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Application of Cross-Track Infrared Sounder (CrIS) Instrument for Remote Detection of Agricultural NH₃ Emissions over Netherlands

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Satellite observations have great potential for monitoring emissions and concentrations of atmospheric species. This is especially true for atmospheric ammonia (NH₃), which varies greatly in space and time and is difficult to measure in-situ due to its sticky nature. NH₃ measurements are important as NH₃ is a significant contributor to the production of secondary inorganic aerosols (PM_{2.5}) and can add excessive reactive nitrogen to the environment. In this study we demonstrate how satellite remote sensing observations can be used to monitor changes in NH₃ concentrations by evaluating timeseries of Cross-Track Infrared Sounder (CrIS) satellite data with in-situ NH₃ concentrations and meteorological parameters (i.e. soil temperature and soil moisture). We provide an example demonstrating the capability to monitor the annual springtime increase in atmospheric NH₃ concentrations in Netherlands, which is mainly associated with farming practices (e.g. manure spreading on fields in the springtime). We then combine these satellite observations of NH₃ with meteorological conditions, with the goal of developing a model to predict the timing of ammonia emissions based on past agricultural practices in the area (e.g. artificial fertilizer and manure spreading).