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Ph.D. DISSERTATION DEFENSE

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Date:	**Friday, April 28, 2023**
Time/Location:	**13:00 [EST] / X McLean, Room 106**
Title:	**Methods for retrieval of ozone amount, cloud and aerosol optical depth from ground-based irradiance measurements**

Chairperson: **Prof. Knut Stamnes, SIT - Dept. of Physics**

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ABSTRACT

This dissertation focuses on the retrieval of total ozone column amount and aerosol and cloud optical depth using atmospheric physics, machine learning, irradiance instruments, and radiative transfer simulations. After introducing the basics of atmospheric physics, radiative transfer, and machine learning, three studies are presented.

The first study analyzes total ozone column amounts over Antarctica using a ground-based instrument and satellite retrievals. The study compares data collected over a 12-year period by the Norwegian Institute for Air Research (NILU-UV) irradiance instrument with Ozone Monitoring Instrument (OMI) data from NASA's AURA satellite. The variations in the ozone layer and ozone hole are discussed and the differences between ground-based NILU-UV and satellite-based OMI retrievals are investigated.

The second study aims to provide a general algorithm for aerosol optical depth retrieval from irradiance measurements. The algorithm is demonstrated using measurements obtained by the NILU-UV instrument, assuming aerosol properties typical of coastal urban areas.

The third study discusses the use of a neural network-based machine learning algorithm to determine total ozone column amount, and cloud optical depth. A NILU-UV instrument deployed on the rooftop of the Department of Physics is used to demonstrate the algorithm. The study compares the retrieved ozone column amounts with those obtained from the OMI and shows that NILU-UV instruments are suitable for monitoring trends in ozone column amounts and cloud optical depth.

Overall, this dissertation provides insights into the retrieval of column ozone amount as well as aerosol and cloud optical depth using different methods and tools, which are useful for monitoring and understanding the Earth's atmosphere.