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Complex organic molecules (COMs) are increasingly observed in the environs of young stellar objects (YSOs), including hot cores/corinos around high-mass/low-mass protostars and protoplanetary disks. It is widely believed that COMs are first formed in the ice mantle of dust grains and subsequently released to the gas by thermal sublimation at high temperatures (T>100 K) in strong stellar radiation fields. In this paper, we report a new mechanism that can desorb COMs from icy grain mantles at low temperatures (T<100K), which is termed rotational desorption. The rotational desorption process of COMs comprises two stages: (1) ice mantles on suprathermally rotating grains spun-up by radiative torques (RATs) are first disrupted into small fragments by centrifugal stress, and (2) COMs and water ice then evaporate rapidly from the tiny fragments (i.e., radius a <1nm) due to thermal spikes or enhanced thermal sublimation due to increased grain temperature for larger fragments (a>1 nm). We discuss the implications of rotational desorption for releasing COMs and water ice in the inner region of protostellar envelopes (hot cores and corinos), photodissociation regions, and protoplanetary disks (PPDs). In shocked regions of stellar outflows, we find that nanoparticles can be spun-up to suprathermal rotation due to supersonic drift of neutral gas, such that centrifugal force can be sufficient to directly eject some molecules from the grain surface, provided that nanoparticles are made of strong material. Finally, we find that large aggregates (a~ 1-100 micron) exposed to strong stellar radiations can be disrupted into individual icy grains via RAdiative Torque Disruption (RATD) mechanism, which is followed by rotational desorption of ice mantles and evaporation of COMs. In the RATD picture, we expect some correlation between the enhancement of COMs and the depletion of large dust grains in not very dense regions of YSOs.

[포 IM-18] High-Resolution Observations of the Molecular Clouds Associated with the Huge H II Region CTB 102 (거대 수소 이온화 영역 CTB 102와 연관된 분자운의 고분해능 관측)

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We report the first high-resolution (sub-arcminute) large-scale mapping ^{12}CO and ^{13}CO observations of the molecular clouds associated with the giant outer Galaxy H II region CTB 102 (KR 1). These observations were made using a newly commissioned receiver on the 13.7-m radio telescope at the Taeduk Radio astronomy Observatory (TRAO). Our observations show that the molecular clouds have a spatial extent of 60 x 35 pc and a total mass of $10^{4.8}$ – $10^{5.0}$ solar mass, Infrared data from WISE and 2MASS were used to identify and classify the YSO population associated with ongoing star formation activity within the molecular clouds. Moving away from the H II region, there is an age/class gradient consistent with sequential star formation. The infrared and molecular line data were combined to estimate the star formation efficiency (SFE) of the entire cloud as well as the SFE for various sub regions of the cloud.

천문우주관측기술

[포 AT-01] Transient Alert Message Processing System for the LSST era

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We have developed and tested a prototype system to process transient alert messages from the currently working facilities such as Gaia and GCN notices. Our experiments with the prototype focus on developing a platform that can be used in the LSST era with about 10 million alerts per night and helping Korean community members with the automated processing environment to provide auxiliary information for every alert message. The system consists of a message broker implemented by Redis and multiple message subscribers specialized for specific scientific interests. The current implementation of the entire system allows new Korean members to adopt their own processing chains receiving the messages from our local broker. We welcome experimental ideas and opinions from the Korean community about the current message processing system. We plan to test the current system with the ZTF alerts in the near future.

[포 AT-02] Real-Time Reduction Software for Slitless Spectral Image

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