



Detecting methane plumes with the APEX imaging spectrometer

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The Airborne Prism EXperiment (APEX) is an imaging spectrometer primarily designed for environmental remote sensing of the land surface but also allows observing atmospheric trace gases. To test if APEX can be used to detect strong methane plumes, the instrument was flown over a coal mining area near Ibbenbüren (Germany). According to the European Point source emission inventory (E-PRTR), emissions from the ventilation shafts of these coal mines are the largest single source of methane in Germany.

We present the first measurements of methane ever taken by APEX making use of the absorption features of methane in the short-wave infrared spectral range. Our detection algorithm uses a matched filter to identify the presence of methane. The filter is tested in two spectral windows (1600-1700 nm and 2100-2500 nm) and for different spatial binning of pixels to improve the signal-to-noise. Using this approach, we could clearly identify two meandering methane plumes originating from the ventilation shafts of two coal mines (Bockradener Schacht and Theodor Schacht). The filter performed best for the spectral window from 1600-1700 nm with a binning of 10×10 pixels corresponding to a spatial resolution of about $35 \times 25 \text{ m}^2$

In conclusions, we could demonstrate that APEX is able to detect strong methane plumes. The results provide a basis for developing more sophisticated and quantitative methane retrievals.