PROCEEDINGS OF SCIENCE

Fermi-LAT γ-ray study of the Chamaeleon molecular cloud complex using thermal dust optical depth obtained with *Planck*

Katsuhiro Hayashi* **on behalf of the *Fermi*-LAT collaboration**
Department of Physics, Nagoya University, Chikusa-ku, Nagoya, Aichi, 464-8601, Japan
E-mail: khayashi@a.phys.nagoya-u.ac.jp

The diffuse γ-ray emission from local molecular clouds is a powerful probe of local cosmic rays and interstellar gas. Here we report a γ-ray analysis for the Chamaeleon molecular-cloud complex using *Fermi* Large Area Telescope (LAT) data. The Chamaeleon molecular cloud is located in the solar neighborhood at a distance of about 150 pc. In previous *Fermi*-LAT analyses of the Chamaeleon region (Ackermann et al. 2012 and Planck Collaboration XXVIII, 2015), the γ-ray emitting interstellar gas was mainly decomposed into three components: atomic hydrogen, molecular hydrogen and some excess gas not traced properly by standard HI and CO surveys. In this analysis, we take a different approach and examine total column density ($N_{\rm H}$) models based on the dust optical depth at 353 GHz (τ_{353}) obtained with *Planck* observations. Recent studies of the relation between $N_{\rm H}$ and dust optical depth in local molecular clouds found a large deviation from a simple linear relation (e.g., Roy et al. 2013 and Planck Collaboration XXVIII, 2015), possibly due to evolutions of dust grains in cores of clouds. In fitting γ-ray data with several $N_{\rm H}$ models, including both linear and non-linear relations with τ_{353}, we found that a non-linear relation of τ_{353} proportional to the $\sim$1.3-th power of $N_{\rm H}$ gives the best fit, which may indicate dust evolutions in high density regions.

7th Fermi Symposium 2017
15-20 October 2017
Garmisch-Partenkirchen, Germany

*Speaker.