



BBURNED

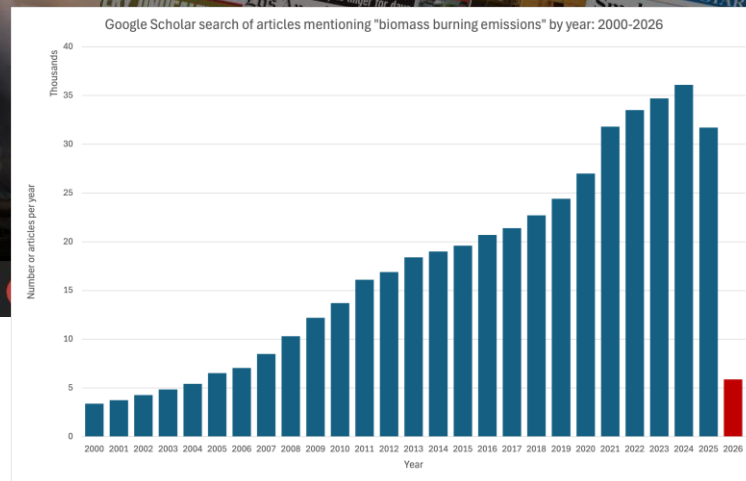
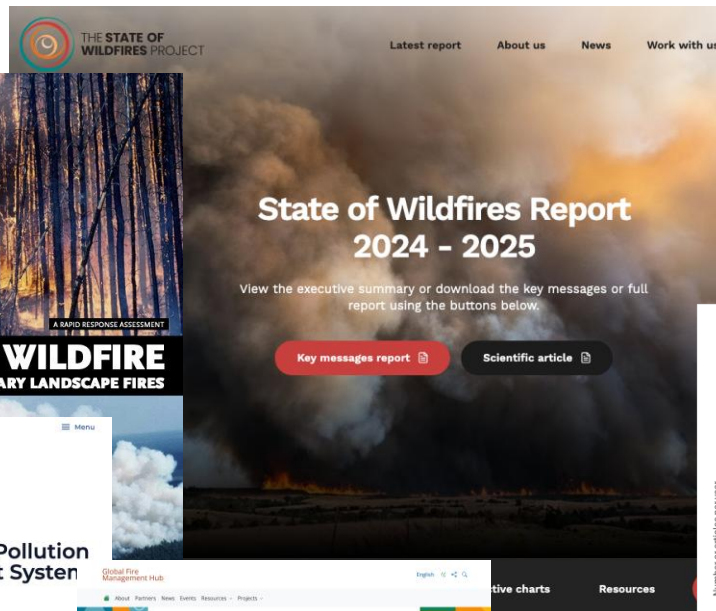
Biomass Burning Uncertainty: ReactionNs, Emissions and Dynamics

<https://www2.acom.ucar.edu/bburned>

Mark Parrington¹, Cynthia Whaley², Nancy French³, Rebecca Buchholz⁴,
Shyno Susan John⁵, Stephanie R. Schneider⁶, Chunmao Zhu⁷, Madina Doumbia⁸, N'datchoh
Evelyne Touré⁸, Shobha Kondragunta⁹, Yang Li¹⁰

¹European Centre for Medium-Range Weather Forecasts (ECMWF), Bonn, Germany, ²Environment and Climate Change Canada, Victoria, BC, Canada, ³Michigan Tech Research Institute, Ann Arbor, Michigan, USA, ⁴National Center for Atmospheric Research, Boulder, Colorado, USA, ⁵Air Environment Consulting Pty Ltd, Brisbane, Australia, ⁶McMaster University, Department of Chemistry & Chemical Biology, Hamilton, ON, Canada, ⁷Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokohama, Kanagawa, Japan, ⁸University Péléforo Gon Coulibaly (UPGC), Korhogo, Côte d'Ivoire, ⁹National Oceanic and Atmospheric Administration (NOAA), Washington DC, USA, ¹⁰Baylor University, Waco, Texas, USA

G r o w i n g



Improved quantification of uncertainties, and differences between estimates from different systems, is essential to providing data driven information and tackling mis-information around wildfires.

<https://www.unep.org/resources/report/spreading-wildfire-rising-threat-extraordinary-landscape-fires>
<https://www.carbonbrief.org/media-reaction-canadas-wildfires-in-2023-and-the-role-of-climate-change/>
<https://stateofwildfires.com/latest-report/>

<https://community.wmo.int/site/knowledge-hub/programmes-and-initiatives/global-atmosphere-watch-programme-gaw/wmo-vegetation-fire-and-smoke-pollution-warning-advisory-and-assessment-system-vfsp-was>
<https://www.who.int/health-topics/wildfires>
<https://stateofwildfires.com/latest-report/>
<https://www.fao.org/partnerships/fire-hub/en>

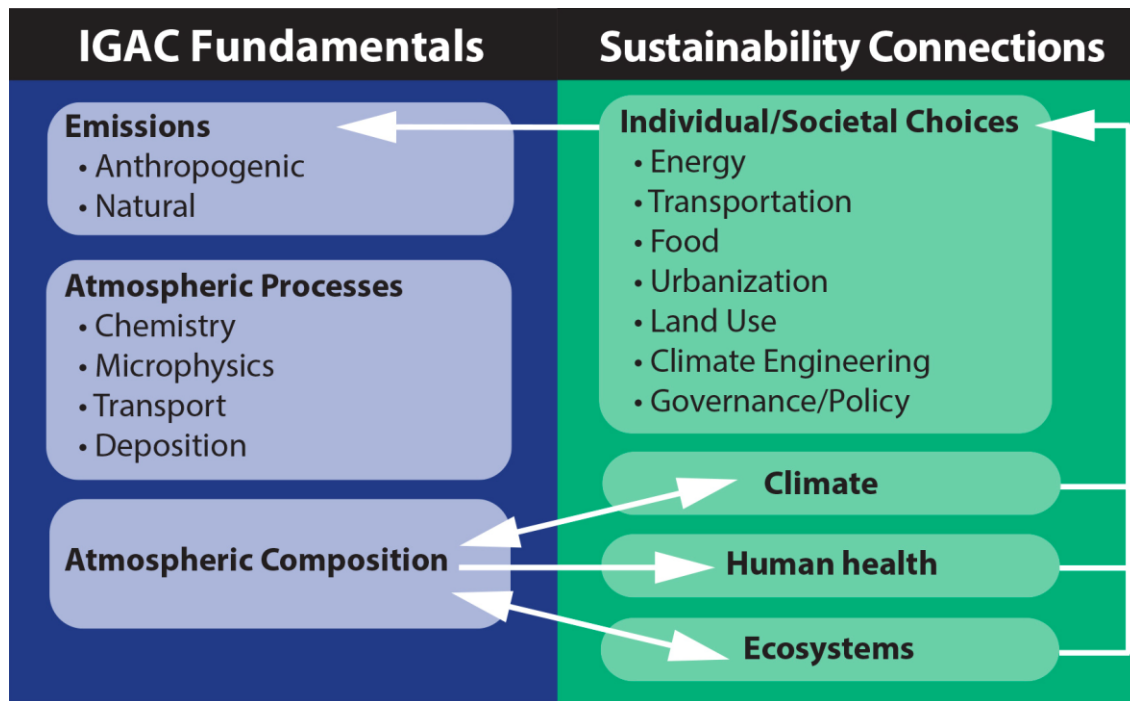
Motivation: IGAC activity centered on biomass burning

Biomass burning emissions and the resulting atmospheric processes are critical components to atmospheric chemistry research – both are **highly uncertain, and highly variable**.

Identified the need for an IGAC activity focussed on assessing and quantifying uncertainties in biomass burning emissions and their application in atmospheric chemistry research, with synergies across other IGAC activities.

IGAC's mission is to ***facilitate atmospheric chemistry research towards a sustainable world***. This is achieved through IGAC's four focal activities:

- advancing knowledge
- fostering community
- building capacity
- engaging society



IGAC
of Future and
the
Atmospheric
(ICACGP)

SSC: Scientific Steering Committee

Offices: IGAC Director

Community: ~1,500 scientists, students,
policy makers, stakeholders, and general
public from across six continents

The international community gives IGAC a
unique ability to function without borders and
to facilitate atmospheric chemistry research
towards a sustainable world.

Funding from NASA, NOAA, NSF, NIES.

-IUGG

futureearth



SSC

Offices

Community

Background: IGAC activity centered on biomass burning

BBURNED is an IGAC activity started in December 2022 aimed at:

- addressing the current understanding of the uncertainty and variability in biomass burning emission estimation, and
- building a community of science and practice to more accurately represent atmospheric chemistry resulting from fire.

Biomass burning emissions, and resulting atmospheric processes, are highly variable and uncertain but are critical to advancing our understanding of atmospheric chemistry.

Characterizing the complex uncertainties from heterogeneity in fuels, combustion, and wildfire occurrence and behaviour needs attention for quantifying air quality and climate impacts.

BBURNED aspires to interact and collaborate with other activities, including IGAC's GEIA, the Task Force on Hemispheric Transport of Air Pollution (HTAP), WMO VFSP-WAS, CEOS AC-VC and the wider biomass burning community.



Overarching Goal

BBURNED aims to better **quantify the current understanding of the uncertainty and variability** in biomass burning emission estimation, and determine how to more accurately represent and understand atmospheric chemistry resulting from fire. We will be a conduit to **coordinate and organize the international scientific community** to improve understanding of the current and future impacts of wildfires, prescribed burning and agricultural fire on public health and climate by addressing the uncertainties in **atmospheric chemistry** processes influenced by biomass burning.



I G A C

BBURNED

Biomass Burning Uncertainty:
ReactionNs, Emissions and Dynamics

<https://www2.acom.ucar.edu/bburned>

STEERING COMMITTEE:

Rebecca Buchholz

National Center for Atmospheric Research, USA

Nancy French

Michigan Technological University, USA

Mark Parrington,

European Centre for Medium-Range Weather Forecasts

Cynthia Whaley

Environment and Climate Change Canada

WORKING GROUP LEADS:

Madina Doumbia (emissions)

Univ. Péléforo Gon Coulibaly, Korhogo, Côte d'Ivoire

N'Datchoh Evelyne Touré (emissions)

Univ. Félix Houphouët Boigny, Abidjan, Côte d'Ivoire

Shobha Kondragunta (emissions)

National Oceanic and Atmospheric Administration

Stephanie Schneider (chemistry)

McMaster University, Canada

Chunmao Zhu (chemistry)

Japan Agency for Marine-Earth Science and Technology

Shyno Susan John (modelling)

U. Wollongong, Australia

Yang Li (modelling)

Baylor University, USA

IGAC SSC MEMBER:

Louisa Emmons

National Center for Atmospheric Research, USA

BBURNED Working Groups



Emission Estimation

- Regional intercomparison quantification of different inventories
- Summary of strengths and weaknesses by region and biome
- Study of using the same emission factors in emission creation
- Comprehensive VIIRS-only evaluation
- How important is temporal variability in emission factors

Atmospheric Chemistry Processes

- Ozone creation, what are the main drivers in the plume
- Quantify the importance of HONO
- Interacting urban and wildfire pollution
- Brown carbon and aging

Modelling Atmospheric Composition

- Conduct a comparative analysis of fire emission inventories.
- Use sensitivity studies to quantify when & where plume rise & diurnal cycles are most important.
- Perform region & biome-specific evaluations of model capabilities.
- Develop a review paper on fire modelling, both plume chemistry & dynamics

Please contact us if you
would like to join/contribute
to the working groups
Early Career Researchers
are especially welcome!

BBURNED Achievements

Fire Emissions Workshop (FEW) November 2023 <https://www2.acom.ucar.edu/bburned/fire-emission-workshop-virtual-2023>

A virtual workshop was held jointly by BBURNED and HTAP in November 2023 to review current fire emissions datasets and draft recommendations for addressing uncertainties. Resulting review paper published in Elementa.



Parrington, M. et al. 2025. Biomass burning emission estimation in the MODIS era: State-of-the-art and future directions. *Elem Sci Anth*, 13: 1. DOI: <https://doi.org/10.1525/elementa.2024.00089>

REVIEW

<https://doi.org/10.1525/elementa.2024.00089>

Biomass burning emission estimation in the MODIS era: State-of-the-art and future directions

Mark Parrington^{1*}, Cynthia H. Whaley², Nancy H. F. French³, Rebecca R. Buchholz⁴, Xiaohua Pan⁷, Christine Wiedinmyer⁸, Edward J. Hyer⁷, Shobha Kondragunta⁸, Johannes W. Kaiser⁹, Enza Di Tomaso¹, Guido R. van der Werf¹⁰, Mikhail Sofiev¹¹, Kelley C. Barsanti⁴, Arlindo M. da Silva⁵, Anton S. Darmenov⁵, Wenfu Tang⁴, Debora Griffin¹², Maximilien Desservettaz¹³, Therese (Tess) Carter¹⁴, Clare Paton-Walsh¹³, Tianjia Liu¹⁵, Andreas Uppstu¹¹, and Julia Palamarchuk¹¹

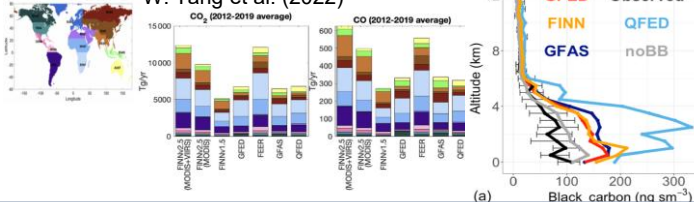
Co-convoked by HTAP



Downloaded from <https://doi.org/10.1525/elementa.2024.00089>

Intercomparisons of global fire emission inventories

W. Tang et al. (2022)



Modelled black carbon concentrations compared to observed in situ from DC3 airborne campaign. Carter et al. (2020)

Fire Uncertainty in Chemistry, Emissions, And Modelling (FUNCHEM) September 2024

<https://www2.acom.ucar.edu/bburned/workshop-2024-fire-uncertainty>

A Hybrid / Kuala Lumpur, Malaysia workshop was held jointly by iLEAPS in September 14-15, 2024 to identify priority fire uncertainty research questions, discuss preliminary/ongoing science. As a result of this workshop, we have launched the inter-journal special issue.

AGU inter-journal special issue

<https://agupubs.onlinelibrary.wiley.com/hub/journal/21698996/call-for-papers/si-2025-000172>

JGR Atmospheres

HOME

BROWSE

HIGHLIGHTS

COMMENTARIES

COLLECTIONS

ABOUT



Call for Papers

Biomass Burning Uncertainties: Emissions, Chemistry, and Physics

Submission deadline: Friday, 31 December 2027

☒ Sign up for email alerts

Enter your email to receive alerts when new articles and issues are published.



Open for submissions until December 2027.

Covering: JGR-Atmospheres, JGR-Biogeosciences, JAMES, GRL, Global Biogeochemical Cycles, and Earth's Future



BBURNED

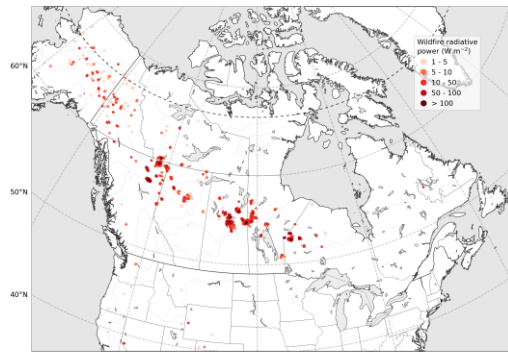
**Biomass Burning Uncertainty:
ReactionNs, Emissions and Dynamics**

<https://www2.acom.ucar.edu/bburned>

Thank you for your attention!

Fire emissions and smoke activities in the Copernicus Atmosphere Monitoring Service

GFASv1.2 Total Fire Radiative Power: 2025-06-01 - 2025-06-30



CAMS Total Fire Carbon Emissions (GFASv1.2) for Canada

