

Development of the precise measurement of carbon dioxide in the atmosphere with optical spectrum analyzer

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Carbon dioxide is the greenhouse gas which is most significant effect on global warming. So it's necessary to observe transition of carbon dioxide precisely to understand global warming. Around 20 Fourier transform spectrometer (FTS), which is one of the precise measurement, have been operated in the world to observe column density of carbon dioxide in the atmosphere (XCO_2). However, FTS have a high cost and are unsuitable for portable use and emissions and absorption of carbon dioxide have locality. So it's necessary to observe carbon dioxide in atmosphere all over the world to understand emissions and absorption of carbon dioxide. Therefore we need the instrument which is compact, portable and can measure precisely. So the purpose is development of compact and precise measurement with optical spectrum analyzer (OSA). The instrument measures XCO_2 to incorporate sunlight in OSA through an optical fiber and to measure sunlight's absorption spectrum in the wavelength region of around 1600nm of carbon dioxide. Resolution of OSA is 0.02nm. We estimated the instrumental line shape (ILS) for OSA with laser and gas cell in the laboratory and include ILS in the result of Line-By-Line Radiative Transfer Model (LBLRTM). We show the measuring and analysis result and discuss ways to improve the accuracy.

Keywords: optical spectrum analyzer, carbon dioxide, precise measurement