Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

AAS001-P23 会場:コンベンションホール 時間: 5月27日17:15-18:45

赤外線望遠鏡による温室効果ガスの観測

Observation of greenhouse gases from ground-based infrared astronomical telescope

林 洋司[1*], 今須 良一[1], 宮田 隆志[2]

Yoji Hayashi[1*], Ryoichi Imasu[1], Takashi Miyata[2]

[1]東京大学気候システム研究センター, [2]東京大学天文学教育研究センター

[1]CCSR, The University of Tokyo, [2]Institute of Astronomy, Univ. of Tokyo

A network of ground-based observation of greenhouse gases is spread over the world and long-term measurements at those sites are utilized to understand spatial and temporal variations of these gases. However, observation is still lacking in South America and Africa. Institute of Astronomy, The University of Tokyo has conducted an international project called TAO (University of Tokyo Atacama Observatory) Project. In this project, a huge telescope (diameter of the main mirror is 6m) is being constructed at the observation site in Chile. We have a plan to estimate concentrations of greenhouse gases from the telescope data.
In this study, we propose a new data analysis method for estimating concentrations of greenhouse gases using an infrared astronomical telescope on the ground. As the first step of the analysis of these gases, we here develop a method to derive ozone concentrations.
Because the TAO is still under construction, we use another telescope called Subaru in Hawaii. The Subaru telescope, which has 9 observational instruments, is located at the top of Mt. Mauna Kea, Hawaii. In this study, we use mid-infrared grating spectrometer, called Cooled Mid Infrared Camera and Spectrometer (COMICS). This spectrometer provides spectroscopic capabilities from 7.5-13.5 um, which contains absorption bands of methane and ozone. In this analysis, we use standard stars, which have known temporally stable radiation. Ideal spectra data of the standard stars are archived by Cohen et al., 1999.
In this study, we developed a new method using two stars which have different zenith angles observed in a short interval. We analyze observed data, which is obtained on Jan. 13, 2006. From these data, we could obtain seven analyzable data sets. The result shows the difference of zenith angle is sensitive parameter in our analysis. Next, inputting meteorological data (altitude, pressure, temperature and water vapor) to radiative transfer model to compare with analyzed data, our analysis data almost corresponded to model output, especially in the absorption band of water vapor (11-13um). Finally, we derived column amount of ozone as 105 DU, while 200 DU is simultaneously observed by the satellite measurement.
Then, we found that it is possible to derive atmospheric absorption features by this method. For the next step of estimating concentrations of greenhouse gases, we should perform more accurate measurement.

キーワード:温室効果ガス,赤外線天体望遠鏡,すばる望遠鏡,中間赤外,標準星

Keywords: greenhouse gases, infrared astronomical telescope, Subaru telescope, mid-infrared, standard star