ATom: DC-8 Forward Camera Videos, 2016-2017

Get Data

Documentation Revision Date: 2022-03-07

Dataset Version: 1

Summary

This dataset contains images taken from the front of the NASA DC-8 aircraft during the first three ATom campaigns from 2016-2017. Images were taken with an Axis P1357 High Definition camera with a Theia TH138A wide-angle lens. These images were then stitched together at a 10-second frequency into an MP4 (*.mp4) video for each flight. The forward camera shows the visible atmosphere that DC-8 flew through, allowing the in situ measurements to be placed in the context of cloud fields, smoke and haze layers, and boundary layers.

There are 29 data files in media (*.mp4) format included in this dataset.

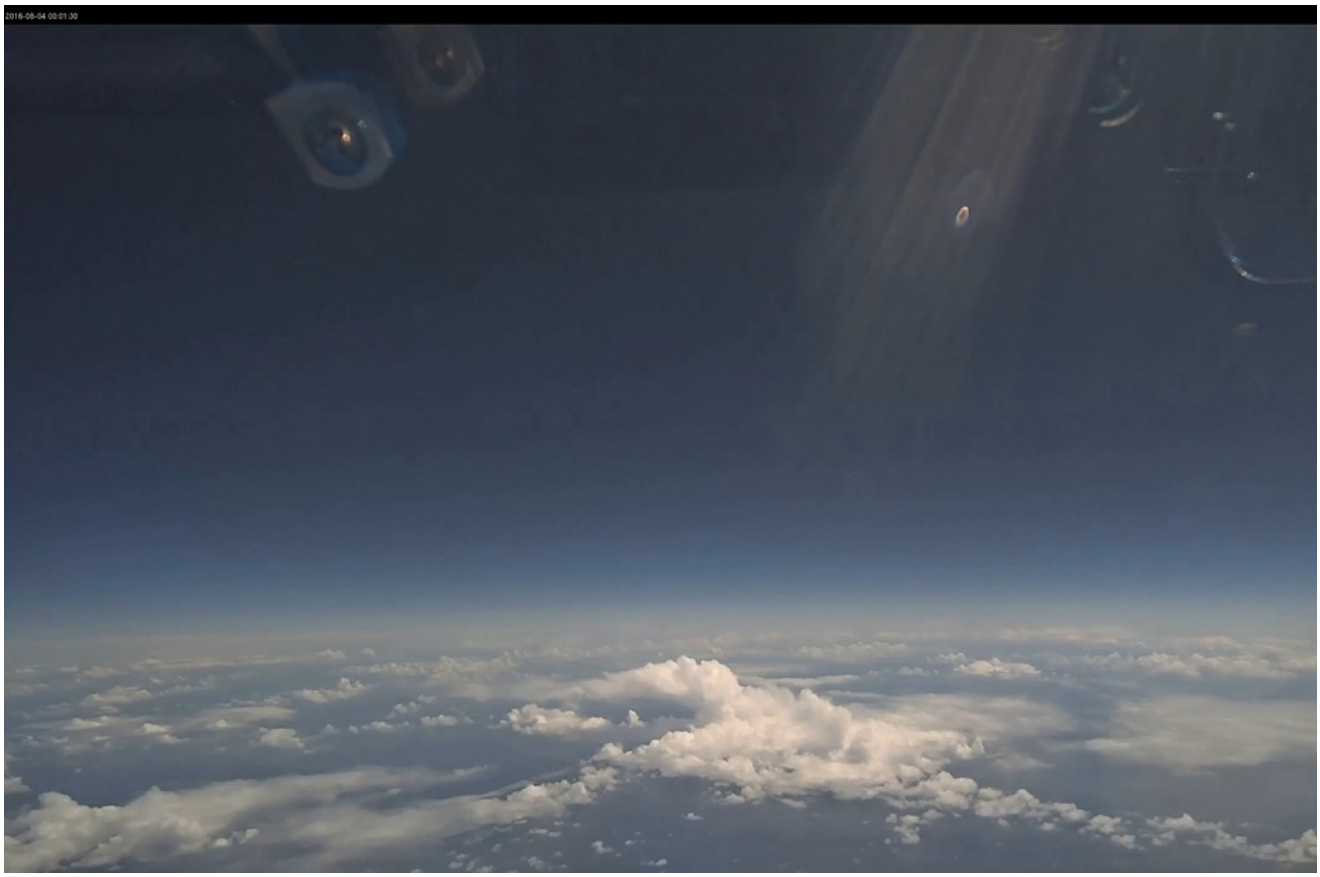

Figure 1. View from the front of the NASA DC-8 aircraft during the ATom-1 campaign.

Citation

Van Gilst, D., and M.J. Prather. 2022. ATom: DC-8 Forward Camera Videos, 2016-2017. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1938

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1. Dataset Overview

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Project: Atmospheric Tomography Mission

The Atmospheric Tomography Mission (ATom) was a NASA Earth Venture Suborbital-2 mission. It studied the impact of human-produced air pollution on greenhouse gases and on chemically reactive gases in the atmosphere. ATom deployed an extensive gas and aerosol payload on the NASA DC-8 aircraft for systematic, global-scale sampling of the atmosphere, profiling continuously from 0.2 to 12 km altitude. Flights occurred in each of four seasons over a 4-year period.

Related Datasets

Wofsy, S.C., S. Afshar, H.M. Allen, E.C. Apel, E.C. Asher, B. Barletta, et al. 2021. ATom: Merged Atmospheric Chemistry, Trace Gases, and Aerosols, Version 2. ORNL DAAC, Oak Ridge, Tennessee, USA.https://doi.org/10.3334/ORNLDAAC/1925

- Data from all ATom instruments and all four flight campaigns, including aircraft location and navigation data, merged to several different time bases.

Wofsy, S.C., and ATom Science Team. 2018. ATom: Aircraft Flight Track and Navigational Data. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1613

- Flightpath (location and altitude) data for each of the four campaigns provided in KML and CSV formats.

2. Data Characteristics

Spatial Coverage: Global. Flights circumnavigate the globe, primarily over the oceans.

Spatial Resolution: Point measurements

Temporal Coverage: Periodic flights occurred during the ATom-1, ATom-2, and ATom-3 campaigns.

Campaign	Date Range
ATom-1	July 29 - August 23, 2016
ATom-2	January 26 - February 21, 2017
ATom-3	September 28 - October 28, 2017
ATom-4	April 24 - May 21, 2018

Temporal Resolution: 10 seconds

Data File Information

There are 29 data files in media (*.mp4) format included in this dataset. Files are named FCAM_DC8_**YYYYMMDD**_R#.ict where **YYYYMMDD** is the start date (in UTC time) of the flight and # is the file version or revision number. Files contain images taken from the front of the DC-8 aircraft during ATom flights. The UTC date (YYYY-MM-DD) and time (HH:MM:SS) of each frame are logged in the upper-left of the image.

3. Application and Derivation

ATom builds the scientific foundation for mitigation of short-lived climate forcers, in particular, methane (CH_4), tropospheric ozone (O_3), and Black Carbon aerosols (BC).

ATom Science Questions

Tier 1

- What are chemical processes that control the short-lived climate forcing agents CH4, O3, and BC in the atmosphere? How is the chemical reactivity of the atmosphere on a global scale affected by anthropogenic emissions? How can we improve chemistry-climate modeling of these processes?

Tier 2

- Over large, remote regions, what are the distributions of BC and other aerosols important as short-lived climate forcers? What are the sources of new particles? How rapidly do aerosols grow to CCN-active sizes? How well are these processes represented in models?
- What type of variability and spatial gradients occurs over remote ocean regions for greenhouse gases (GHGs) and ozone-depleting substances (ODSs)? How do the variations among air parcels help identify anthropogenic influences on photochemical reactivity, validate satellite data for these gases, and refine knowledge of sources and sinks?

Significance

ATom delivers unique data and analysis to address the Science Mission Directorate's objectives of acquiring “datasets that identify and characterize important phenomena in the changing Earth system” and “measurements that address weaknesses in current Earth system models leading to improvement in modeling capabilities.” ATom will provide unprecedented challenges to the CCMs used as policy tools for climate change assessments, with comprehensive data on atmospheric chemical reactivity at global scales, and will work closely with modeling teams to translate ATom data to better, more reliable CCMs. ATom provides extraordinary validation data for remote sensing.

4. Quality Assessment

No quality information is provided.

5. Data Acquisition, Materials, and Methods

Project Overview

ATom makes global-scale measurements of the chemistry of the atmosphere using the NASA DC-8 aircraft. Flights span the Pacific and Atlantic Oceans, nearly pole-to-pole, in continuous profiling mode, covering remote regions that receive long-range inputs of pollution from expanding industrial economies. The payload has proven instruments for in situ measurements of reactive and long-lived gases, diagnostic chemical tracers, and aerosol size, number, and composition, plus spectrally resolved solar radiation and meteorological parameters.

Combining distributions of aerosols and reactive gases with long-lived greenhouse gases (GHGs) and ozone-depleting substances (ODSs) enables disentangling of the processes that regulate atmospheric chemistry: emissions, transport, cloud processes, and chemical transformations. ATom analyzes measurements using customized modeling tools to derive daily averaged chemical rates for key atmospheric processes and to critically evaluate CCMs. ATom also differentiates between hypotheses for the formation and growth of aerosols over the remote oceans.

Forward Camera

The forward camera shows the visible atmosphere that ATom was flying through, allowing the in situ measurements to be placed in the context of cloud fields, smoke and haze layers, and boundary layers. Each frame is synched to the standard 10-second merged measurements, and the location of each frame can be found on the merged files or the MDS files. These FCAM files enable those analyzing the ATom measurements to do a quick fly-through of each research flight to understand the surrounding mesoscale and micrometeorological environment as well as sunlight conditions.

The forward camera (FCAM) for ATom 1-3 was an Axis P1357 High Definition camera, with a Theia TH138A wide-angle lens. Initially recorded at 24 fps at a resolution of 2592x1944, the video is sampled every 10 seconds (ratio of 1:240). The UTC date (YYYY-MM-DD) and time (HH:MM:SS) of each frame are logged in white-on-black type in the upper left of the frame. The SS is always in 10s of seconds. The original video is recorded at 24 fps but at a 4K resolution of 3840x2160, and is sub-sampled in time as before. All video is encoded using the H264 – MPEG-4 AVC codec.

Additional information can be found in the ESPO FCAM ReadMe File.

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

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Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References