

Final Project Report
"ARM CLASIC CIRPAS Twin Otter Aerosol"
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submitted by
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Summary of Twin Otter – related work for CLASIC by NOAA aerosol group

The NOAA/ESRL/GMD aerosol group made three types of contributions related to airborne measurements of aerosol light scattering and absorption for the Cloud and Land Surface Interaction Campaign (CLASIC) in June 2007 on the Twin Otter research airplane operated by the Center for Interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS). GMD scientists served as the instrument mentor for the integrating nephelometer and particle soot absorption photometer (PSAP) on the Twin Otter during CLASIC, and were responsible for (1) instrument checks/comparisons; (2) instrument trouble shooting/repair; and (3) data quality control (QC) and submittal to the archive. Each of these is described in more detail below.

Instrument checks/comparisons

This procedure was designed to identify major instrument problems before the start of the CLASIC experiment and the related "Cumulus Humilis Aerosol Processing Study (CHAPS)" conducted near Oklahoma City at the same time. As the various instrument platforms arrived in Oklahoma prior to the start of the campaigns, the nephelometers and PSAPs on these platforms were run through a basic checkout and intercomparison procedure. A large (57L), stirred mixing chamber was used to provide well-mixed aerosols to instruments. Identical flow rates and lengths of conductive tubing were used and ambient aerosols were occasionally augmented by ammonium sulfate and kerosene soot when necessary. All instruments were compared against a NOAA mobile reference nephelometer and PSAP. The comparisons we performed showed that the measurements from the Twin Otter instruments were comparable with the NOAA reference instruments within the analytical uncertainties.

Instrument troubleshooting/repair

Early in the campaign the Twin Otter nephelometer malfunctioned. A NOAA nephelometer was temporarily installed in the Twin Otter to avoid data loss, while the malfunctioning nephelometer was shipped overnight to NOAA in Boulder, CO, for troubleshooting and repair. The nephelometer lamp was replaced and the instrument was thoroughly cleaned and recalibrated after water was found inside the sample volume. It

was determined that the water was likely condensate resulting from sampling high humidity air in the air-conditioned Twin Otter cabin prior to takeoff. Appropriate changes to the operation procedures were suggested to ameliorate this problem for both the nephelometer and PSAP on-board the Twin Otter.

Data QC and submittal to ARM archive

After each research flight, the raw Twin Otter nephelometer and PSAP and GPS data were converted into NOAA data format and reviewed at using NOAA's standard data visualization package. This daily check ensured that any problems with the instruments would be identified immediately (there were none, other than that described above) and preliminary comparisons could be done with other platforms. Following the campaign standard instrument corrections were applied and the data were edited to remove minor spikes (usually resulting from the stairstep profiles) and submitted to the ARM archive.