

Alpha Jet Atmospheric eXperiment (AJAX) produces database on trace gas and meteorological observations

Background: Earth scientists commonly use satellite- and ground-based measurement instruments to observe climate and air quality. These instruments measure trace gases and meteorology in a vertical column but do not capture their detailed distribution. Scientists at ARC utilized the Alpha Jet, a modified tactical strike fighter with NASA custom instrument payloads, to collect data at varying altitudes to address compelling new Earth science objectives. The Alpha Jet served as a unique platform to capture understudied atmospheric phenomena because of its rapid response and access to airspace nearby ARC.

Main findings: The Alpha Jet Atmospheric eXperiment ([AJAX](#)) conducted research flights from 2011 to 2018 to collect airborne measurements of trace gases along with weather and atmospheric parameters over California and Nevada. AJAX was a multi-objective program with a variety of sampling strategies taken across 229 flights. The AJAX team cataloged all data and made it available as open access on the [LaRC DAAC](#). Collected data include:

- 1) Source identification of wildfires, urban outflow, and climate emissions from oil, gas, and agriculture.
- 2) Boundary layer observations in California to better understand trace gas dynamics from mobile emissions.
- 3) Tropospheric profiling by combining instruments and techniques to improve model data and validate satellite remote sensing measurements.

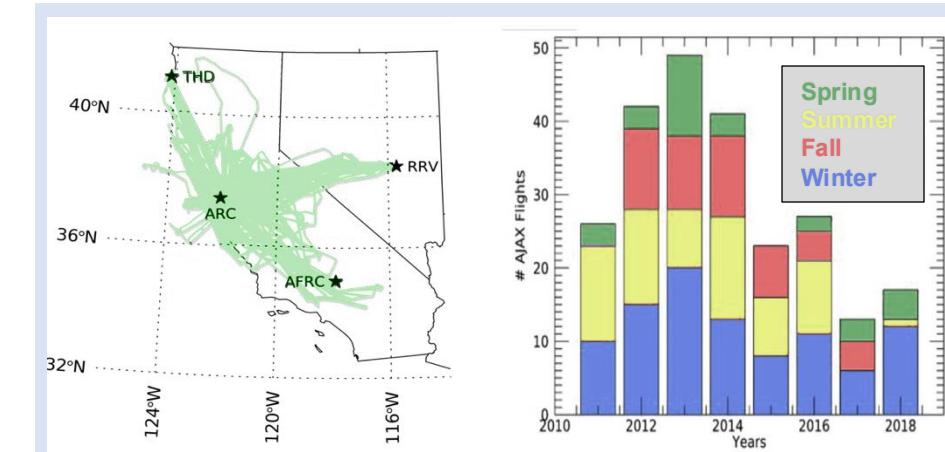
Impact: Publicly available data from AJAX enables NASA Earth Science research at governmental and academic institutions, as well as supports downstream products that improve emergency management and environmental policy decision making. AJAX has contributed to over [30 peer reviewed articles](#) so far.

Yates, E.L., Iraci, L.T., Kulawik, S.S., Ryoo, J-M., Marrero, J.E., Parworth, C.P., St. Clair, J.M., Hanisco, T.F., Bui, T.P.V., Chang, C.S., Dean-Day, J.M. An extensive database of airborne trace gas and meteorological observations from the Alpha Jet Atmospheric eXperiment (AJAX), *Earth Syst. Sci Data*, 15, 2375-2389, <https://doi.org/10.5194/essd-15-2375-2023>, 2023.



Image: Warren Gore

The Alpha Jet during a preflight inspection at ARC.



Map of AJAX flight tracks (left) and AJAX flights by year and season (right). (AFRC = Armstrong Flight Research Center, RRV = Railroad Valley, THD = Trinidad Head).