Department of Earth Sciences

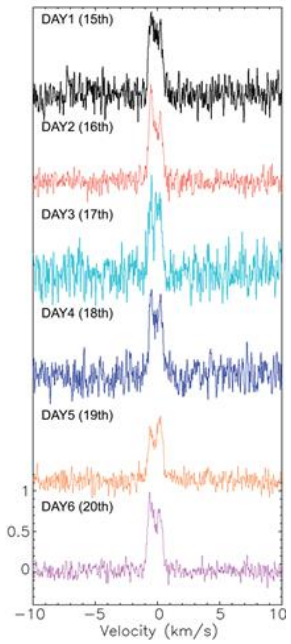
Molecular Astrophysics and Astrobiology

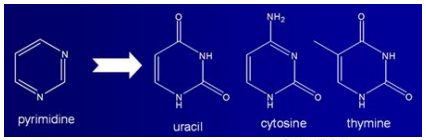
Research Focus:

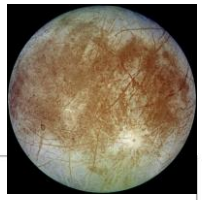
- Search for prebiotically important complex organic molecules (COMs) in space –
  - Is life unique on Earth or ubiquitous in the universe?
- Study of Solar System and interstellar comets –
  - Besides understanding of the origin and evolution of Solar System, comet study may shed light on the origin of life on Earth.
- Study of Solar System icy worlds –
  - Some icy worlds may possess subsurface oceans. Are these icy worlds habitable? Do they harbor life?

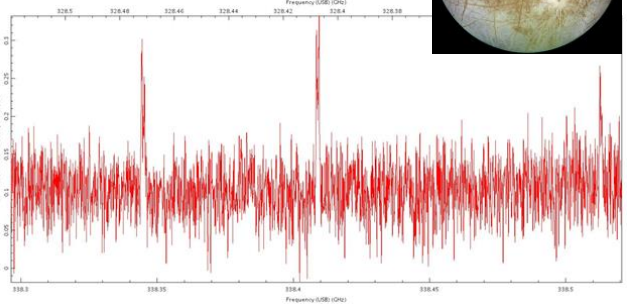
Telescopes used in study:

The Atacama Large Millimeter/submillimeter Array (ALMA; world's largest ground-based observing facility), Submillimeter Array (SMA), James Clerk Maxwell Telescope (JCMT), Submillimeter Telescope (SMT), and the Kitt Peak 12m (12M).









(Left) Daily intensity variation of HCN emission of comet 46P/Wirtanen during perihelion. (Center top) Interstellar pyrimidine is one of the COMs searched for. (Top right) Water plume was detected with ALMA on Europa, an icy moon of Jupiter. (Bottom) Methanol lines observed in a short-period comet.

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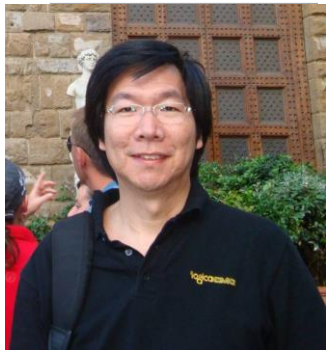

Background:

PhD in Astronomy, University of Illinois at Urbana-Champaign, USA

Funding: Ministry of Science and Technology

Publications

- Coulson, I.M.; Liu, F.-C.; Cordiner, M.A.; Kuan*, Y.-J.; Chuang, Y.-L.; Charnley, S.B.; Tseng, W.-L.; Milam, S. N.; Ip, W.-H.; Lin, Z.-Y. 2020, "JCMT Spectral and Continuum Imaging of Hyperactive Comet 46P/Wirtanen", *Astronomical Journal*, 160, 182
- Cordiner, M.A.; Milam, S.N.; Biver, N.; Bockelée-Morvan, D.; Roth, N.X.; Bergin, E.; Jehin, E.; Remijan, A.J.; Charnley, S.B.; Mumma, M.J.; Boissier, J.; Crovisier, J.; Paganini, L.; Kuan, Y.-J.; Lis, D.C., 2020, "Unusually High CO Abundance of the First Active Interstellar Comet", *Nature Astronomy*, 4, 861
- Cordiner, M.A., Charnley, S.B., Kisiel, Z., McGuire, B.A., Kuan, Y.-J. 2017, "Deep K-band Observations of TMC-1 with the Green Bank Telescope: Detection of HC_7O, Nondetection of $HC_{11}N$, and a Search for New Organic Molecules", *Astrophysical Journal*, 850, 187