chemistry. We present line profiles and maps of H2O using data from two guaranteed-time key programs “Water In Star-forming regions with Herschel” and “Herschel observations of EXtra-Ordinary Sources”. We analyze the temperature and density structures using LTE and non-LTE methods. We also estimate turbulent and expansion velocities, and abundance of water in the inner and outer envelopes using the 1D radiative transfer code. Around high-mass protostars we find H2O abundances of ~10-8-10-9 for the outer envelope and ~10-4-10-5 for the inner envelope, and expansion and turbulent velocities range from 1.0 km s-1 to 2.0 km s-1. The abundances and kinematic parameters of the sources do not show clear trends with evolutionary indicators. The Herschel/HIFI mapping observations of H2O toward the Orion Bar PDR show that H2O emission peaks between the shielded dense gas and the radicals position, in agreement with the theoretical and the observational PDR structure. The derived H2O abundance is ~10-7 and peaks at the depth of AV ~8 mag from the ionization front. Together with the low ortho-to-para ratio of H2O (~1) presented by Choi et al. (2014), our results show that the chemistry of water in the Orion Bar is dominated by photodesorption and photodissociation.

관측자료

[구 AT-01] IGRINS : 1st Year Operation & Future Plan

Jae-Joon Lee (이재준), Hwihyun Kim (김휘현), Narae Hwange (황나래), Chan Park (박찬), Byeong-Gon Park (박병곤)
Korea Astronomy and Space Science Institute (한국천문연구원)

After successful commissioning observations in 2014, Immersion Grating Infrared Spectrograph (IGRINS) has been conducting its normal scientific operations on the 2.7m Harlan J. Smith telescope at the McDonald Observatory and has been producing high spectral resolution near-infrared spectroscopic data in excellent quality. We will present the current status of the instrument and its software packages, and highlight initial scientific results. In particular, we will discuss possibilities of having IGRINS on larger telescopes.

[구 AT-02] Photometric Transformation from RGB Bayer Filter System to Johnson-Cousins BVR Filter System

Woojin Park[1], Soojong Pak[1], Hyunjin Shim[2], Huynh Anh N. Le[1], Myungshin Im[3], Seunghyuk Chang[4], Joonkyu Yu[5]
[1]School of Space Research and Institute of Natural Sciences, Kyung Hee University, Yongin, Gyeonggi 446-701, Korea, [2]Department of Earth Science Education, Kyungpook National University, Buk-gu, Daegu 702-701, Korea,
[3]CEOU, Astronomy Program, Department of Physics & Astronomy, Seoul National University, Gwanak-gu, Seoul, Korea, [4]Center for Integrated Smart Sensors, Korea Advanced Institute of Science and Technology (KAIST), Gangnam-gu, Seoul 135-854, Korea, [5]Hwasangdae Observatory, Hongcheon-gun, Gangwon-do 250-862, Korea

The RGB Bayer filter system consists of a mosaic of R, G, and B filters on the grid of the photo sensors which typical commercial DSLR (Digital Single Lens Reflex) cameras and CCD cameras are equipped with. Lot of unique astronomical data obtained using an RGB Bayer filter system are available, including transient objects, e.g. supernovae, variable stars, and solar system bodies. The utilization of such data in scientific research requires that reliable photometric transformation methods are available between the systems. In this work, we develop a series of equations to convert the observed magnitudes in the RGB Bayer filter system (RB, GB, and BB) into the Johnson-Cousins BVR filter system (BJ, VJ, and RC). The new transformation equations derive the calculated magnitudes in the Johnson-Cousins filters (BJcal, VJcal, and RCcal) as functions of RGB magnitudes and colors. The mean differences between the transformed magnitudes and original magnitudes, i.e. the residuals, are (BJ - BJcal) = 0.064 mag, (VJ - VJcal) = 0.041 mag, and (RC - RCcal) = 0.039 mag. The calculated Johnson-Cousins magnitudes from the transformation equations show a good linear correlation with the observed Johnson-Cousins magnitudes.

[구 AT-03] Measuring AGN Core-shift Effect by Extended KVN with Global Baselines

Taehyun Jung[1,2], Richard Dodson[3], Seog-Tae Han[1], Do-Young Byun[1], Bong Won Sohn[1,2], Maria J. Rioja[3,4,7], Mareki Honma[5], Jamie Stevens[6], Pablo de Vincente[7]
[1]Korea Astronomy & Space Science Institute, Korea,

[2]*University of Science and Technology, Korea,*
[3]*International Centre for Radio Astronomy Research, Australia,*
[4]*University of Western Australia, Australia,*
[5]*Mizusawa VLBI Observatory, NAOJ, Japan,*
[6]*Australia Telescope National Facility, CSIRO, Australia,*
[7]*Observatorio Astronomico Nacional (IGN),Spain*

Very Long Baseline Interferometry (VLBI) at millimeter wavelengths results in the highest angular resolutions achieved in astronomy and has a unique access to emission regions that are inaccessible with any other approach or at longer wavelengths. The simultaneous multi-frequency VLBI system in the Korean VLBI Network (KVN) is considered one of the most effective systems for compensating the atmospheric phase fluctuations, which is particularly bothersome at mm-VLBI. We have been demonstrating its performance and uniqueness at mm-VLBI observations. As a results, international VLBI partners from Japan, China, Australia and EU have expressed their interest on the KVN style simultaneous multi-frequency system. In this talk, we will report the activities for extending the simultaneous multi-frequency system to global VLBI network and introduce its science driver, measuring AGN core-shift effects.

[구 AT-04] Benchmark Results of a Radio Spectrometer Based on Graphics Processing Unit

Jongsoo Kim and Jan Wagner
Korea Astronomy and Space Science Institute

We set up a project to make spectrometers for single dish observations of the Korean VLBI Network (KVN), a new future multi-beam receiver of the ASTE (Atacama Submillimeter Telescope Experiment), and the total power (TP) antennas of the Atacama Large Millimeter/ submillimeter Array (ALMA). Traditionally, spectrometers based on ASIC (Application-Specific Integrated circuit) and FPGA (Field-Programmable Gate Array) have been used in radio astronomy. It is, however, that a Graphics Processing Unit (GPU) technology is now viable for spectrometers due to the rapid improvement of its performance. A high-resolution spectrometer should have the following functions: poly-phase filter, data-bit conversion, fast Fourier transform, and complex multiplication. We wrote a program based on CUDA (Compute Unified Device Architecture) for a GPU spectrometer. We measured its performance using two GPU cards, Titan X and K40m, from NVIDIA. A non-optimized GPU code can process a data stream of around 2 GHz bandwidth, which is enough for the KVN spectrometer and promising for the ASTE and ALMA TP spectrometers.

태양계

[구 SS-01] Near-IR Radiative Transfer Process for the Hazy Atmosphere of Titan

Sang-Joon Kim
School of Space Research, Kyung Hee University, Korea

Radiative transfer programs have been developed to simulate near-IR spectra of Titan. The formalism of the radiative transfer calculations includes the absorption and emission lines of CH_4, C_2H_2, C_2H_6, and HCN, and continua produced by Titanian haze particles. Absorption and scattering of sunlight by haze particles are considered by employing a two-stream approximation and a spherical-shell model for the atmospheric layers of Titan. Various constraints on the radiative transfer calculations for generating synthetic spectra will be discussed and presented. Several examples of comparisons between the synthetic spectra and recent spectral observations of Titan will also be presented.

[구 SS-02] KISO/KWFC Observation of the Dust Ejecta Associated with the 2007 Outburst of 17P/Holmes

Masateru Ishiguro[1], Yuki Sarugaku[2], Daisuke Kuroda[3], Hidekazu Hanayama[3], Yoonyoung Kim[1], Yuna Kwon[1], Hiroyuki Maehara[3], Jun Takahashi[4], Tsuyoshi Terai[3], Fumihiko Usui[2], Jeremie J.Vaubaillon[5], Tomoki Morokuma[2], Naoto Kobayashi[2], and Jun-ichi Watanabe[3]
[1]*Seoul National University,* [2]*The University of Tokyo,* [3]*National Astronomical Observatory of Japan,* [4]*University of Hyogo,* [5]*Paris Observatory*

The 2007 event occurred at 17P/Holmes is known as the most energetic cometary outburst in the history of modern astronomical observations. At this conference, we report our new observation of the comet one orbital period after the event. We thus made the observation of 17P/Holmes in 2014 September using the Kiso Wide Field Camera (KWFC) attached to the 105 cm Schmidt telescope at the Kiso Observatory. It is known that dust particles are thought to converge on the orbital