

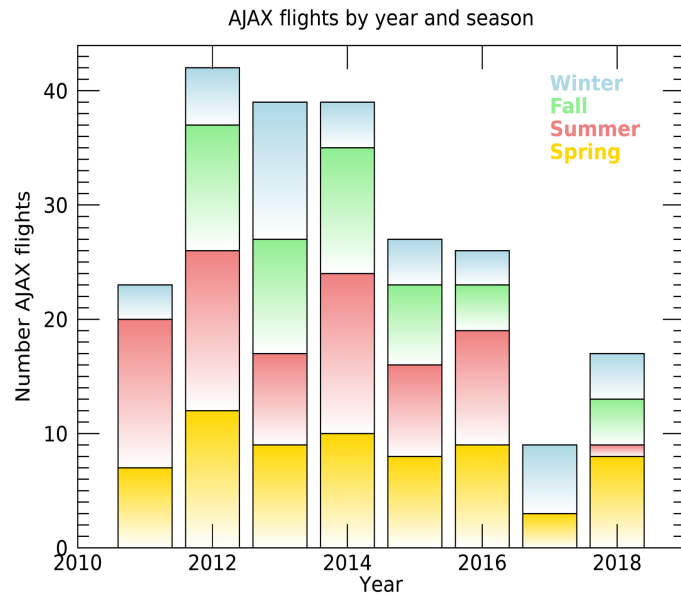
# The unusual case of AJAX: Archiving a multi-year, multi- objective, multi-instrument data set

NASA ARC: **Emma Yates** (BAERI), Laura Iraci,

ASDC/ NASA LaRC: Kasey Phillips, Megan Buzanowicz, Nitin Arora,  
Nathan Jester, Susan Haberer, Gabriel Mojica,

ADMG: Deborah Smith

# AJAX (Alpha Jet Atmospheric eXperiment)

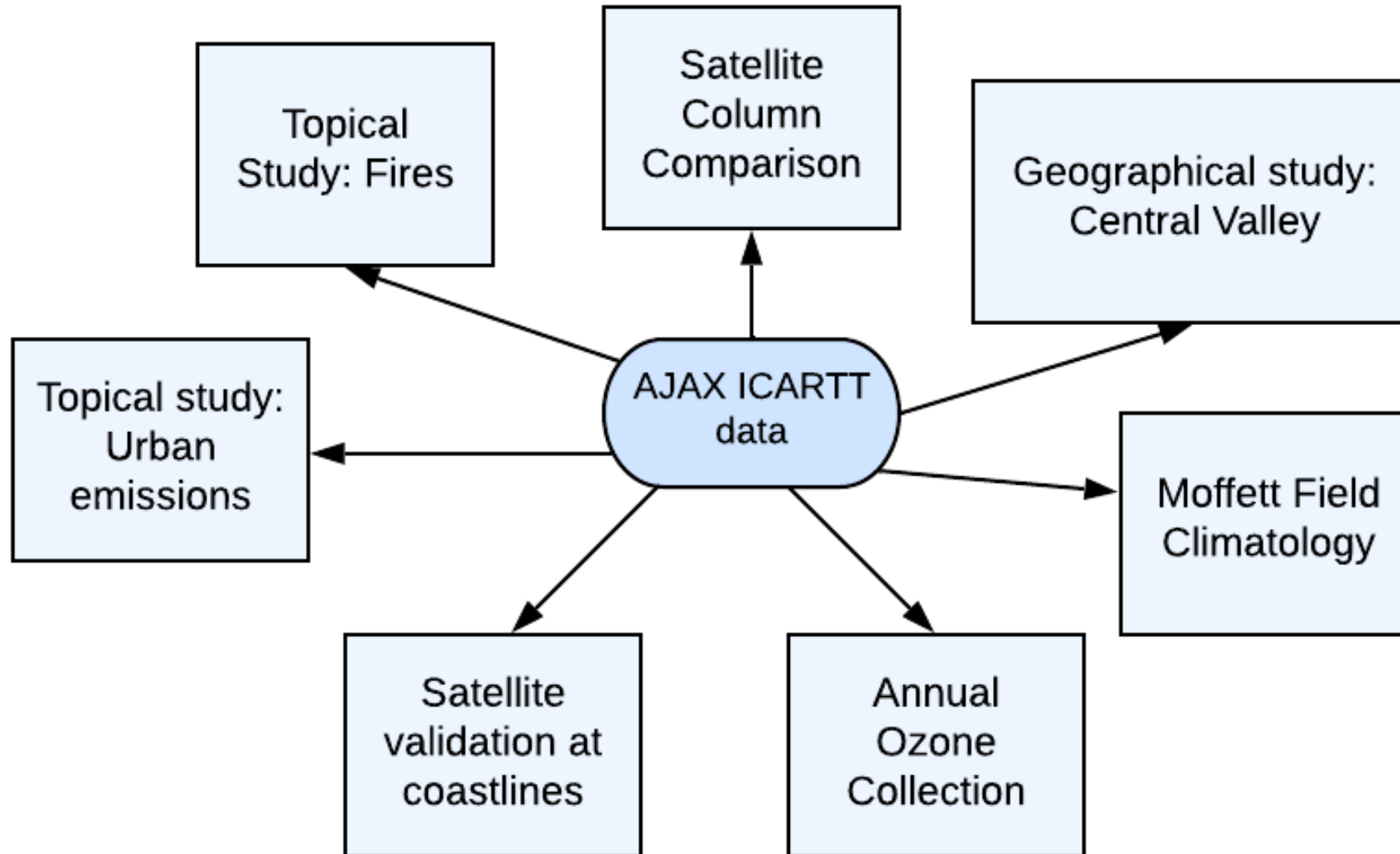


## The unusual case of AJAX:

- Year-round, long-term dataset
- Payload: 4 different instruments
  - O<sub>3</sub>, CH<sub>4</sub>, CO<sub>2</sub> and H<sub>2</sub>O, HCHO, MMS
- Variety of flight objectives:
  - Satellite Cal/Val (GOSAT, OCO-2, TROPOMI)
  - Air Quality transport & trends
  - Extreme events: Atmospheric rivers, wildfires, urban outflow
- Involved in a variety of NASA and non-NASA field campaigns



# Variety of AJAX data users



# Help! We need to archive ~1000 datafiles!

- Beginning 2021 we started working with ASDC/ADMG:
  - Kasey Phillips, Megan Buzanowicz, Nitin Arora, Nathan Jester, Susan Haberer, Gabriel Mojica, Deborah Smith
- Questions/challenges we had along the way:
  - How can we structure this big collection so different users can find different subsets?
  - Conversion of datafiles to ICARTT Format
  - Can we make a compendium of a subset of flights with a DOI?

# Flight catalog questions

## How to facilitate searching?

- date, flight number, species, flight objective

The screenshot shows the EarthData ASDC website interface. At the top, there is a search bar and navigation links for ABOUT, DATA, COMMUNITY, OUTREACH, and RESOURCES. The breadcrumb trail indicates the current location: Home / Browse Projects / AJAX / Flight Catalog. The main heading is "Alpha Jet Atmospheric eXperiment". Below this, there are tabs for "Description" and "Flight Catalog", with "Flight Catalog" being the active tab. A search input field is present, followed by a pagination control showing page 1 of 22. A note below the search field says: "To learn more about AJAX flight objectives, visit the [project home page](#)." Below this is a table with columns for Date, Flight Number, O3, CO2/CH4, CH2O, MMS, Analysis Docs (PDF), Flight Objectives, and All Files. The "Flight Objectives" column is circled in red. The table contains four rows of flight data.

Date	Flight Number	O3	CO2/CH4	CH2O	MMS	Analysis Docs (PDF)	Flight Objectives	All Files
2018-06-06	229	✓	✓	✓	✓		CentralValley, On/Off, Vpoccean, profile	📁
2018-05-30	228	✓	✓	✓	✓		CentralValley, On/Off, Profile, VPocean	📁
2018-05-09	227	✓	✓	✓	✓		CentralValley, On/Off, Profile, VPocean	📁
2018-05-03	226	✓	✓		✓		CentralValley, On/Off, Profile, VPocean	📁

# Grouping of data

## Alpha Jet Atmospheric eXperiment: Flight 198



### Flight Data Files

[Expand View](#)

[Collapse View](#)

You must be logged in to your [Earthdata account](#) to download data files.

#### Flight Analysis Document

- AJAX-Analysis\_20160812\_R2\_F198.pdf

#### AJAX\_CH2O\_1

- AJAX-CH2O\_ALPHA\_20160812\_R1\_F198.ict

#### AJAX\_CO2\_CH4\_1

- AJAX-CO2CH4\_ALPHA\_20160812\_R1\_F198.ict

#### AJAX\_MMS\_1

- AJAX-MMS\_ALPHA\_20160812\_R0\_F198.ict

#### AJAX\_O3\_1

- AJAX-O3\_ALPHA\_20160812\_R1\_F198.ict

# ICARTT format questions

- Use of other & special comments
- ICARTT Data Management Implementation Plan was very useful

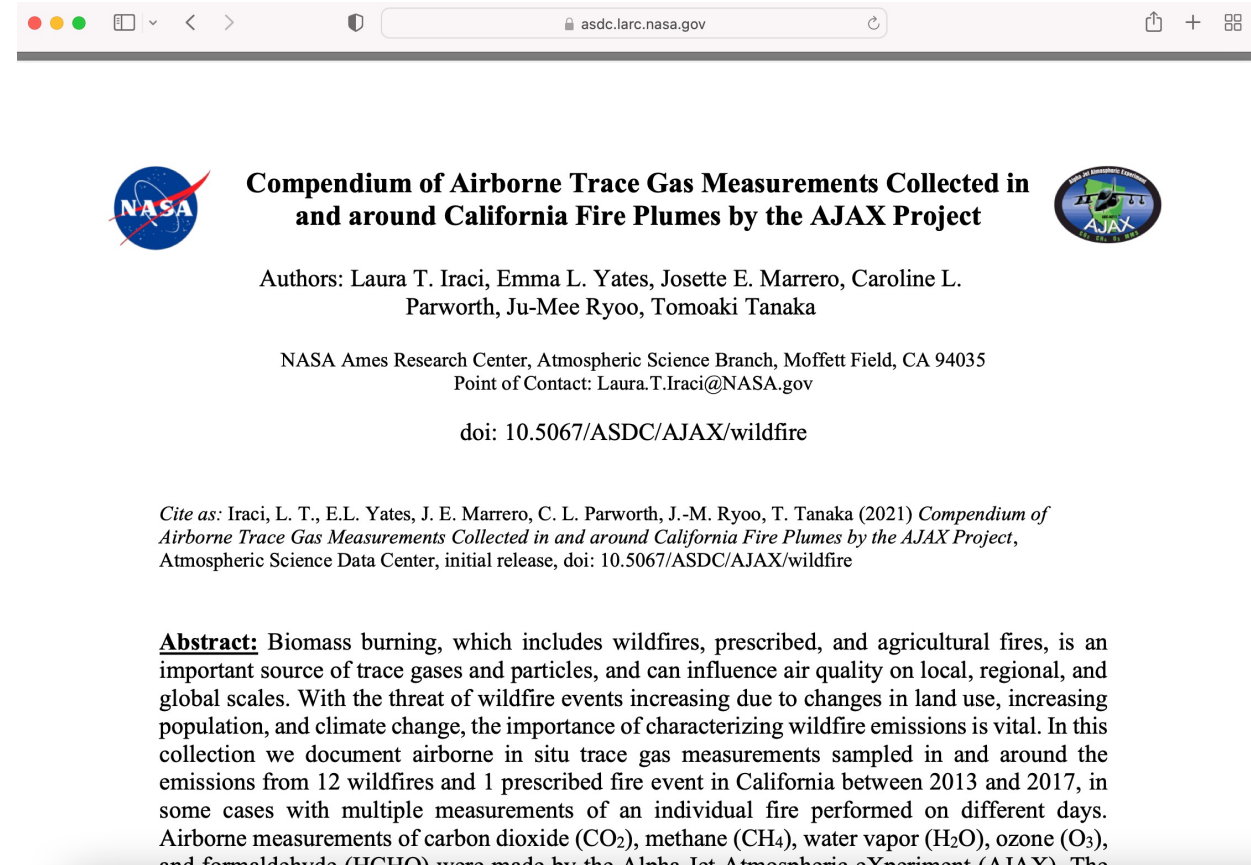
```

AJAX-03_ALPHA_20180606_R1_F229.ict
42, 1001, V02_2016
Iraci, Laura
NASA Ames Research Center
In Situ Airborne Ozone
Alpha Jet Atmospheric eXperiment (AJAX)
1,1
2018, 6, 6, 2021, 9, 20
0
Int_Start, seconds, Time_Start, number_of_seconds_from_00000.UTC
6
1, 1, 1, 1, 1, 1
-9999, -9999, -9999, -9999, -9999, -9999
Int_End, seconds, Time_Stop, number_of_seconds_from_00000.UTC
TIME, seconds, Time_Mid, Use_This_Time_For_All_Analyses number_of_seconds_elapsed_from_00000.UTC_until_the_average_of
Int_Start and Int_End
G_Lat, deg +N, Platform_Latitude_insitu_None, GPS Latitude
G_Lon, deg +E, Platform_Longitude_insitu_None, GPS Longitude
G_Alt, m, Platform_AltitudeEllipsoid_insitu_None, GPS WGS84 Altitude Reference
O3, ppbv, Gas_O3_InSitu_S_AVMR, ozone mixing ratio
1
SPECIAL_COMMENTS: Flight: F229| Flight Objectives: On/Off, VPocean, Profile, CentralValley| Flight Date: 6/6/2018
21
PI_CONTACT_INFO: NASA ARC, MS245-5, Moffett Field, CA, 94035 laura.t.iraci@nasa.gov, 650-604-0129
PLATFORM: H211 Alpha Jet
LOCATION: Mountain View, CA
ASSOCIATED_DATA: N/A
INSTRUMENT_INFO: 2B Technologies, model 205, S/N: 734, GPS from MMS
DATA_INFO: Latitude (deg), Longitude (deg), Altitude (GPS m), O3 parts per billion by volume (ppbv)
UNCERTAINTY: Ozone calibration uncertainty is +/-3 ppbv
ULOD_FLAG: -7777
ULOD_VALUE: N/A
LLOD_FLAG: -8888
LLOD_VALUE: N/A
DM_CONTACT_INFO: Emma Yates, NASA ARC; emma.l.yates@nasa.gov; 650-604-2237
PROJECT_INFO: Alpha Jet Atmospheric eXperiment (AJAX), https://www.nasa.gov/centers/ames/earthscience/programs/ajax
STIPULATIONS_ON_USE: All position and mixing ratio values provided are calculated to be correct at TIME(Time_Mid). Use
of other time indices will result in dislocation of the measurements during aircraft travel. For responsible scientific
use of the data sets provided in this archive, data users are strongly encouraged to carefully study the file headers
and associated documentation.
USERS OF THIS DATA ARE STRONGLY ENCOURAGED TO CONTACT THE EXPERIMENTERS, AND ANY PRESENTATION OR PUBLICATION OF THE DATA
CONTAINED IN THIS FILE SHOULD ACKNOWLEDGE THE NASA AMES RESEARCH CENTER, AJAX PROJECT. Users are expected to abide by
the AJAX Data Policy and offer co-authorship to relevant instrument PIs when appropriate.
OTHER_COMMENTS: Calibration factors applied: S = 0.950000 Z = 0.810000
Users should only consider Time_Mid when interpreting these measurements.
REVISION: R1
R1: Final data
R0: Preliminary data
Int_Start, Int_End, TIME, G_Lat, G_Lon, G_Alt, O3
69860.0, 69868.0, 69864.0, -9999.0000, -9999.0000, -9999.0000, 27.5000
69870.0, 69878.0, 69874.0, -9999.0000, -9999.0000, -9999.0000, 28.5450
69880.0, 69888.0, 69884.0, -9999.0000, -9999.0000, -9999.0000, 28.5640
69890.0, 69898.0, 69894.0, -9999.0000, -9999.0000, -9999.0000, 29.8180
69900.0, 69908.0, 69904.0, -9999.0000, -9999.0000, -9999.0000, 31.5090
69910.0, 69918.0, 69914.0, -9999.0000, -9999.0000, -9999.0000, 31.4140
69920.0, 69928.0, 69924.0, -9999.0000, -9999.0000, -9999.0000, 32.9150
```

# Special compendium

## AJAX wildfire data set:

- [DOI: 10.5067/ASDC/AJAX/Wildfire](https://doi.org/10.5067/ASDC/AJAX/Wildfire)

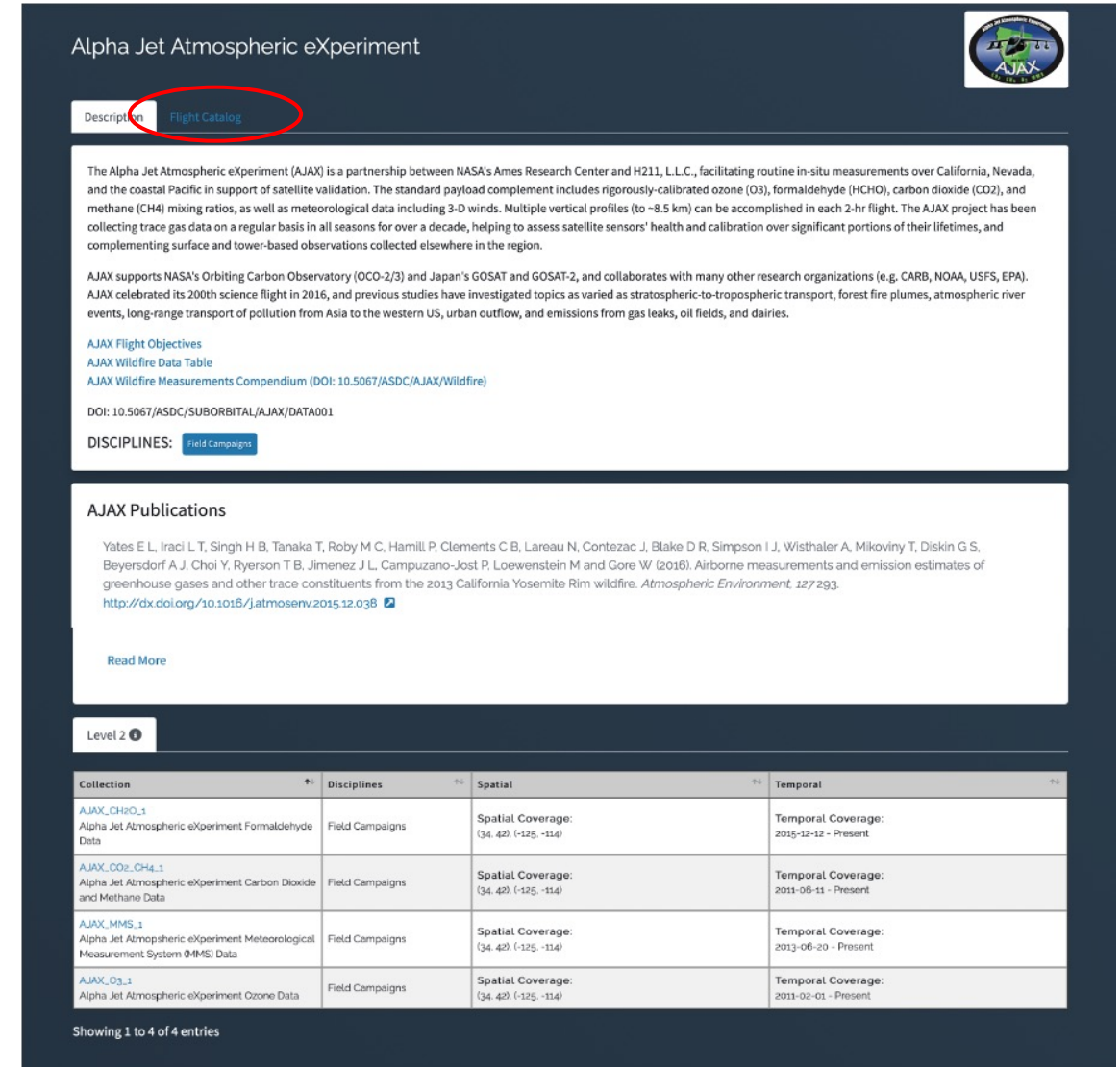


The screenshot shows a web browser window with the URL [asdc.larc.nasa.gov](https://asdc.larc.nasa.gov). The page content includes the NASA logo, the title "Compendium of Airborne Trace Gas Measurements Collected in and around California Fire Plumes by the AJAX Project", and the AJAX Project logo. The authors listed are Laura T. Iraci, Emma L. Yates, Josette E. Marrero, Caroline L. Parworth, Ju-Mee Ryoo, and Tomoaki Tanaka. The contact information is NASA Ames Research Center, Atmospheric Science Branch, Moffett Field, CA 94035, with a point of contact email at [Laura.T.Iraci@NASA.gov](mailto:Laura.T.Iraci@NASA.gov). The DOI is [10.5067/ASDC/AJAX/wildfire](https://doi.org/10.5067/ASDC/AJAX/wildfire). A citation is provided: Iraci, L. T., E.L. Yates, J. E. Marrero, C. L. Parworth, J.-M. Ryoo, T. Tanaka (2021) *Compendium of Airborne Trace Gas Measurements Collected in and around California Fire Plumes by the AJAX Project*, Atmospheric Science Data Center, initial release, doi: 10.5067/ASDC/AJAX/wildfire. An abstract follows, describing biomass burning as a source of trace gases and particles, and detailing the collection of airborne in situ trace gas measurements from 12 wildfires and 1 prescribed fire event in California between 2013 and 2017. The abstract lists the gases measured: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), water vapor (H<sub>2</sub>O), ozone (O<sub>3</sub>), and formaldehyde (HCHO).



# ASDC AJAX landing page

- Includes links to:
  - “AJAX Flight Objectives”
  - Wildfire compendium
  - publications



Alpha Jet Atmospheric eXperiment

Description **Flight Catalog**

The Alpha Jet Atmospheric eXperiment (AJAX) is a partnership between NASA's Ames Research Center and H211, L.L.C., facilitating routine in-situ measurements over California, Nevada, and the coastal Pacific in support of satellite validation. The standard payload complement includes rigorously-calibrated ozone (O3), formaldehyde (HCHO), carbon dioxide (CO2), and methane (CH4) mixing ratios, as well as meteorological data including 3-D winds. Multiple vertical profiles (to ~8.5 km) can be accomplished in each 2-hr flight. The AJAX project has been collecting trace gas data on a regular basis in all seasons for over a decade, helping to assess satellite sensors' health and calibration over significant portions of their lifetimes, and complementing surface and tower-based observations collected elsewhere in the region.

AJAX supports NASA's Orbiting Carbon Observatory (OCO-2/3) and Japan's GOSAT and GOSAT-2, and collaborates with many other research organizations (e.g. CARB, NOAA, USFS, EPA). AJAX celebrated its 200th science flight in 2016, and previous studies have investigated topics as varied as stratospheric-to-tropospheric transport, forest fire plumes, atmospheric river events, long-range transport of pollution from Asia to the western US, urban outflow, and emissions from gas leaks, oil fields, and dairies.

[AJAX Flight Objectives](#)  
[AJAX Wildfire Data Table](#)  
[AJAX Wildfire Measurements Compendium \(DOI: 10.5067/ASDC/AJAX/Wildfire\)](#)

DOI: 10.5067/ASDC/SUBORBITAL/AJAX/DATA001

DISCIPLINES: [Field Campaigns](#)

### AJAX Publications

Yates E L, Iraci L T, Singh H B, Tanaka T, Roby M C, Hamill P, Clements C B, Lareau N, Cortezac J, Blake D R, Simpson I J, Wisthaler A, Mikoviny T, Diskin G S, Beyersdorf A J, Choi Y, Ryerson T B, Jimenez J L, Campuzano-Jost P, Loewenstein M and Gore W (2016). Airborne measurements and emission estimates of greenhouse gases and other trace constituents from the 2013 California Yosemite Rim wildfire. *Atmospheric Environment*. 127 293.  
<http://dx.doi.org/10.1016/j.atmosenv.2015.12.038>

[Read More](#)

Level 2

Collection	Disciplines	Spatial	Temporal
<a href="#">AJAX_CH2O_1</a> Alpha Jet Atmospheric eXperiment Formaldehyde Data	Field Campaigns	Spatial Coverage: {34, 42}, (-125, -114)	Temporal Coverage: 2015-12-12 - Present
<a href="#">AJAX_CO2_CH4_1</a> Alpha Jet Atmospheric eXperiment Carbon Dioxide and Methane Data	Field Campaigns	Spatial Coverage: {34, 42}, (-125, -114)	Temporal Coverage: 2011-09-11 - Present
<a href="#">AJAX_MMS_1</a> Alpha Jet Atmospheric eXperiment Meteorological Measurement System (MMS) Data	Field Campaigns	Spatial Coverage: {34, 42}, (-125, -114)	Temporal Coverage: 2013-06-20 - Present
<a href="#">AJAX_O3_1</a> Alpha Jet Atmospheric eXperiment Ozone Data	Field Campaigns	Spatial Coverage: {34, 42}, (-125, -114)	Temporal Coverage: 2011-02-01 - Present

Showing 1 to 4 of 4 entries

Search for collections or topics

Search Results (8,531 Collections)

Alpha Jet Atmospheric eXperiment Carbon Dioxide and Methane Data

Showing 20 of 194 matching granules

Sort View

Filter Granules Clear Filters

Granule Search

Granule ID(s)

Search Single or Multiple Granule IDs...

Temporal

Start

YYYY-MM-DD HH:mm:ss

End

YYYY-MM-DD HH:mm:ss

Recurring?

Day/Night

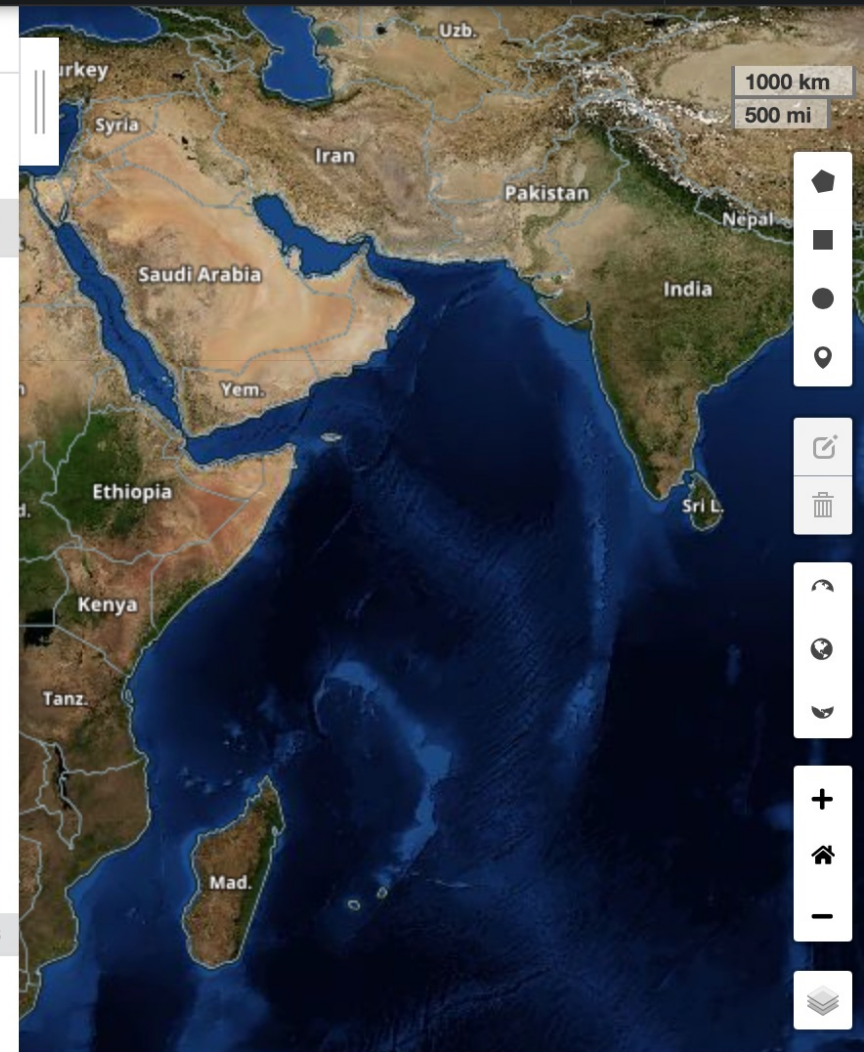
Find granules captured during the day, night or anytime.

AJAX-CO2CH4_ALPHA_20110622_R1_F23.ict	AJAX-CO2CH4_ALPHA_20110623_R1_F24.ict
<b>START</b> 2011-06-22 20:53:53	<b>START</b> 2011-06-23 20:39:57
<b>END</b> 2011-06-22 21:54:09	<b>END</b> 2011-06-23 22:18:30
AJAX-CO2CH4_ALPHA_20110625_R1_F25.ict	AJAX-CO2CH4_ALPHA_20110626_R1_F26.ict
<b>START</b> 2011-06-25 20:02:38	<b>START</b> 2011-06-26 20:29:46
<b>END</b> 2011-06-25 22:03:40	<b>END</b> 2011-06-26 22:36:47
AJAX-CO2CH4_ALPHA_20110720_R1	AJAX-CO2CH4_ALPHA_201 Search Time: 1.4s

Subscriptions

Add


Download All 194



## Download Status

This page will automatically update as your orders are processed. The Download Status page can be accessed later by visiting <https://search.earthdata.nasa.gov/downloads/7432564235> or the [Download Status and History](#) page.

### Alpha Jet Atmospheric eXperiment Carbon Dioxide and Methane Data ^

Status	Access Method	Granules
 Complete (100%)	Download	194 Granules

Download your data directly from the links below, or use the provided download script.

[Download Files](#) [Download Script](#)

**Linux:** You must first make the script an executable by running the line 'chmod 777 download.sh' from the command line. After that is complete, the file can be executed by typing './download.sh'. For a detailed walk through of this process, please reference this [How To guide](#).

**Windows:** The file can be executed within Windows by first installing a Unix-like command line utility such as [Cygwin](#). After installing Cygwin (or a similar utility), run the line 'chmod 777 download.sh' from the utility's command line, and then execute by typing './download.sh'.

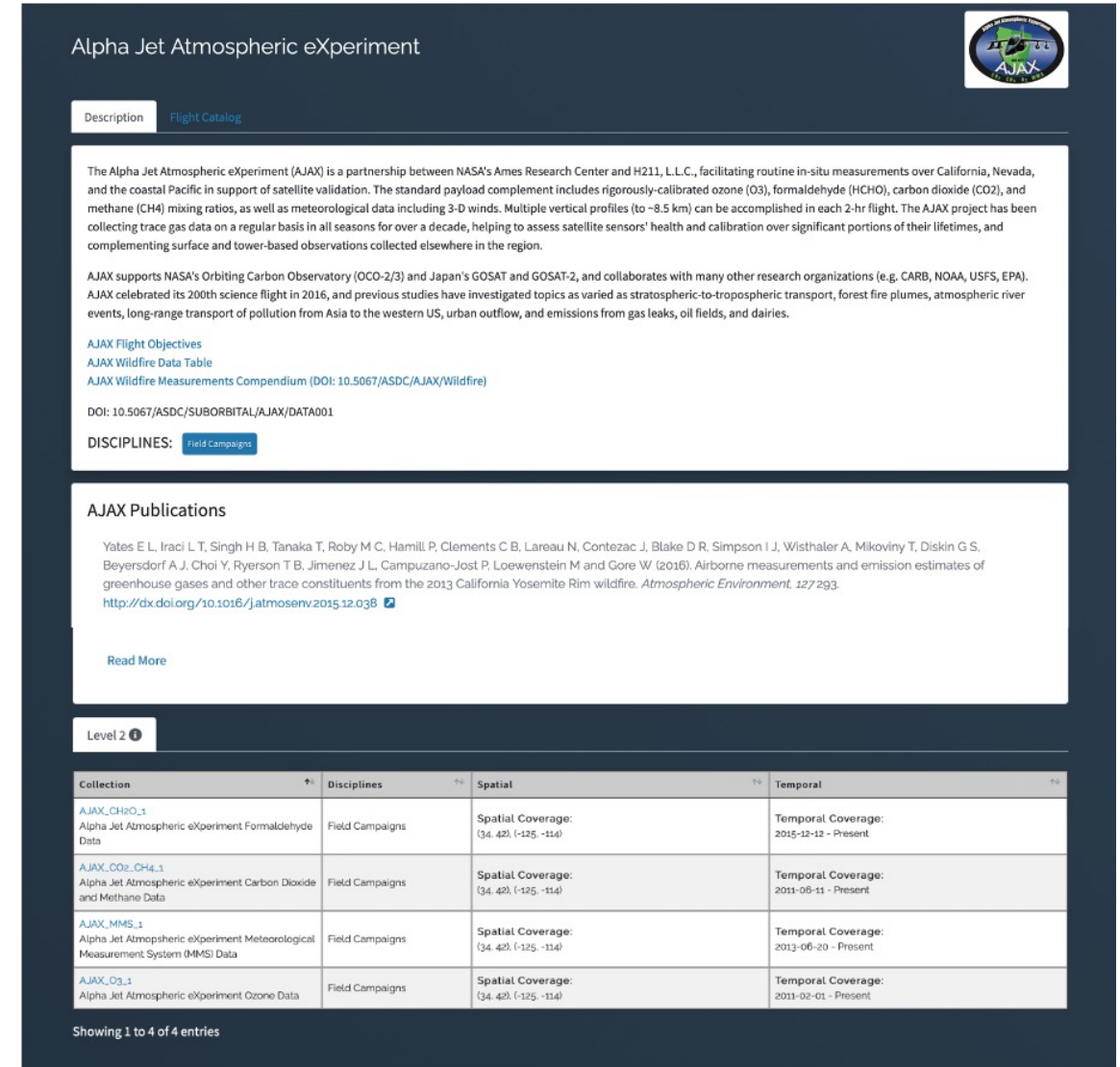
*Retrieved 194 files for 194 granules*

Copy Save Expand

```
#!/bin/bash  
  
GREP_OPTIONS=''
```

# ASDC AJAX landing page

- Includes links to:
  - “AJAX Flight Objectives”
  - Wildfire compendium
  - publications
- Level 2 dataset download:
  - Suggestion for improvement: one click for whole dataset
- Encouraging data use:
  - Homepage imagery & release announcement
  - ASDC web hits for AJAX collections
  - Flight catalog tutorial would be helpful



Alpha Jet Atmospheric eXperiment

Description [Flight Catalog](#)

The Alpha Jet Atmospheric eXperiment (AJAX) is a partnership between NASA's Ames Research Center and H211, L.L.C., facilitating routine in-situ measurements over California, Nevada, and the coastal Pacific in support of satellite validation. The standard payload complement includes rigorously-calibrated ozone (O3), formaldehyde (HCHO), carbon dioxide (CO2), and methane (CH4) mixing ratios, as well as meteorological data including 3-D winds. Multiple vertical profiles (to ~8.5 km) can be accomplished in each 2-hr flight. The AJAX project has been collecting trace gas data on a regular basis in all seasons for over a decade, helping to assess satellite sensors' health and calibration over significant portions of their lifetimes, and complementing surface and tower-based observations collected elsewhere in the region.

AJAX supports NASA's Orbiting Carbon Observatory (OCO-2/3) and Japan's GOSAT and GOSAT-2, and collaborates with many other research organizations (e.g. CARB, NOAA, USFS, EPA). AJAX celebrated its 200th science flight in 2016, and previous studies have investigated topics as varied as stratospheric-to-tropospheric transport, forest fire plumes, atmospheric river events, long-range transport of pollution from Asia to the western US, urban outflow, and emissions from gas leaks, oil fields, and dairies.

[AJAX Flight Objectives](#)  
[AJAX Wildfire Data Table](#)  
[AJAX Wildfire Measurements Compendium \(DOI: 10.5067/ASDC/AJAX/Wildfire\)](#)

DOI: 10.5067/ASDC/SUBORBITAL/AJAX/DATA001

DISCIPLINES: [Field Campaigns](#)

### AJAX Publications

Yates E L, Iraci L T, Singh H B, Tanaka T, Roby M C, Hamill P, Clements C B, Lareau N, Cortezac J, Blake D R, Simpson I J, Wisthaler A, Mikoviny T, Diskin G S, Beyersdorf A J, Choi Y, Ryerson T B, Jimenez J L, Campuzano-Jost P, Loewenstein M and Gore W (2016). Airborne measurements and emission estimates of greenhouse gases and other trace constituents from the 2013 California Yosemite Rim wildfire. *Atmospheric Environment*. 127 293.  
<http://dx.doi.org/10.1016/j.atmosenv.2015.12.038>

[Read More](#)

Level 2

Collection	Disciplines	Spatial	Temporal
<a href="#">AJAX_CH2O_1</a> Alpha Jet Atmospheric eXperiment Formaldehyde Data	Field Campaigns	Spatial Coverage: (34, 42), (-125, -114)	Temporal Coverage: 2015-12-12 - Present
<a href="#">AJAX_CO2_CH4_1</a> Alpha Jet Atmospheric eXperiment Carbon Dioxide and Methane Data	Field Campaigns	Spatial Coverage: (34, 42), (-125, -114)	Temporal Coverage: 2011-09-11 - Present
<a href="#">AJAX_MMS_1</a> Alpha Jet Atmospheric eXperiment Meteorological Measurement System (MMS) Data	Field Campaigns	Spatial Coverage: (34, 42), (-125, -114)	Temporal Coverage: 2013-06-20 - Present
<a href="#">AJAX_O3_1</a> Alpha Jet Atmospheric eXperiment Ozone Data	Field Campaigns	Spatial Coverage: (34, 42), (-125, -114)	Temporal Coverage: 2011-02-01 - Present

Showing 1 to 4 of 4 entries

# Summary

## **Which datasets have you produced?**

- AJAX

## **What worked well?**

- Flight catalog
- Use of special/other comments
- Special compendium

## **Suggestions:**

- One click for entire dataset
- Flight catalog tutorial

## **What DAAC have you worked with?**

- ASDC

## **What pain points did you find when working with the DAAC?**

- Grouping of data
- Time stamp requirements (ICARTT)

## **Have you tried to use in the cloud?**

- No