Section S1

A major influence on fire discharge in the framework is the condition of the subsurface at the location of the fire event. Different types of subsurface have different biological qualities and correlates. In GEIOBB we used IGBP categorized data from MODIS LCT (Friedl and Sulla-Menashe, 2022) and we reclassified the original 17 classifications and reclassified the results to reorganize the subsurface types into seven categories (Table 1, reclassification approach), including grasslands and savannas, woody savannas or shrubs, tropical forests, temperate forests, boreal forests, temperate evergreen forests, and crops, to allow for better matching in subsequent assignments of biomass and related factors.

Table S1. Reclassification method.

IGBP LCT Description	LCT Value	Method and Value
Evergreen Needleleaf Forests	1	If latitude>50, then V5; else V6
Evergreen Broadleaf Forests	2	If latitude>-23.5 and <23.5, then V3; else V4
Deciduous Needleleaf Forests	3	If latitude >50, then V5; else V4
Deciduous Broadleaf Forests	4	V4
Mixed Forests	5	If latitude >50, then V5; if latitude>-23.5 and <23.5, then V3; else V4
Closed Shrublands	6	V2
Open Shrublands	7	V2
Woody Savannas	8	V2
Savannas	9	V1
Grasslands	10	V1
Permanent Wetlands	11	V1
Croplands	12	V7
Urban and Built-up Lands	13	If tree cover < 40, then V1; if tree cover >40 and <60, then V2; if tree cover >60 then assign to Mixed Forests.
Cropland/Natural Vegetation Mosaics	14	V1
Permanent Snow and Ice	15	-
Barren	16	V1
Water Bodies	17	-

Where V1 is grasslands and savannas, V2 is woody savannas or shrubs, V3 is tropical forests, V4 is temperate forests, V5 is boreal forests, V6 is temperate evergreen forests, and V7 is crops.

Section S2

$$F(x,t) = \left(\frac{NDVI_{now}}{NDVI_{2010}} + \frac{TC_{now}}{TC_{2010}} \right) * AGB \tag{1}$$

Where $NDVI_{now}$ is the mean value of the month before a single fire event, $NDVI_{2010}$ is the mean value of $NDVI$ in 2020, TC_{now} is the tree cover in the year of the fire incident, TC_{2010} is the tree cover in 2020, and AGB is the Above Ground Biomass data in 2010.
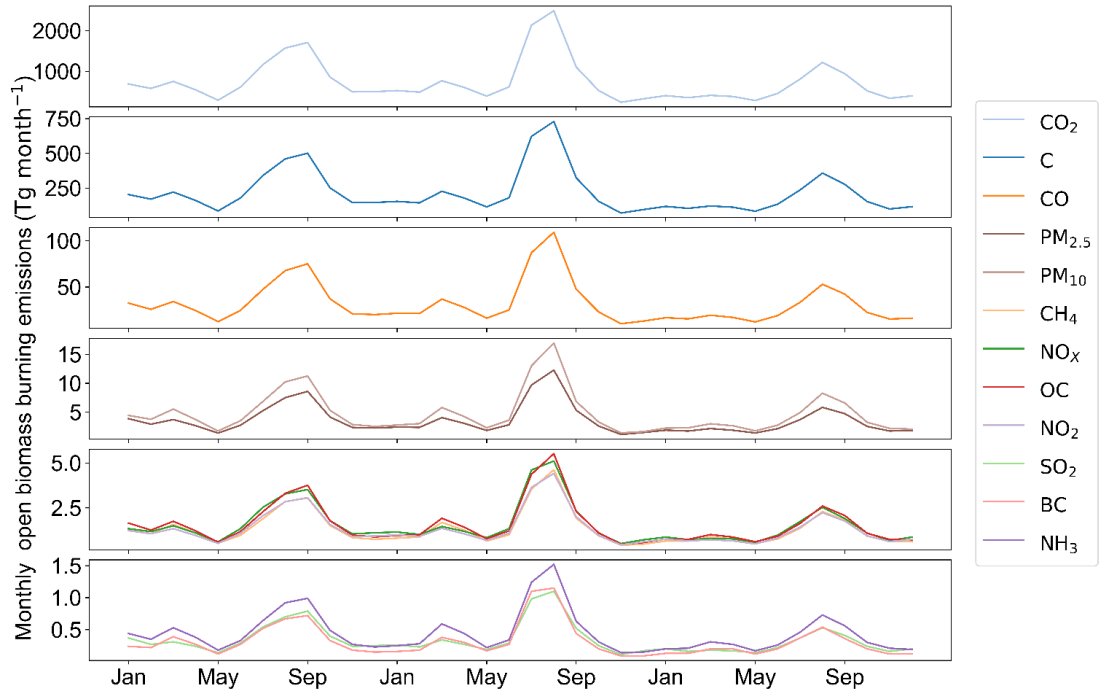
Figure S1: Global monthly variations of OBB emissions from 2020 to 2022.