[연1-P01] Excitation Processes of the CH4 Aurorae of Jupiter and Saturn

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

Recently, an analysis of 3-micron spectra of CH4 line emission from our Gemini/GNIRS observations of Jupiter's polar regions yielded an unexpected result: The homopause (~1 microbar pressure level) located directly above the long-lasting 8-micron CH4 north-polar hot spot (Great 8-micron Hot Spot: GHS) is cool compared with the temperatures of nearby auroral regions (Kim et al. 2017). Most of the 8-micron emission of the GHS originates from

CH4 at the ~1 mbar level (i.e., deeper in the stratosphere, where cooling time is several years), much longer than at the altitude of the homopause. We propose a mechanism to explain the temperature difference: locally-fixed and transient, but energetic auroral particles, which can penetrate to the 1 mbar level and deposit energy there creating and maintaining the GHS. For Saturn, thus far we have not detected distinctive 8-micron nor 3-micron CH4 hot spots in the polar regions. We will present a possible implication for this difference between Jupiter and Saturn. [Kim, S.J. et al., Icarus, 281, 281-285, 2017.]

[연1-P02] Experimental Apparatus for Opposition Effect at Seoul National University

Yoonsoo P. Bach, Masateru Ishiguro, and Jin-Guk Seo
Department of Astronomy and Physics, Seoul National University (서울대학교), Seoul, South Korea

The Opposition Effect (OE) is an enhancement of the brightness of a reflecting light as the phase angle (the Sun-target-observer angle) approaches zero. The mechanisms have been studied both theoretically and experimentally and nowadays recognized that there are two major mechanisms, namely, coherent backscattering OE (CBOE) and shadow hiding OE (SHOE). From data analyses of an S-type asteroid Itokawa taken with the Hayabusa spacecraft onboard camera, it is suggested that the CBOE would be dominant at phase angle smaller than ~ 1.4 deg, while SHOE dominates at larger phase angles (M. Lee & M. Ishiguro, under review). The study on the physical parameters which affect the OE, such as size and composition, will lead us to find a way to disentangle each of them from observation. The experiments in lab, however, faces two major difficulties: (a) the detector blocks the incident light if phase angle is nearly zero and (b) incident and emission angles must be controlled with high angular resolution to prevent blurring of OEs at different phase angles in one measurement. In this presentation, we introduce a new apparatus which has been installed at Seoul National University to investigate the OE in our lab, and summarize the initial results. It will be a valuable starting point to establish infrastructure in Korea, and will shed light on the investigation of OE physics using laboratory simulants.

[연1-P03] Simulations of the Lunar Exosphere: Effects of Multiple Sodium Sources on Coma and Tail

Dong Wook Lee and Sang Joon Kim
School of Space Research, Kyung Hee University, Korea

Since there are two-different observational constraints for the lunar exosphere data, it is interesting to find the best exospheric model that can account for the observed characteristics of the lunar coma and tail simultaneously (Lee & Kim, 2017).The characteristics of the lunar exosphere can be constrained by comparing simulated models with observational data of the coma and tail. In this work, considering effects of triple sodium sources (two dayside sources: a low- and a high-velocity component; and an Isotropic source component), we present time-dependent simulations showing initial conditions around the lunar coma and the final stage of the lunar tail. Based on an updated 3-D lunar exosphere model (Lee & Kim, 2017), we are presenting the simulated images of the lunar sodium coma and its correlation with lunar tail's physical parameters.

[Lee, D.W. & Kim, S.J. 2017. BAAS, 49, 417.18]

[연1-P04] UAV를 이용한 스발바르 걸리 지형의 측량과 화성 걸리와의 비교
Terrain surveying for gully in Svalbard using UAV and comparison with Mars

이재용(Jaeyong LEE)[1], 오구치 타카시(Takashi OGUCHI)[2].
[1]*Graduate School of Frontier Sciences, The University of Tokyo, lee@csis.u-tokyo.ac.jp.*
[2]*Center for Spatial Information Science, The University of Tokyo.*

북극 스발바르의 사면 지형에는 걸리가 발달되어 있다. 이러한 걸리는, 그 성인에는 여러 의견이 있으나, 화성에도 중고위도를 중심으로 다수 분포한다. 화성의 걸리는 2000년대에 들어 비로소 본격적으로 규명되고 있으나, 지

형적 특성으로 인한 탐사의 한계로 지구에 분포하는 유사 지형을 통한 비교 연구가 일반적이다(Costard, et al. 2007 등).

이 연구에서는 스발바르의 주도 롱이어비엔에서 UAV을 이용하여 획득한 DEM으로 스발바르 걸리를 측량하고, 이를 화성 중위도의 테라 사이메리아, 테라 시레넘, 노아키스 테라에 분포하는 걸리와 비교하였다. Longyearbreen 빙하 전방에 위치한 사면을 UAV로 촬영하고, 이를 SfM-MVS(Structure from Motion & MultiView Stereo) 기법으로 3차원 점군 모델과 고해상도 DEM을 제작하여 분석하였다. 화성의 경우 MRO궤도 탐사선이 촬영한 HiRise DTM을 이용하여 분석하였다. 두 걸리는 기후와 지질 조건에 차이가 있음에도 불구하고 유사한 패턴을 보였다. 특히 테라 사이메리아에 위치한 걸리와 롱이어비엔 북사면의 걸리는 기준거리, 단면적, 폭, 경사, 제방 두께 등에서 상당한 정량적 유사관계가 있었다. 이는 두 행성의 걸리가 유사한 성인 및 형성 프로세스를 거쳤을 가능성을 시사한다.

측량 기법과 UAV 의 안정성을 개선시키면 지형 모델의 품질 향상 및 극지에서의 UAV 운용이 용이해질 것으로 기대된다. 또한 스발바르의 기후 요소 및 물리량 적용은 향후 화성 지형연구에도 응용할 수 있을 것으로 사료된다.

[연1-P05] Impact deformation of Feldspar in Achondrite: NWA 2727, NWA 3117, NWA 856 Meteorite

Jaeyong LEE[1], Timothy J. FAGAN[2]
[1]*Graduate School of Frontier Sciences, The University of Tokyo, lee@csis.u-tokyo.ac.jp.*
[2]*Dept. of Earth Sciences, Waseda University.*

We investigated shock history of three achondrite meteorites: NWA 3117, a howardite from asteroid Vesta, NWA 2727, a breccia from the Moon, and NWA 856, a shergottite from Mars. Shock histories were evaluated from deformation of plagioclase feldspars. Feldspar grains were classified based on observations in cross-polarized light as undulatory, mosaic, mosaic-recrystallized or maskelynite. This sequence represents increasing deformation of original feldspar crystals. Undulatory crystals have wavy extinction, mosaic crystals have patchy extinction, and mosaic-recrystallized grains appear as if they were originally coarse-grained and have recrystallized to mosaics of small equant crystals. Maskelynite grains are isotropic, indicating transformation to glass. Based on feldspar deformation, the degrees of impact processing are NWA 856 > NWA 3117 > NWA 2727. The high deformation of NWA 856 is expected because this sample is from Mars, which is a large parent body and requires a powerful impact to accelerate a rock to escape velocity. In contrast, the parent body of NWA 3117 (Vesta) is smaller than that of NWA 2727 (the Moon), yet NWA 3117 appears more highly deformed than NWA 2727. One possible explanation is that NWA 2727 is from a relatively young part of the Moon, which has not been exposed to impacts as long as the surface of Vesta.

[연1-P06] Regional Variations in Spectra of (25143) Itokawa taken with Hayabusa/AMICA

Sunho Jin, Masateru Ishiguro
Seoul National University

The Hayabusa remote-sensing images of near-Earth asteroid (25143) Itokawa exhibited large diversity in spectral properties. The evidence suggests a various degrees of space weathering on the surface. It is known that the space weathering changes the spectra of S-type asteroids redder and reduces the depths of absorption around 1㎛. It is therefore possible to determine the surface ages through the investigation of the degree of space weathering. It is, however, reported that the scattered light components severely degrade the Asteroid Multiband Imaging Camera (AMICA) images, especially at the wavelengths >0.86 ㎛. Our team came up with a technique for subtracting the scattered light components (Ishiguro 2014). Here, we upgraded the techniqu e by applying simplex algorism to correct the artifacts for all AMICA bands. This new technique enables to apply for the longest channel (i.e., zs-band at 1.01 ㎛) images, which was not studied so far. With the AMICA all bands data, we estimated the surface ages at the different location to be 0.6-2 Myr. Based on this data together with the geological information (e.g. gravitational potentials and local). we will discuss about the evolution of surface materials on the asteroid.