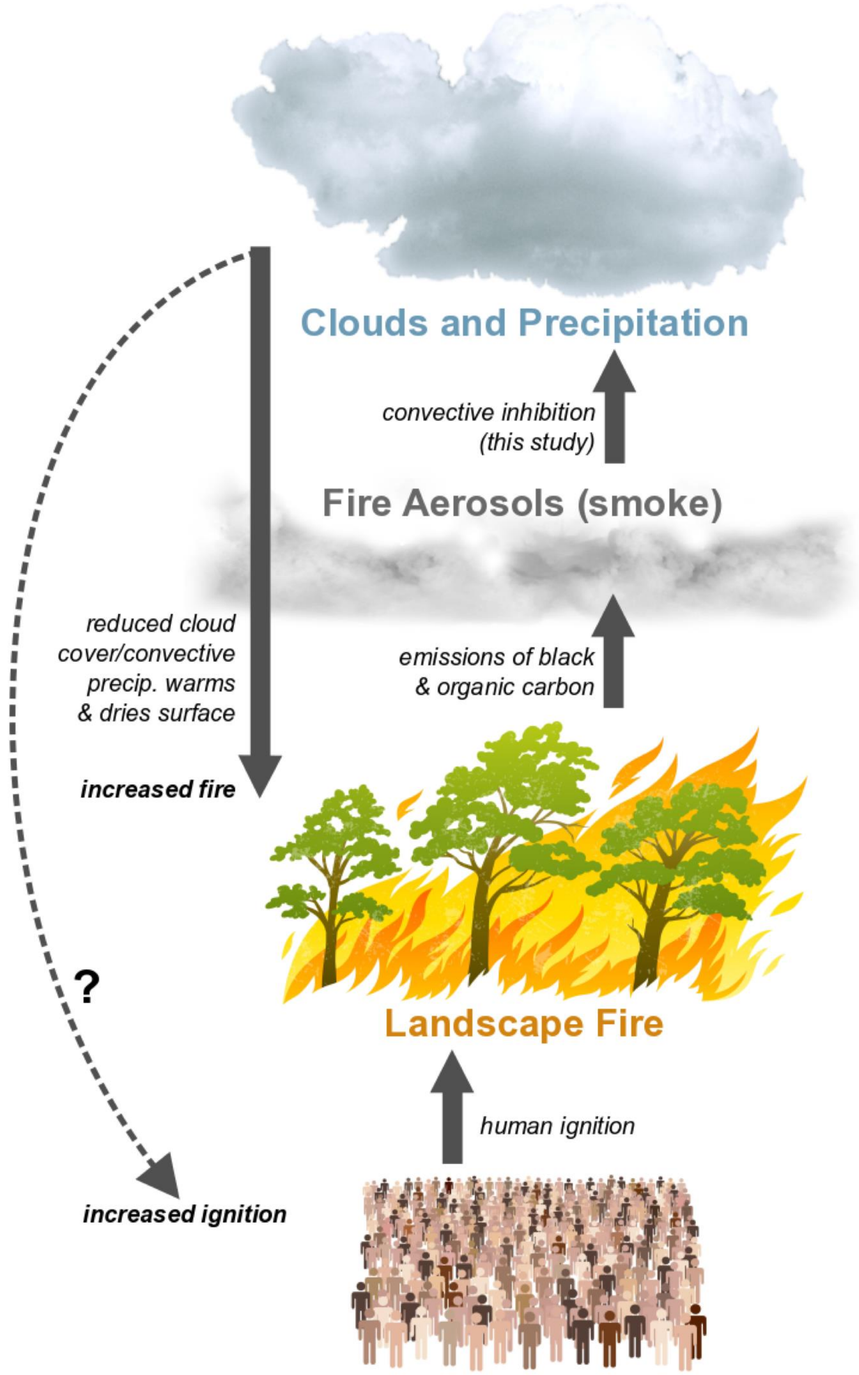
FIRES LIMIT RAINFALL IN SUB-SAHARAN AFRICA

Feedback loop with implications for regional/global climate, local hydrology and agricultural practices in ecologically vulnerable tropical regions.



AGU PUBLICATIONS

Geophysical Research Letters

RESEARCH LETTER
10.1002/2015GL065063

Key Points:
- Satellite observations of temporal dynamics of aerosol-cloud interactions

Human-caused fires limit convection in tropical Africa: First temporal observations and attribution

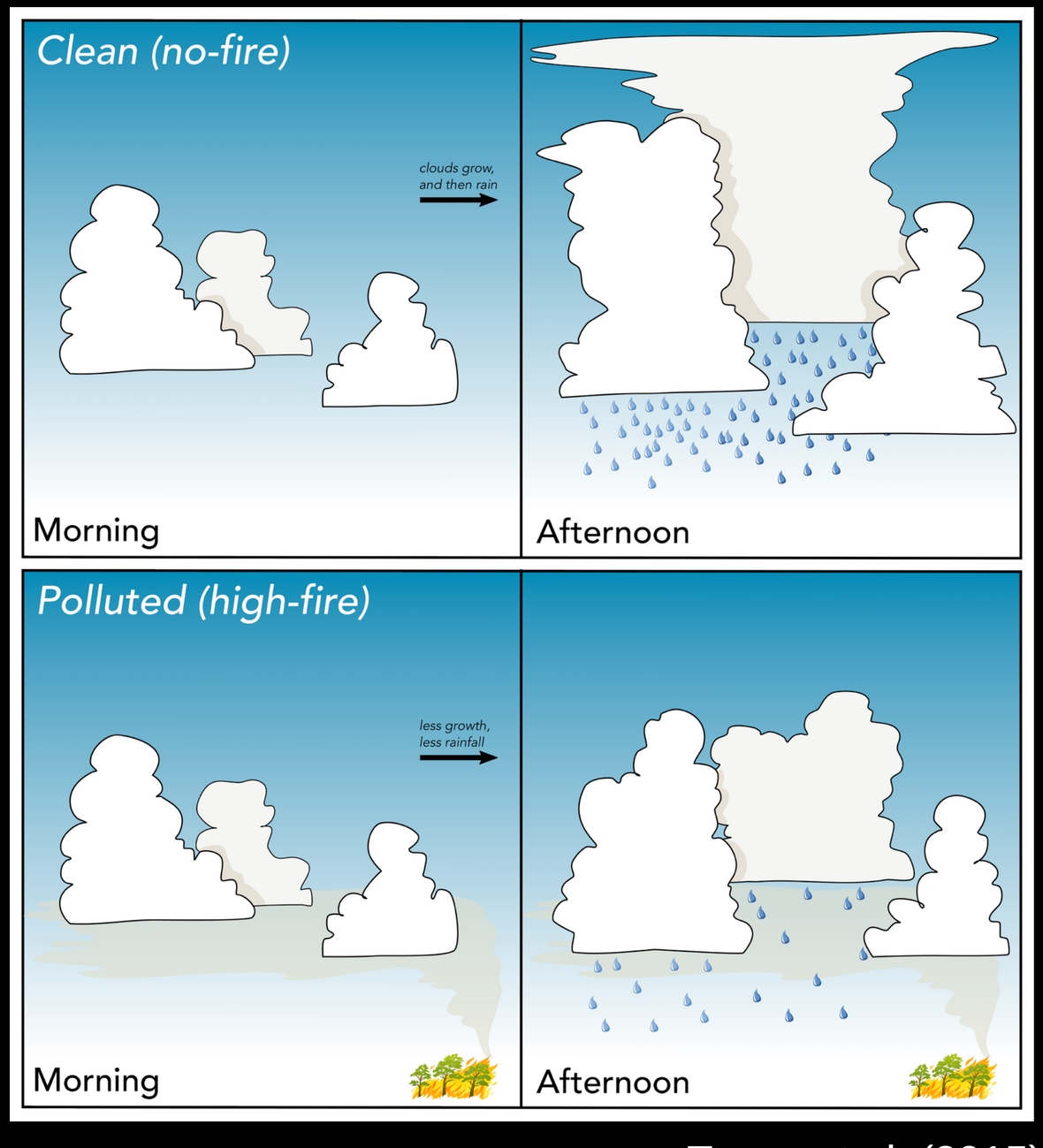
M. G. Tosca[1], D. J. Diner[1], M. J. Garay[1], and O. V. Kalashnikova[1]

[1] Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA

FIRES LIMIT RAINFALL IN SUB-SAHARAN AFRICA

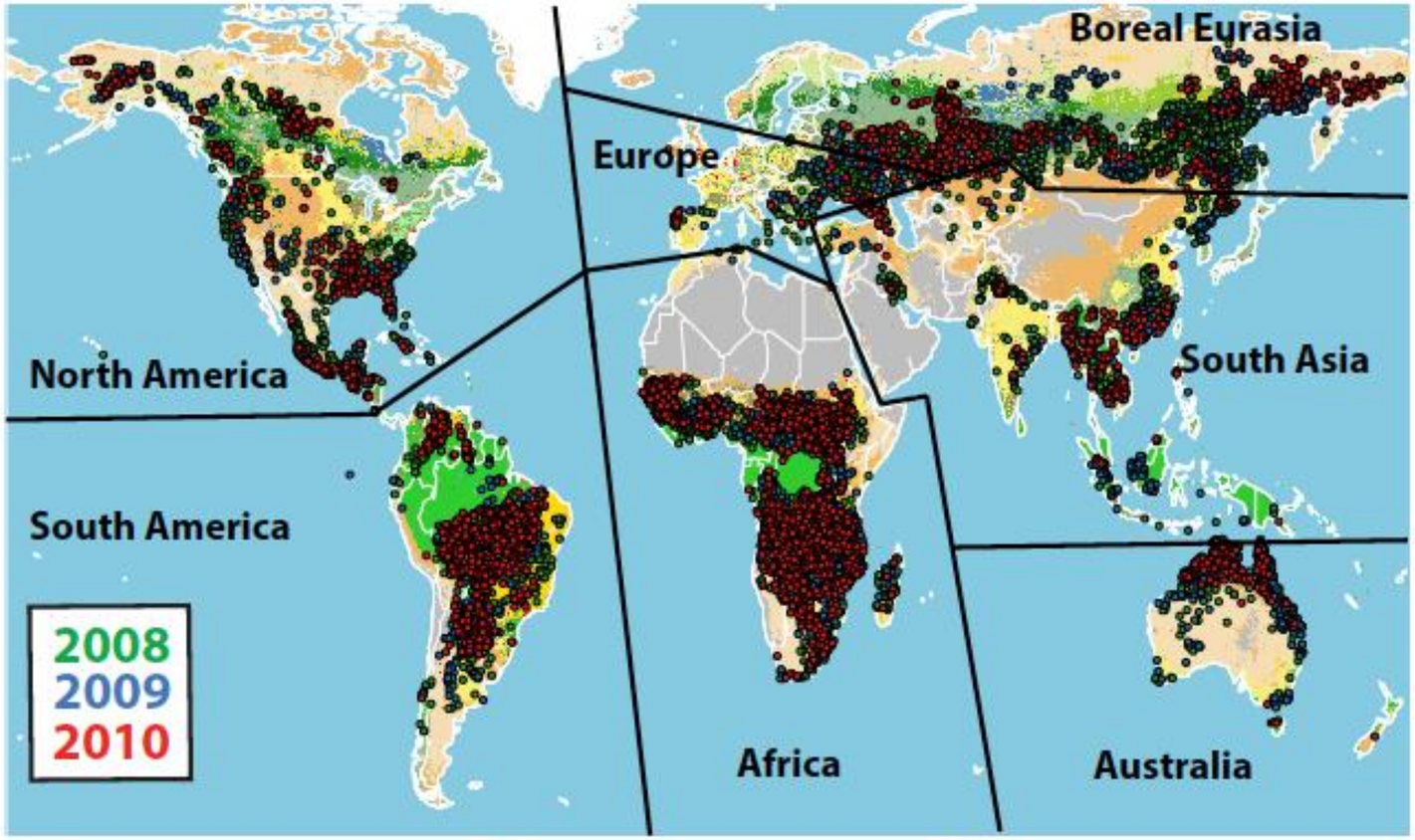
In clean conditions, as the Earth's surface warms throughout the day, air rises, clouds form, and rain commences

In polluted conditions, the Earth's surface warms less throughout the day, less clouds form, and less rain falls.



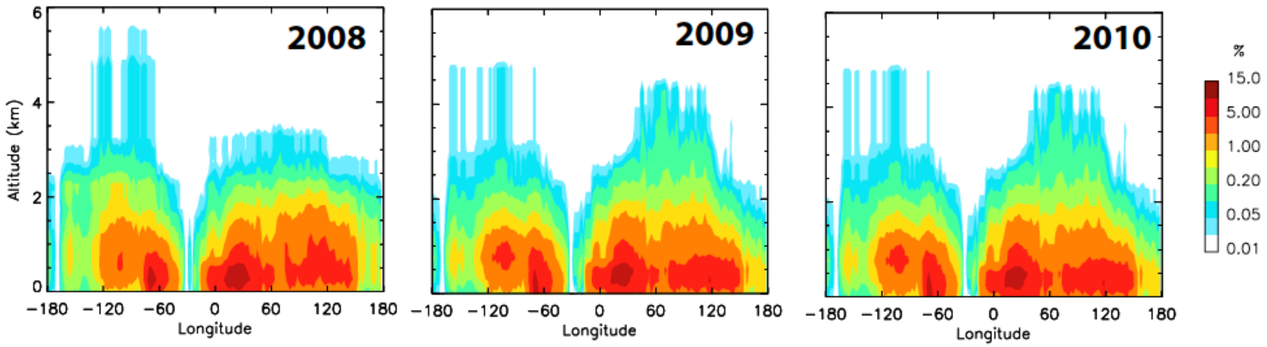
Tosca et al. (2015), GRL

WILDFIRE+CLIMATE GLOBAL IMPLICATIONS

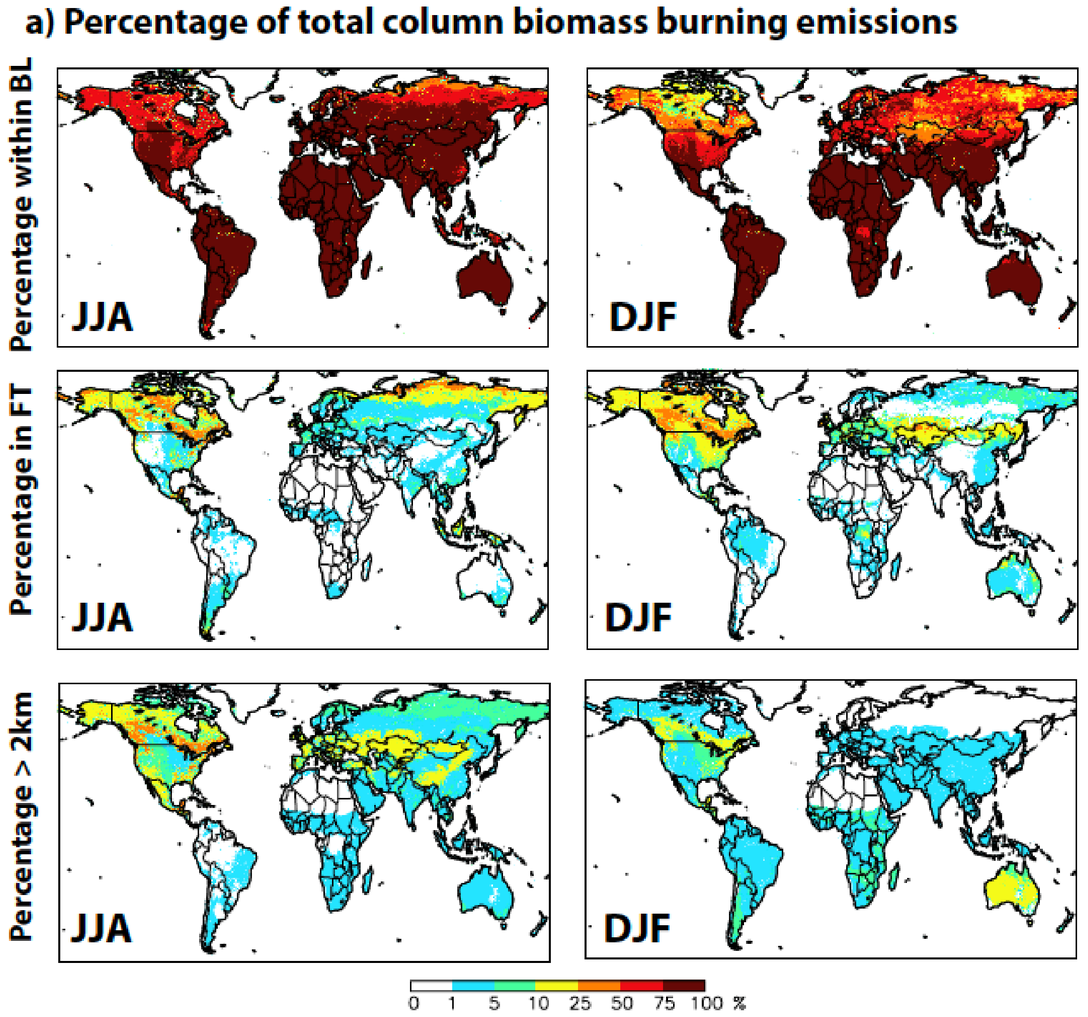


Martin, Kahn, & Tosca (2018), JGR

WILDFIRE+CLIMATE GLOBAL IMPLICATIONS

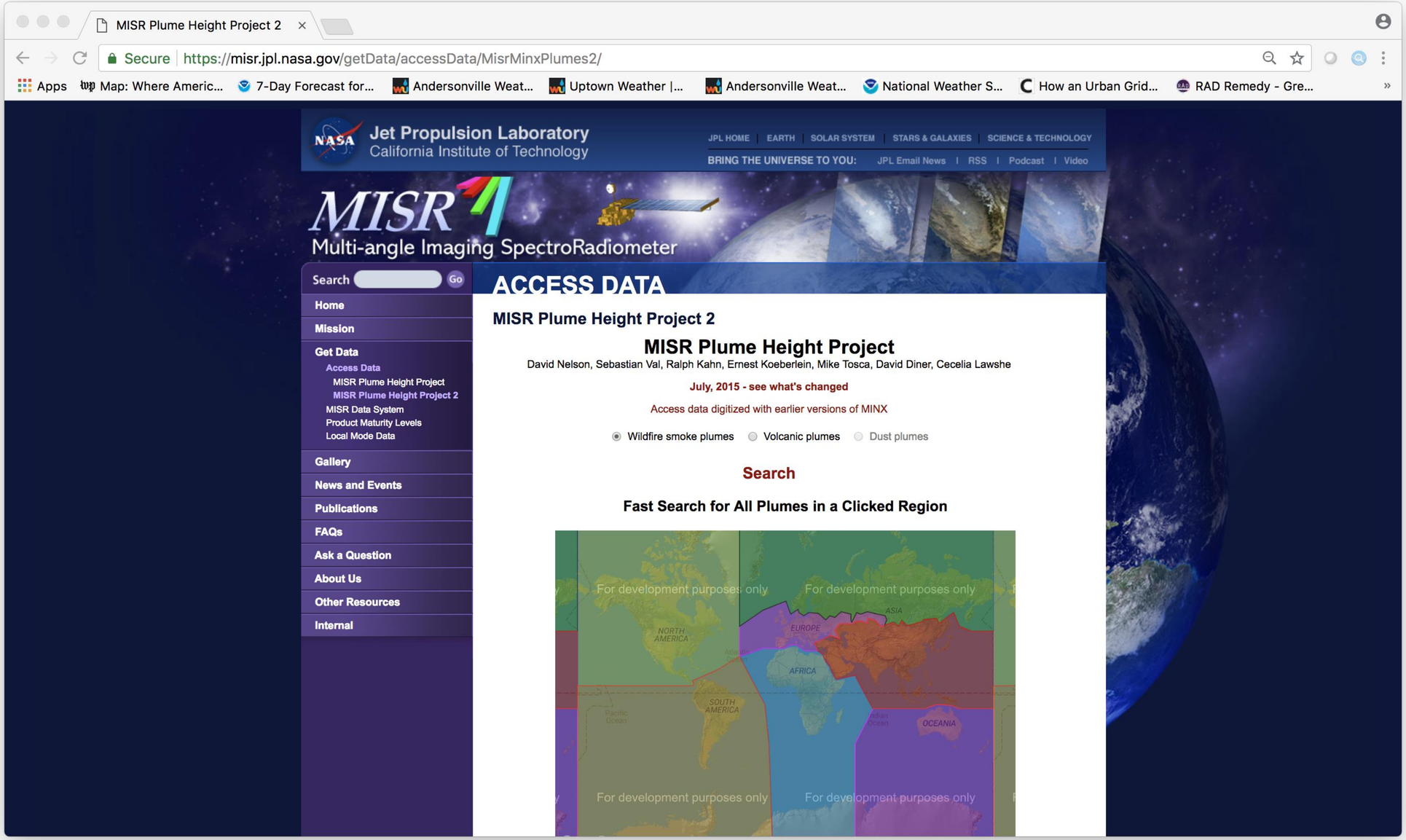


- *Vast* majority of plumes are in Africa (but, very small fires)
- Most fires on the planet occur between July and September (dominated by signal from southern Africa)
- Smoke from wildfire generally does not make it above 2km, with some notable exceptions
- Substantial fraction of plumes in high latitudes inject above the planetary boundary layer
- Most plumes in tropics/subtropics are low-altitude injection events
- Canada/Alaska seem to experience more high-injection plumes than Siberia?
- Implications for climate?



Martin, Kahn, & Tosca (2018), JGR

RADICAL COLLABORATIONS



VIEW

MODIFY KEY

COLOR DEFAULT

OPACITY DEFAULT

PLOT CONTROLS

PLOT TYPE MAP

DATA HEX PILLAR

DATA

FILTER 1 FILTER 2 FILTER 3 FILTER 4

WIND CORRECTED PLUME HEIGHT
0 12,461

TOTAL RADIATIVE POWER
0 1916

SINGLE SCATTERING ALBEDO
0 1

AEROSOL OPTICAL DEPTH
0 1

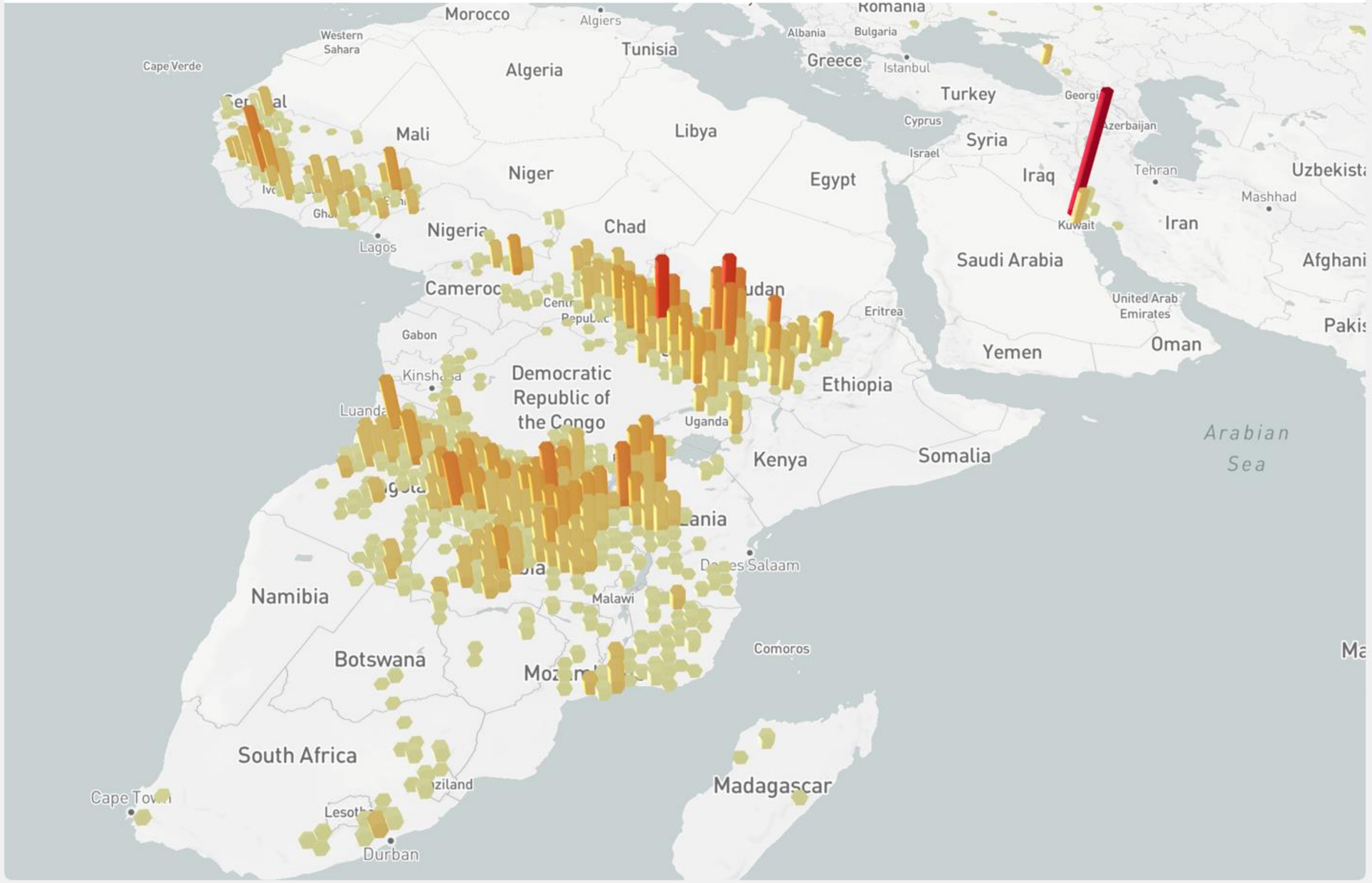
FIRE ORIGIN HEIGHT ABOVE SEA LEVEL
-161 5,170

AFRICA REGION

ALL BIOME

DATE RANGE 01 / 01 / 2006 12 / 31 / 2011

1 EDIT FILTER 1 **MAP** 3D FIRE RADIATIVE POWER AND WIND CORRECTED PLUME HEIGHT



2006 2007 2008 2009 2010 2011

DESIGN PROCESS vs. SCIENTIFIC METHOD

Understand

Empathize
Learn
Listen

Ideate

Explore
Visualize
Imagine

Prototype

Test
Observe
Propose

Refine

Polish
Implement
Deliver

Hypothesize

Question
Propose
Imagine
Explore

Experiment

Measure
Research
Analyze

Conclude/Theory

Publish
Discuss
Present