MobileDOAS

1. List of components

- ❏ Spectrometer
- ❏ Optical fiber
- ❏ Telescope
- ❏ GPS
- ❏ USB cable for spectrometer
- ❏ Mobile DOAS laptop
- ❏ External battery and laptop power supply (optional)
- ❏ Tape for mounting telescope (if needed)

2. Prior to use

- ❏ Fully charge the laptop

3a. Installing on a vehicle

- ❏ Lower window and mount telescope to the outside of the vehicle. We often use electric tape, wrapping it around window frame with the door open. Aim telescope as straight up as possible. Driver's side is preferred as it is less likely to be blocked by overhead trees while driving.
- ❏ Connect the fiber to the telescope and run it through an open window to the spectrometer inside the car.
- ❏ Connect spectrometer to USB port.
- ❏ Click magnetic GPS onto the roof and run cable in through open window. Connect to USB port.

3b. Installing on a helicopter

- ❏ Get permission from pilot to attach telescope to the outside of the helicopter. Typically, we use an 'airborne inlet' which is placed into an open window and includes a mount for an upward-looking DOAS telescope.
- ❏ Aim the telescope up as straight as possible. The helicopter rotor does not affect the measurements.
- ❏ Connect fiber to telescope (outside) and spectrometer (inside).
- ❏ Connect spectrometer to USB port.
- ❏ Tape GPS near window (inside) and connect to USB port.

4. Starting the measurements

- ❏ Boot the mobile DOAS laptop
- ❏ Open MobileDOAS software
- ❏ Click green arrow in top left corner to start a measurement
- ❏ Follow the on-screen instructions for collecting dark and sky references
- ❏ The measurement will start automatically. Red bars will appear indicating overhead SO2 column.
- ❏ Follow Gas Flight instructions

5. Ending the measurements

- ❏ Press the red square in the top left corner to stop the measurement.

Additional Info MobileDOAS

6. Calculating SO$_2$ emission rates

- ☐ Start MobileDOAS software
- ☐ Click *Analysis -> Calculate Flux from File*
- ☐ Click *Open Log Files* and select the *EvaluationLog* from the MobileDOAS output directory.
- ☐ Individual traverses need to be evaluated separately. Using the sliders on the bottom, select data that do not belong to current traverse. Click *Delete Selected*. (the data will not be deleted, just removed from consideration).
- ☐ Using the sliders on the left, select a maximum and minimum light intensity. Click *Filter* to remove outliers from consideration.
- ☐ Using the slider on the right, select a baseline SO$_2$ value (= zero SO$_2$).
- ☐ Enter an estimated *Wind Speed*.
- ☐ Enter an estimated *Wind Direction* or *Source Latitude* and *Longitude*. If coordinates are provided, estimates for wind direction will be calculated below. Choose one of these.
- ☐ Finally click *Flux =* to calculate the SO$_2$ emission rate for this traverse
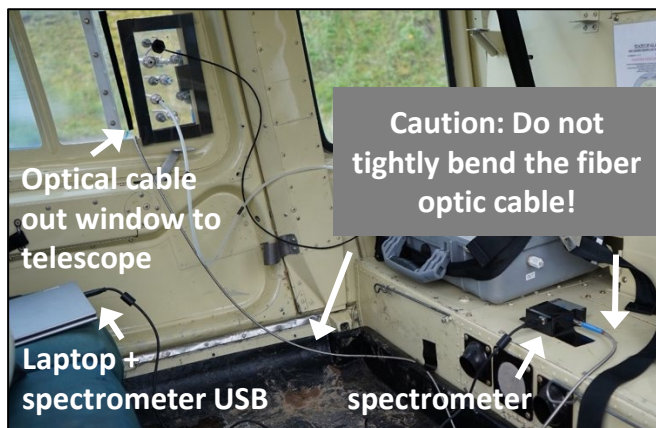- ☐ Repeat this process for each measured traverse.

7. Measurement strategies

- ➢ For multiple, long traverses, consider stopping and restarting measurements between traverses at least every hour such that new dark and sky references are recorded.
- ➢ During a measurement, click *View -> RealTime Route* to see a color-coded map view of your current measurement. This is helpful for determining the plume position.
- ➢ During a measurement, click *View -> Spectrum Fit* to see the DOAS fit of each spectrum as it comes in. If the modeled spectrum (light blue) does not capture the narrow-band features of the measurement (red), consider restarting measurements to collect a new sky reference.

8. Troubleshooting

- ❖ Problem: Software can't find GPS or spectrometer
- ➢ If USB ports are labeled, check if devices are plugged in correct ports
- ➢ For GPS, set correct COM port in Configuration -> Operation Setting -> GPS. Baud rate should be 4800.
- ❖ Problem: Software crashes during measurements
- ➢ Ensure USB connections are robust, possibly try a different cable

MobileDOAS helicopter setup

Optical cable out window to telescope

Caution: Do not tightly bend the fiber optic cable!

Laptop + spectrometer USB

spectrometer

Laptop w/ MobileDOAS software (required!)

Airborne Inlet

Cable taped down

MobileDOAS telescope