\text{COO}^-] + [\text{C}_2\text{H}_5\text{COO}^-] + [\text{C}_2\text{O}_4^{2-}])} \quad (\text{S9})$$

Where  $x_i$  are cations of interest, and all ionic concentrations are expressed in  $\mu\text{eq L}^{-1}$ .

Fractional Acidity (FA) represents the ratio to examine acidity neutralization capacity of rainwater [12–14] is :

$$\text{FA} = \frac{[\text{H}^+]}{([\text{NO}_3^-] + [\text{SO}_4^{2-}] + [\text{HCOO}^-] + [\text{CH}_3\text{COO}^-] + [\text{C}_2\text{H}_5\text{COO}^-] + [\text{C}_2\text{O}_4^{2-}])} \quad (\text{S10})$$

We adapted equations 8, 9, 10 by modifying the original equations of the cited authors in order to account for both mineral and organic acidic compounds.

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