

Wildfires and wood stoves: woodsmoke toxicity and chemical characterization study in the north-western United States

www.nrfirescience.org/resource/23220

PM2.5 is the most monitored air pollutant for which EPA has set national ambient air quality standards (NAAQS). As such, it is the pollutant on which the Air Quality Index (AQI) is most often based. PM2.5 and PM10 are the only criteria pollutant whose composition, and therefore toxicity varies. The PM2.5 AQI does not account for...

Author(s): Odelle Hadley, Anthony Cutler, Ruth Schumaker, Robin Bond

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

Preliminary results from a wildfire detection system using deep learning on remote camera images

www.nrfirescience.org/resource/20702

Pioneering networks of cameras that can search for wildland fire signatures have been in development for some years (High Performance Wireless Research & Education Network-HPWREN cameras and the ALERT Wildfire camera). While these cameras have proven their worth in monitoring fires reported by other means, we have developed a...

Author(s): Kinshuk Govil, Morgan L. Welch, Timothy Ball, Carlton R. Pennypacker

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Estimation of local daily PM2.5 concentration during wildfire episodes: integrating MODIS AOD with multivariate linear mixed effect (LME) models

www.nrfirescience.org/resource/20826

Seasonal peaks of air pollution from wildfires are increasing in frequency and severity in the western provinces of Canada. During these episodes, populations are exposed to adverse short-term health effects due to elevated levels of fine particulate matter, which is the primary pollutant associated with smoke. The spatial...

Author(s): Mojgan Mirzaei, Stefania Bertazzon, Isabelle Couloigner, Babak Farjad, Roland Ngom

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

A statistical model for predicting PM2.5 for the western United States

www.nrfirescience.org/resource/20303

A new statistical model for predicting daily ground level fine scale particulate matter (PM2.5) concentrations at monitoring sites in the western United States was developed and tested operationally during the 2016 and 2017 wildfire seasons. The model is site-specific, using a multiple linear regression schema that relies on the...

Author(s): Amy Marsha, Narasimhan K. Larkin

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Forest fire smoke detection based on visual smoke root and diffusion model

www.nrfirescience.org/resource/19141

The damage caused by forest fire to forestry resources and economy is quite serious. As one of the most important characters of early forest fire, smoke is widely used as a signal of forest fire. In this

paper, we propose a novel forest fire smoke detection method based on computer vision and diffusion model. Unlike the video-based...

Author(s): Yu Gao, Penge Cheng

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Machine learning models accurately model ozone exposure during wildfire events

www.nrfirescience.org/resource/20492

Epidemiologists use prediction models to downscale (i.e., interpolate) air pollution exposure where monitoring data is insufficient. This study compares machine learning prediction models for ground-level ozone during wildfires, evaluating the predictive accuracy of ten algorithms on the daily 8-h maximum average ozone during a 2008...

Author(s): Gregory L. Watson, Donatello Telesca, Colleen Reid, Gabriele G. Pfister, Michael Jerrett

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Fire behaviour and smoke modelling: model improvement and measurement needs for next-generation smoke research and forecasting systems

www.nrfirescience.org/resource/19920

There is an urgent need for next-generation smoke research and forecasting (SRF) systems to meet the challenges of the growing air quality, health and safety concerns associated with wildland fire emissions. This review paper presents simulations and experiments of hypothetical prescribed burns with a suite of selected fire...

Author(s): Yongqiang Liu, Adam K. Kochanski, Kirk R. Baker, William E. Mell, Rodman Linn, Ronan Paugam, Jan Mandel, Aimé Fournier, Mary Ann Jenkins, Scott L. Goodrick, Gary Achtemeier, Fengjun Zhao, Roger D. Ottmar, Nancy H. F. French, Narasimhan K. Larkin, Timothy J. Brown, Andrew T. Hudak, Matthew B. Dickinson, Brian E. Potter, Craig B. Clements, Shawn P. Urbanski, Susan J. Prichard, Adam C. Watts, Derek McNamara

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Human impacts on 20th century fire dynamics and implications for global carbon and water trajectories

www.nrfirescience.org/resource/17317

Fire is a fundamental Earth system process and the primary ecosystem disturbance on the global scale. It affects carbon and water cycles through changing terrestrial ecosystems, and at the same time, is regulated by weather and climate, vegetation characteristics, and, importantly, human ignitions and suppression (i.e., the direct...

Author(s): Fang Li, David M. Lawrence, Ben Bond-Lamberty

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

The impact of US wildland fires on ozone and particulate matter: a comparison of measurements and CMAQ model predictions from 2008 to 2012

www.nrfirescience.org/resource/18246

Wildland fire emissions are routinely estimated in the US Environmental Protection Agency's National Emissions Inventory, specifically for fine particulate matter (PM_{2.5}) and precursors to ozone (O₃);

however, there is a large amount of uncertainty in this sector. We employ a brute-force zero-out sensitivity method to estimate the...

Author(s): Joseph L. Wilkins, George A. Pouliot, Kristen Foley, Wyatt Appel, Thomas E. Pierce

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Fire intensity impacts on post-fire temperate coniferous forest net primary productivity

www.nrfirescience.org/resource/17364

Fire is a dynamic ecological process in forests and impacts the carbon (C) cycle through direct combustion emissions, tree mortality, and by impairing the ability of surviving trees to sequester carbon. While studies on young trees have demonstrated that fire intensity is a determinant of post-fire net primary productivity, wildland...

Author(s): Aaron M. Sparks, Crystal A. Kolden, Alistair M. S. Smith, Luigi Boschetti, Daniel M. Johnson, Mark A. Cochrane

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

The weather conditions for desired smoke plumes at a FASMEE burn site

www.nrfirescience.org/resource/18365

Weather is an important factor that determines smoke development, which is essential information for planning smoke field measurements. This study identifies the synoptic systems that would favor to produce the desired smoke plumes for the Fire and Smoke Model Evaluation Experiment (FASMEE). Daysmoke and PB-Piedmont (PB-P) models...

Author(s): Yongqiang Liu, Scott L. Goodrick, Gary Achtemeier

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Joint Fire Science Program Smoke Science Plan, 2010–2016: Results and Impacts

www.nrfirescience.org/resource/17755

The Smoke Science Plan (SSP) was built upon personal interviews and an extensive web-based needs identification with scientists, fire managers, and air quality managers using online questionnaires (Riebau and Fox 2010a, 2010b). It is structured around four themes, which are conceptualized as complementary investigative areas to...

Author(s): Allen R. Riebau, Douglas G. Fox, Cindy Huber

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Development of a comprehensive plume dynamics and meteorology study plan for FASMEE - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17025

The goal of this project was to develop the Plume Dynamics and Meteorology portion of the Study Plan for the Fire and Smoke Model Evaluation Experiment (FASMEE). The Investigators participated in regular meetings with the other discipline leads, modeling leads, and the science leadership team; field trips to examine potential sites...

Author(s): Brian E. Potter, Craig B. Clements

Year Published: 2017

Type: Document

Technical Report or White Paper

Application of Daysmoke and PB-P Models in Phase I of the Fire and Smoke Model Evaluation Experiment - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17016

This proposed study was in response to the Joint Fire Sciences FA-FON0016-0004 Fire and Smoke Model Evaluation Experiment (FASMEE) Task 5 - Modeling leads. The purpose was to evaluate Daysmoke and PB-Piedmont (PB-P) models to provide information for the FASMEE Phase 2 design. Daysmoke is a local smoke plume dispersion and transport...

Author(s): Yongqiang Liu, Scott L. Goodrick, Gary Achtemeier

Year Published: 2017

Type: Document

Technical Report or White Paper

U.S. EPA Smoke Emissions, Chemistry, and Transport Modeling - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17028

Photochemical grid models such as the Community Multiscale Air Quality Model (CMAQ) are used to estimate local to continental scale O₃, PM, and haze for scientific and regulatory assessments. Field data from specific and well characterized wildland fires is critically important to improve wildland fire emissions estimation...

Author(s): Kirk R. Baker, Thomas E. Pierce

Year Published: 2017

Type: Document

Technical Report or White Paper

FIRETEC and WFDS modeling of fire behavior and smoke in support of FASMEE - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17022

The objective of FASMEE is to obtain measurements that can be used to evaluate and advance operational smoke models. Among the focus areas listed in the FON task statements are the modeling of fire growth, fire behavior, and plume development. In current operational models, the physical processes driving fire growth, fire behavior,...

Author(s): William E. Mell, Rodman Linn

Year Published: 2017

Type: Document

Technical Report or White Paper

Toward an integrated system for fire, smoke and air quality simulations

www.nrfirescience.org/resource/14375

In this study, WRF-Sfire is coupled with WRF-Chem to construct WRFSC, an integrated forecast system for wildfire behaviour and smoke prediction. WRF-Sfire directly predicts wildfire spread, plume and plume-top heights, providing comprehensive meteorology and fire emissions to chemical transport model WRF-Chem, eliminating the need...

Author(s): Adam K. Kochanski, Mary Ann Jenkins, Kara M. Yedinak, Jan Mandel, Jonathan Beezley, Brian K. Lamb

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Modeling study of the contribution of fire emissions on BC concentrations and deposition rates

www.nrfirescience.org/resource/15578

Regional air quality simulations were performed to evaluate the contributions of wildland fires to inter-annual variability of black carbon (BC) concentrations and to assess the contributions of wildfires vs. prescribed fires to BC concentrations and deposition rates to glacier areas and snow-covered surfaces in the western US....

Author(s): Serena H. Chung, Brian K. Lamb, Farren Herron-Thorpe, Rodrigo Gonzalez-Abraham, Vikram Ravi, Tsengel Nergui, Joseph K. Vaughan, Narasimhan K. Larkin, Tara Strand

Year Published: 2015

Type: Document

Technical Report or White Paper

Determination of the smoke-plume heights and their dynamics with ground-based scanning LIDAR

www.nrfirescience.org/resource/13611

Lidar-data processing techniques are analyzed, which allow determining smoke-plume heights and their dynamics and can be helpful for the improvement of smoke dispersion and air quality models. The data processing algorithms considered in the paper are based on the analysis of two alternative characteristics related to the smoke...

Author(s): Vladimir A. Kovalev, Alexander P. Petkov, Cyle E. Wold, Shawn P. Urbanski, Wei Min Hao

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Combustion efficiency and emission factors for wildfire-season fires in mixed conifer forests of the northern Rocky Mountains, US

www.nrfirescience.org/resource/13481

In the US, wildfires and prescribed burning present significant challenges to air regulatory agencies attempting to achieve and maintain compliance with air quality regulations. Fire emission factors (EF) are essential input for the emission models used to develop wildland fire emission inventories. Most previous studies quantifying...

Author(s): Shawn P. Urbanski

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Climate and vegetation influences on fire impacts in Alaskan boreal forest: implications for carbon and fire management

www.nrfirescience.org/resource/15688

Boreal forest fires are an important source of terrestrial carbon emissions, particularly during years of widespread wildfires. Most carbon emission models parameterize wildfire impacts and carbon flux to area burned by fires, therein making the assumption that fires consume a spatiotemporally homogeneous landscape composed of...

Author(s): Crystal A. Kolden, John T. Abatzoglou

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Emissions of air pollutants by Canadian wildfires from 2000 to 2004

www.nrfirescience.org/resource/14707

A wildfire emission model, based on the Canadian Forest Fire Behaviour Prediction System and the

Canadian weather forecast Global Environmental Multiscale model, was applied to forest fires that occurred in Canada between 2000 and 2004. Emissions of 21 chemical species and injection heights were calculated hourly for a regular 0.4...

Author(s): David Lavoue, Brian J. Stocks

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

The validity and utility of MODIS data for simple estimation of area burned and aerosols emitted by wildfire events

www.nrfirescience.org/resource/8371

Wildfire emissions are challenging to measure and model, but simple and realistic estimates can benefit multiple disciplines. We evaluate the potential of MODIS (Moderate Resolution Imaging Spectroradiometer) data to address this objective. A total of 11,004 fire pixels detected over 92 days were clustered into 242 discrete fire...

Author(s): Sarah B. Henderson, Charles Ichoku, Benjamin J. Burkholder, Michael Brauer, Peter L. Jackson

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

Filling in the blanks for prescribed fire in shrublands: developing information to support improved fire planning

www.nrfirescience.org/resource/11086

By collecting information on fuel loading, fuel consumption, fuel moisture, site conditions and fire weather on fires in a variety of shrubland types, researchers are developing a fuller knowledge of shrubland fire effects. Results are being integrated into the software package CONSUME, a user-friendly software tool for predicting...

Author(s): Jake Delwiche

Year Published: 2009

Type: Document

Research Brief or Fact Sheet

A MODIS direct broadcast algorithm for mapping wildfire burned area in the western United States

www.nrfirescience.org/resource/8191

Improved wildland fire emission inventory methods are needed to support air quality forecasting and guide the development of air shed management strategies. Air quality forecasting requires dynamic fire emission estimates that are generated in a timely manner to support real-time operations. In the regulatory and planning realm,...

Author(s): Shawn P. Urbanski, J. Meghan Salmon, Bryce L. Nordgren, Wei Min Hao

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

Simple algorithm to determine the near-edge smoke boundaries with scanning lidar

www.nrfirescience.org/resource/7957

We propose a modified algorithm for the gradient method to determine the near-edge smoke plume boundaries using backscatter signals of a scanning lidar. The running derivative of the ratio of the signal standard deviation (STD) to the accumulated sum of the STD is calculated, and the location of the global maximum of this function is...

Author(s): Vladimir A. Kovalev, Cyle E. Wold, Jenny O. Newton, Wei Min Hao
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Near real-time emissions of trace gases and aerosol particles from biomass burning based on MODIS direct broadcast data

www.nrfirescience.org/resource/10961

Biomass burning is an important source of many atmospheric trace gases and aerosol particles. Quantitative characterization of biomass burning emissions is critical for modeling atmospheric chemistry and assessing the impact of fires on air quality, tropospheric ozone chemistry, and global climate. However, advancement in...

Author(s): Wei Min Hao, J. Meghan Salmon, Bryce L. Nordgren, Shawn P. Urbanski
Year Published: 2005
Type: Document
Conference Proceedings

Automated forecasting of smoke dispersion and air quality using NASA terra and aqua satellite data (Task 5) - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11150

This document contains a description of the air quality forecasting system in operation at the Missoula Fire Science Laboratory. This air quality forecasting system has been steadily assimilating new techniques and algorithms as they have been developed over the past four years. Individual components as well as assemblies of...

Author(s): Wei Min Hao, Shawn P. Urbanski
Year Published: 2005
Type: Document
Technical Report or White Paper

Hydrocarbon and biomass fuel fire field tests

www.nrfirescience.org/resource/11021

Biomass and hydrocarbon fuel fires are two common sources of obscuring smoke which present significant operational challenges over a broad range of possible viewing wavelengths. This is especially true of very large fires where the primary smoke particles (approx. 0.1-0.3 um diameter) obscure vision by both scattering and absorption...

Author(s): Lawrence F. Radke, Dean A. Hegg, J. David Nance, Jaime H. Lyons, Krista K. Laursen, R. J. Ferek, Peter V. Hobbs, Raymond E. Weiss
Year Published: 1990
Type: Document
Conference Proceedings