Supporting Information for

Convergent estimates of biomass burning-derived atmospheric ammonia in Peninsular Southeast Asia

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Text S1. Bayesian isotopic mixing modeling

The Bayesian mixing model makes use of stable isotope data to determine the probability distribution of source contributions to a mixture, explicitly accounting for uncertainties associated with multiple sources, their isotopic signatures, and isotope fractionation during transformations. The model has been widely used in ecological studies, such as food-web analyses. In Bayesian theorem, the contribution of each source is calculated based on mixed data and prior information, such that:

$$P(f_q|data) = \theta(data \mid f_q) \times p(f_q) / \sum\theta(data \mid f_q) \times p(f_q)$$

where $\theta(data|f_q)$ and $p(f_q)$ refer to the likelihood of the given mixed isotope signature, and the pre-determined probability of the given state of nature, based on prior information, respectively. The denominator represents the numerical approximation of the marginal probability of the data. In a Bayesian model (stable isotope in R; SIAR), isotope signatures from the mixed data pool are assumed to be normally distributed. Uncertainty in the distribution of isotope sources and associated isotope fractionation during transformations are factored into the model by defining respective mean (μ) and standard deviation (σ) parameters. Prior knowledge about proportional source contributions (f_q) is parametrized using the Dirichlet distribution, with an interval of [0, 1]. To assess the likelihood of the given f_q, the proposed proportional contribution is combined with a user-specified isotope distribution of sources and their associated isotope effects to develop a proposed isotope distribution for the mixture. The probability of fractional source contributions (f_q) is calculated by the Hilborn sampling-importance-resampling method.

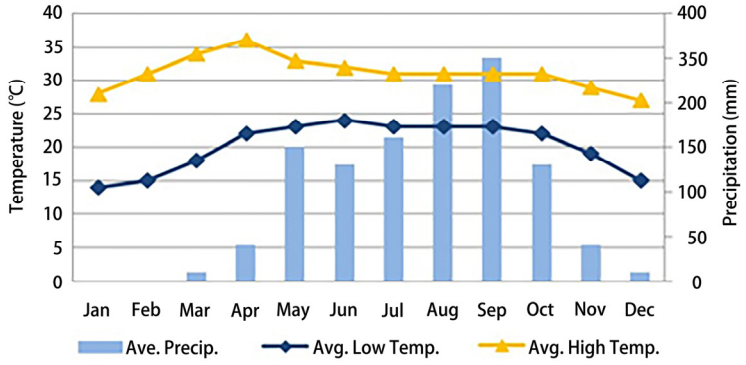

Figure S1. Monthly average temperatures and rainfall in Chiang Mai.

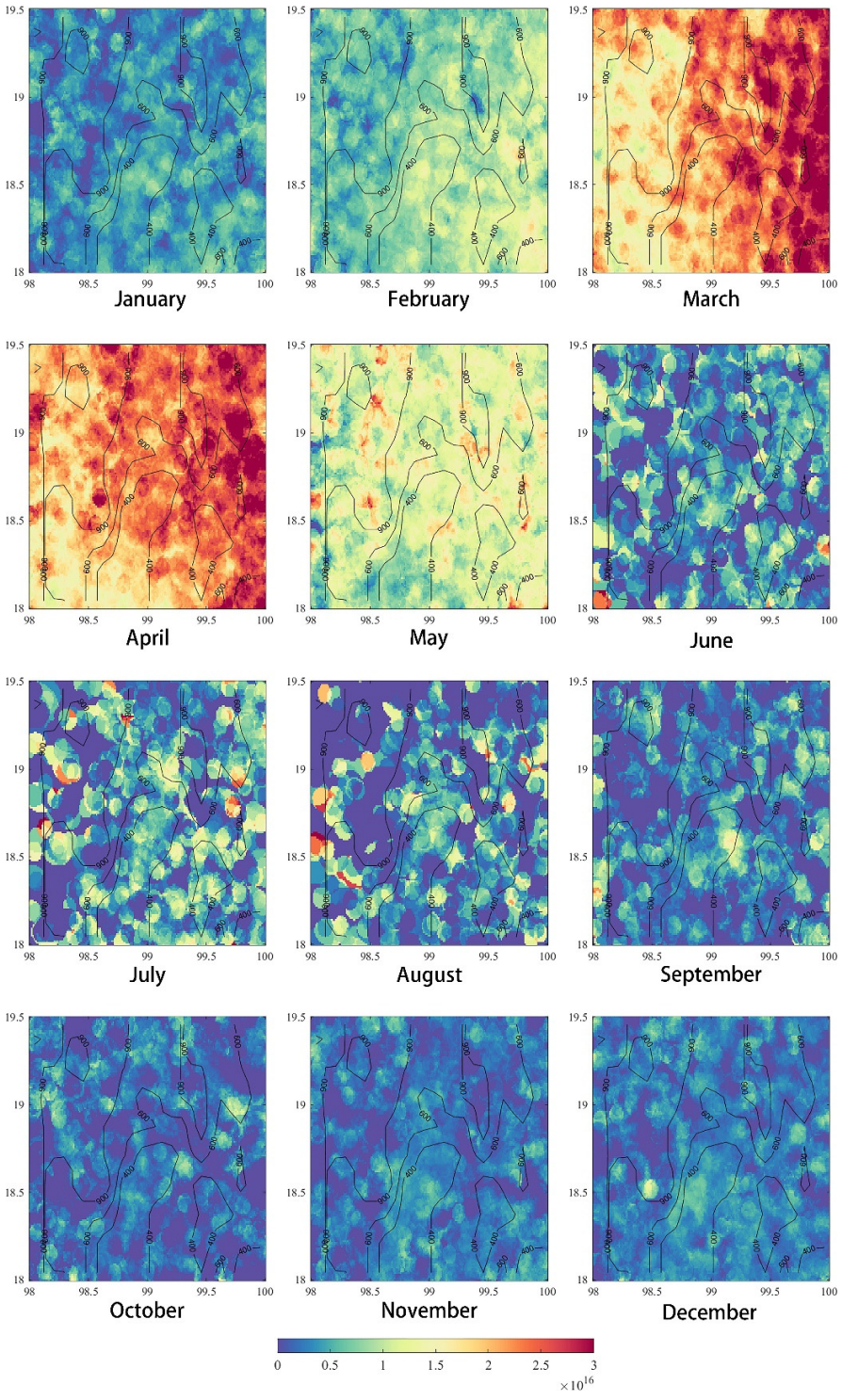

Figure S2. The IASI Metop-A and Metop-B monthly averaged NH_3 distribution (molec cm^{-2}) for 11 years (2008-2018).

Table S1. The description of each site used in this study.

Site	Description	Abbreviate	Latitude	Longitude	Attitude (m)	Remark
S1	Chiang Mai University (Suburban)	CMU	18°47'42.65"N	98°57'28.36"E	345	Passive samples and Medium
S2	Tad Chompoo reservoir at Chiang Mai University (Suburban)	TCR	18°48'12.58"N	98°56'49.54"E	366	Passive samples
S3	Sangwanwittaya school, Chiang Mai Province (Rural)	SW	18°48'32.02"N	98°54'48.00"E	1,116	Passive samples and Medium
S4	Nong Tao health center, Mae Wang District, Chiang Mai (Rural)	NT	18°40'51.17"N	98°33'06.06"E	1,016	Passive samples and Medium
S5	Khun Klang health center, Chom Tong District, Chiang Mai (Rural)	KK	18°32'18.60"N	98°31'29.02"E	1,269	Passive samples and Medium
S6	Northern region school for the blind (Urban-Traffic)	NRS	18°47'15.02"N	98°58'41.37"E	316	Passive samples
S7	Chaeng Kha Thump (Urban-Traffic)	CKT	18°46'53.88"N	98°59'33.68"E	309	Passive samples
S8	Municipal Nong Phueng, Sarapee, Chiang Mai (Urban)	MNP	18°44'37.08"N	99°00'48.78"E	307	Passive samples
S9	Saraphee hospital, Saraphi district, Chiang Mai (Urban)	SP	18°40'53.41"N	99°02'35.63"E	298	Passive samples and MiniVol