Air quality and trace gas observations at the GAW site Pha Din (Vietnam)

Empa
Materials Science and Technology

Relevance

Open biomass burning (BB) is a globally widespread phenomenon, releasing pollutants affecting health and Earth's radiative balance.

Emissions composition is influenced by multiple factors, such as fuel/vegetation-type, moisture, fire temperature, available oxygen, etc. Regional variations in these parameters, require **studies in different world regions**.

Outline

We investigate air quality and atmospheric composition at the regional "Global Atmosphere Watch" station **Pha Din (PDI) in Vietnam** since 2014 (Ref. 1), and conducted an intense campaign in 2015 (Ref. 2).

- **air quality** (CO, O_3)
- **aerosol composition** ($PM_{2.5}$)
- **aerosol optical properties**
- **greenhouse gas** quantities (CO_2, CH_4)
- **atmospheric simulations**

Study Site

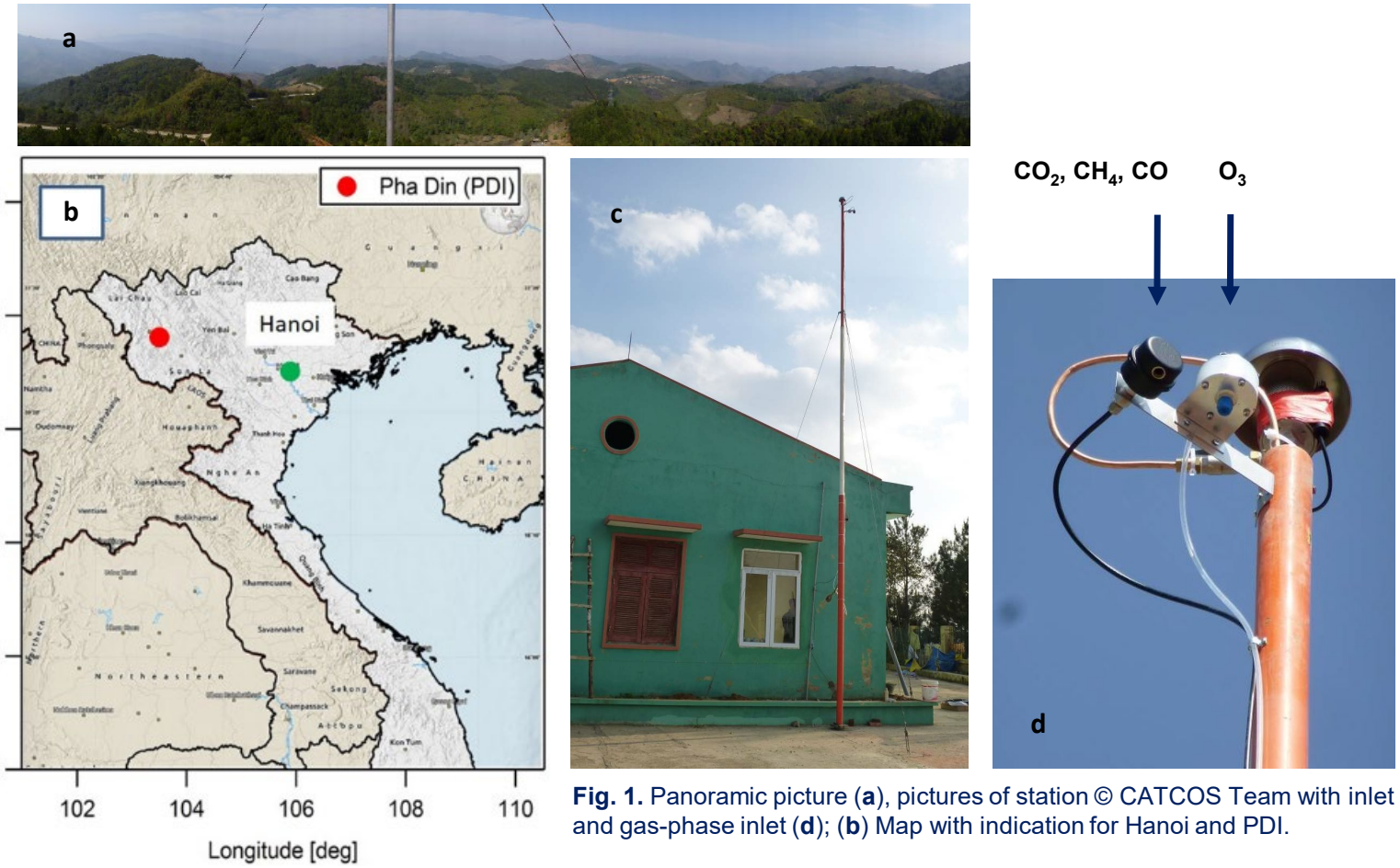

Fig. 1. Panoramic picture (**a**), pictures of station © CATCOS Team with inlet mast (**c**) and gas-phase inlet (**d**); (**b**) Map with indication for Hanoi and PDI.

Presenter

References

Ref. 1:
Bukowiecki et al., AAQR, 19, 1172–1187 (2019), DOI: 10.4209/aaqr.2018.11.0406

Ref. 2:
Nguyen et al., ACP (2021), 21, 8293–8312, DOI: 10.5194/acp-21-8293-2021

Authors: Pieber SM[1], Nguyen DL[2,3], Czech H[2,3], Henne S[1], Bukowiecki N[4], Nguyen NA[5], Buchmann B[1], Emmenegger L[1], Steinbacher M[1]
Affiliations: [1]Empa, Switzerland, [2,3]University Rostock & Helmholtz Zentrum Munich, Germany, [4]Basel University, Switzerland, [5]HYMOC/VNMHA, Vietnam
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Results I

Annually occurring impacts on air quality are visible from the **long-term carbon monoxide (CO) time series** (**Fig. 2, unpublished**). Regional CO levels continuously increase during **dry season, peak around April,** and drop when monsoon sets in.

Carbonaceous aerosol composition analysis of **elemental carbon (EC), organic carbon (OC) and 51 organic target compounds (PAHs, alkanes, fatty acids, anhydrosugars, methoxyphenols, nitrophenols)** highlights periods with low, high and medium BB influence (**Fig. 3,** Ref. 2).

Backward trajectories indicate that polluted air masses are linked with **continental recirculation and advection from southwest**, i.e. areas with highest **fire count density** during the intensive campaign in March-April 2015 (**Fig. 4,** Ref. 2).

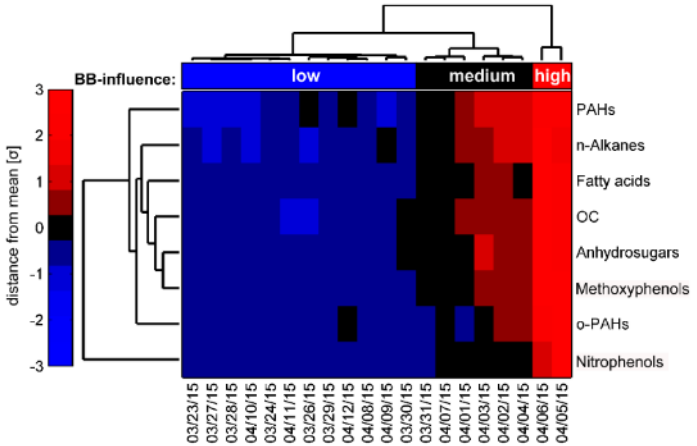

Fig. 3. Clustergram of $PM_{2.5}$ organic composition.

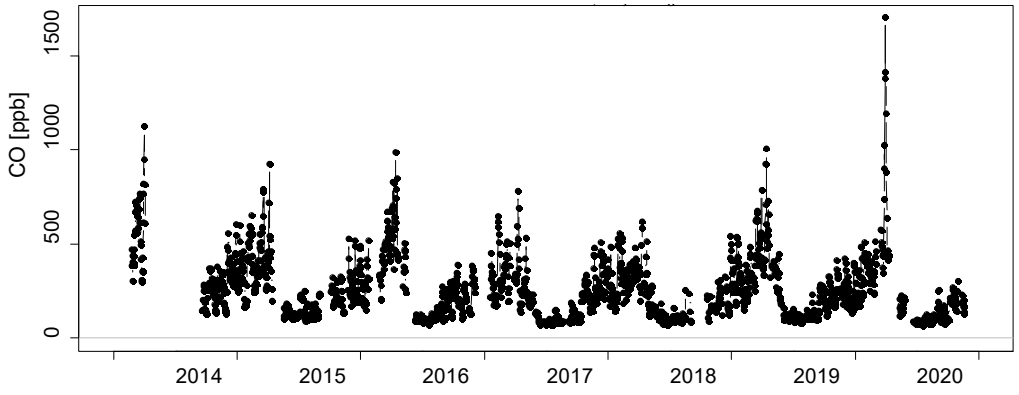

Fig. 2. Carbon monoxide (CO) at PDI from 2014 to 2020 (24h averages).

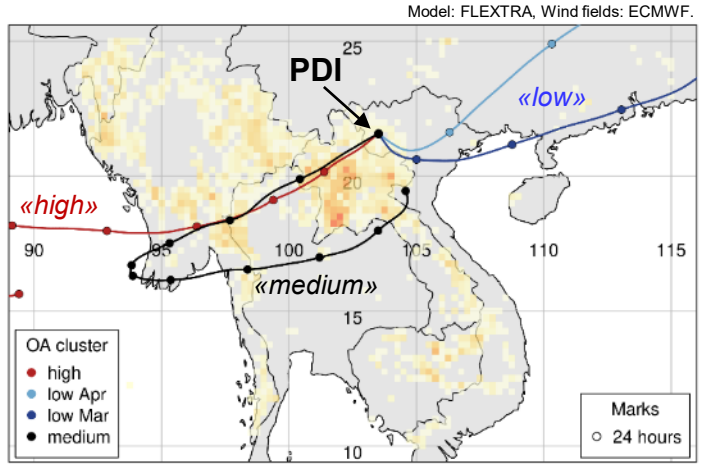

Fig. 4. Map with backward trajectories and fire count density.

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Results II – Simulations of Biomass Burning CO and Plume Age

Fig. 5 (unpublished) compares **observed (black) and simulated (colored by age) regional biomass burning CO** based on the FLEXPART model and GFAS emissions inventory. The model captures the observed events well with regards to their temporal evolution. The **plume ages** are estimated based on the biomass burning CO and range from **very fresh (~24 h, Apr 5/6) to more mature plumes (~72 h, Mar 23)**.

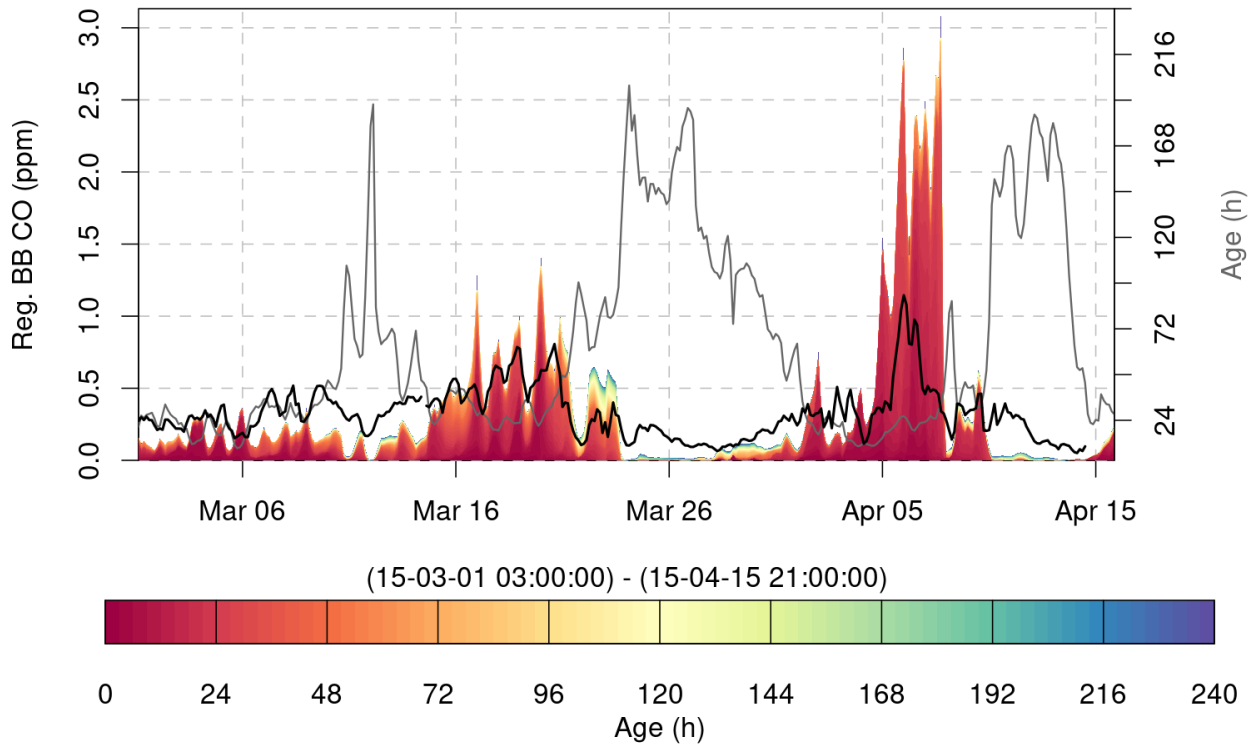

Fig. 5. Observed (black) and simulated (colored by age) regional biomass burning CO. Model: FLEXPART. Emissions: GFAS.

Thank you for your attention!

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