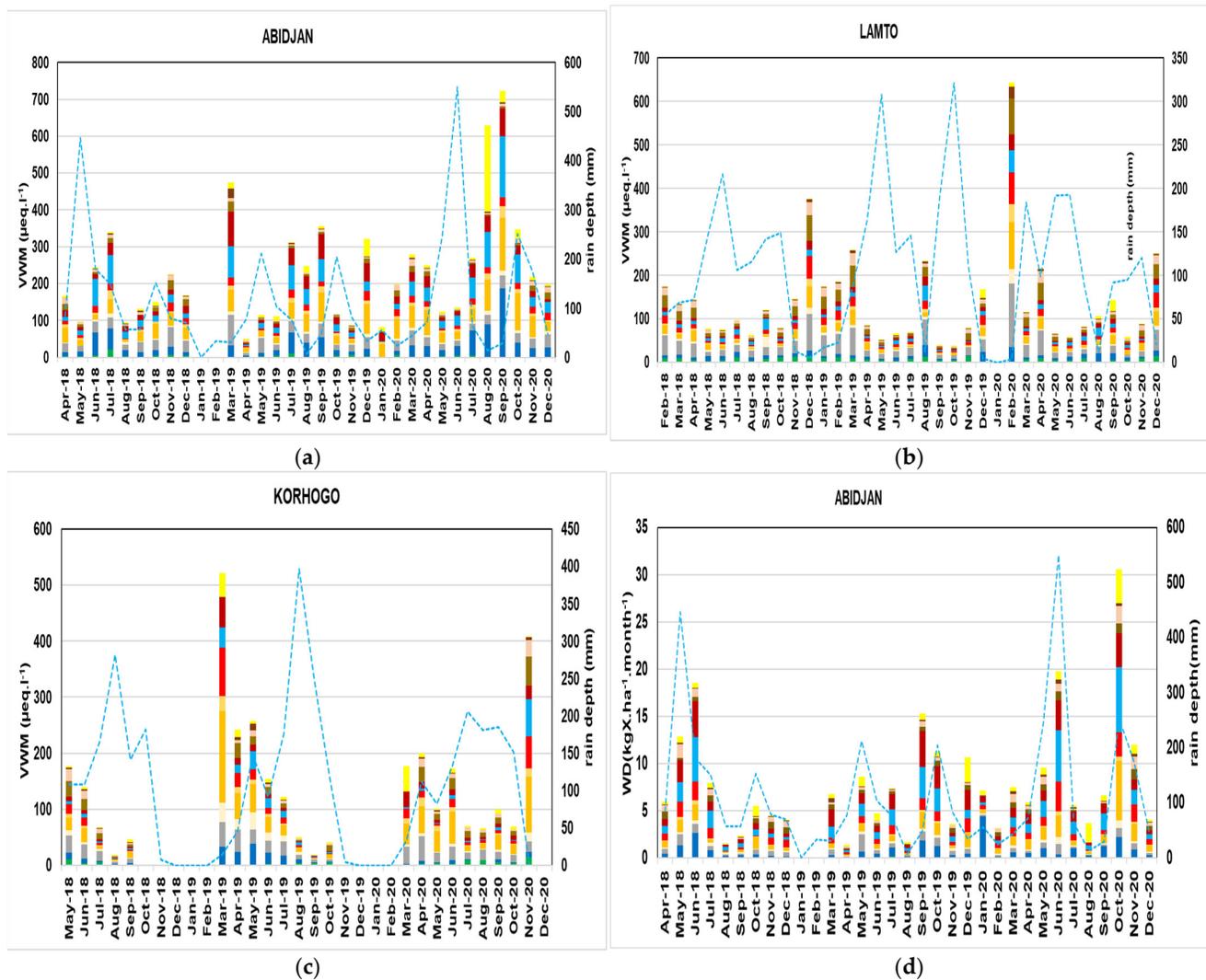
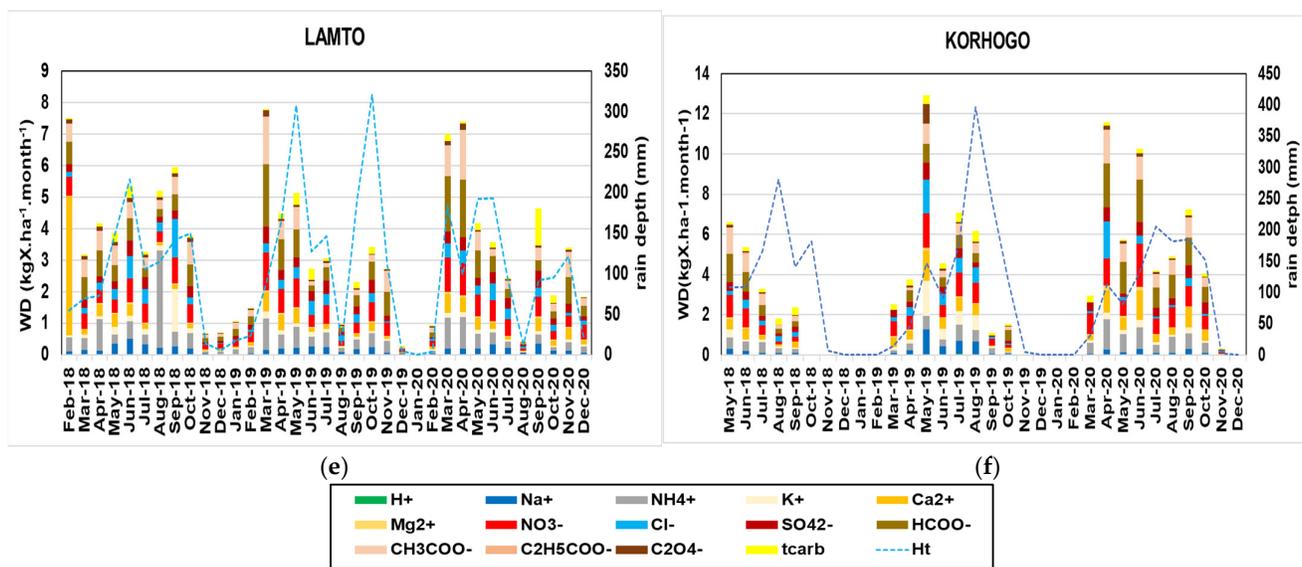


Figure S1. Spearman matrix correlation of rainwater Volume Weighed Mean (VWM) concentrations ($\mu\text{eq L}^{-1}$) for Abidjan(a), Lamto (b)and Korhogo(c)





Notes: * X corresponds to the different ionic species in rains analyzed by ionic chromatography
 * tcarb = total carbonates species calculated from this equation $tcarb = 10^{(pH-5.505)}$ [1].

Figure S2. Monthly Volume Weighed 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).

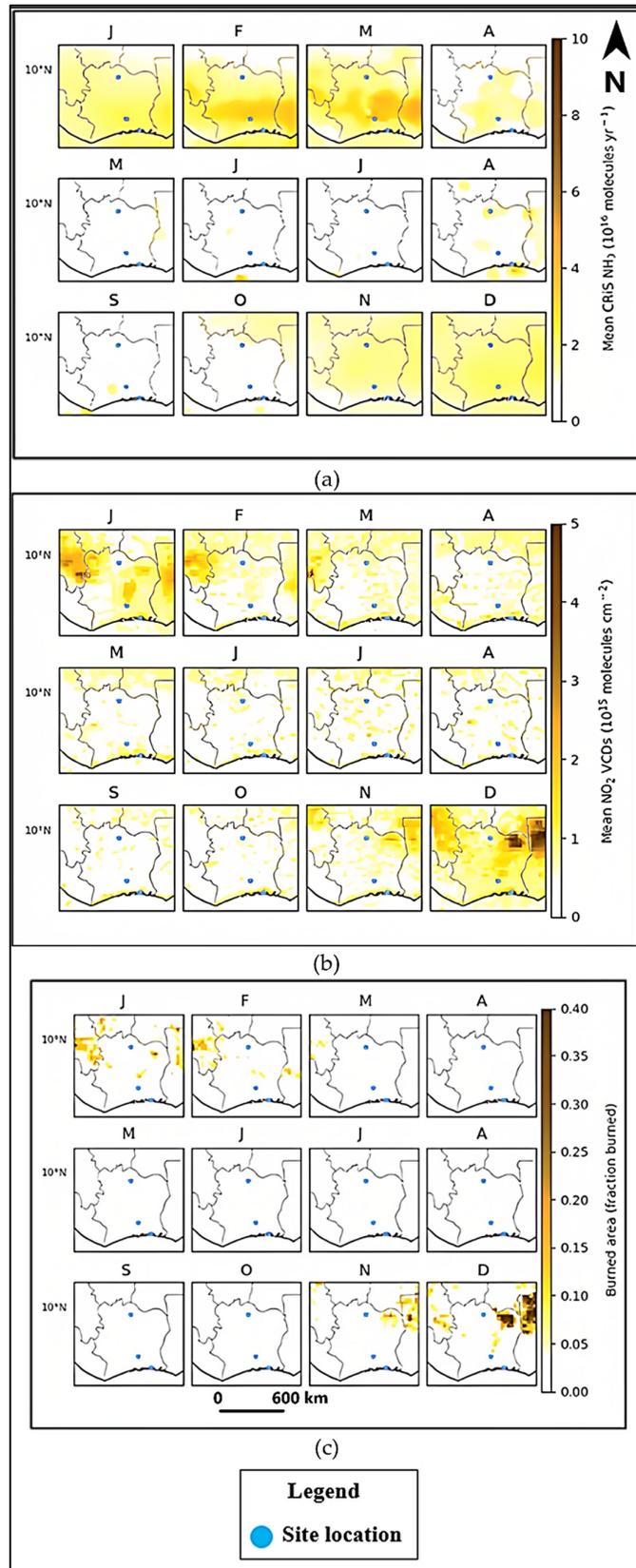


Figure S3. Monthly mean Vertical Column Densities (VCD) of NH₃ from CRiS (upper panel), tropospheric VCD of NO₂ from OMI (middle panel), and burned area from MODIS (lower panel) averaged over 2018-2020. Note that the means for NH₃ do not include April–July 2019

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]:

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

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 g mol^{-1} is the molar mass of each species and P_t in mm is the annual or monthly rain depth.

The 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].

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

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

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

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

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

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