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# An imaging fourier transform spectrometer for remote nadir atmospheric measurements of Carbon Dioxide, Methane and the Oxygen A-band

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The Arctic multi-year ice cover is disappearing more rapidly than climate models estimate and the arctic climate is also changing. With declining ice cover, the Arctic Ocean will be subject to increased shipping traffic and exploration activity for natural resources with a concomitant increase in air pollution. Thus, there is a multifaceted need to monitor greenhouse gases in the polar region. This requires the development of techniques and instrumentation as well as modelling and validation of the measurements. Some of the more important atmospheric species that contribute significantly to climate change are methane (CH4), carbon dioxide ($CO_2$) and water vapour, although the water vapour in the atmosphere is controlled by the radiative impact of the other gases. The effect of the changes in these species is more prominent in the Arctic region. The Arctic is a sensitive world were small changes in greenhouse gas amounts can have amplified effects through their impact on surface albedo, humidity, ocean currents and temperature. Part of this is simply the result of the Stefan-Boltzmann law which implies that a larger temperature change is needed at lower temperatures to account for a given amount of change in energy input.
This paper will focus on the development of a demonstrator Imaging Fourier Transform Spectrometer (IFTS) to be flown on a high-altitude balloon to demonstrate the capacity to measure atmospheric mixing ratios of CH4 and $CO_2$ and the $O_2$ A-band in near space conditions. The spectrometer has two individual channels centered at 762 nm and 1650 nm. The Laboratory for Atmospheric Remote Sounding from Space (LARSS) at York University is developing the IFTS payload and ABB of Quebec City developed the core of the interferometer.
Funding is now in place to develop the demonstrator IFTS to show that images of methane and carbon dioxide can be collected from space. The characteristics of the instrument and plans for the balloon flight will be discussed.
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