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Japan Astrobiology Center Activities and Exoplanets as Extremophiles

The Astrobiology Center (ABC) of the National Institutes of Natural Sciences (NINS) is a new institute established in 2015 and the only Japanese inter-university astrobiology institute that serves the astrobiology community in Japan. ABC is promoting astrobiology efforts to detect planets beyond our solar system and eventually to confirm biosignatures of life in the universe, mainly by developing instruments for the various current telescopes and the next generation extremely large telescopes. Our aim is to be an international and competitive center of excellence under interdisciplinary collaborations, and to conduct cutting-edge research on astrobiology, in particular, exoplanet observations and biosignature studies.

In this talk, I would like to introduce the recent activities of ABC: (1) ABC has developed and/or significantly contributed to several major exoplanet instruments for existing and near-future telescopes, as the first stage of "preparation for many best-in-class detections for exo-life studies". The second stage of extensive observations for "detection of many exoplanets promising for exo-life" has started for the next several years. In parallel with the above developments, ABC members have produced many scientific results in astronomy and biology. To link astronomy and biology, we emphasize photosynthesis studies on exoplanets and under extreme environments, producing papers that bring new insights on possible photosynthesis on M dwarf stars, possible fluorescent biosignatures, and photosynthesis in Antarctica.

CV

PROFESSIONAL PREPARATION:
1988 - Ph.D., Physics, Kyoto University, Japan
1988 - Post-doctoral Fellow, NOAO, Tucson, USA
1990 - Post-doctoral Fellow, JPL, Pasadena, USA

PROFESSIONAL APPOINTMENTS:
1992 - Research Associate, NAOJ, Tokyo
1998 - Associate Professor, NAOJ, Tokyo
2004 - Director of Extrasolar Planet Project Office of NAOJ
2013 – Present: Professor, Graduate School of Science, University of Tokyo, Japan
2015 – Present: Director of Astrobiology Center, Japan

HONORS and AWARDS:
1994, Daiwa-Adrian Prize
2011, Cyushiro Hayashi Prize
2013, Toray Science and Technology Prize

FIVE MAJOR PUBLICATIONS:
1) Tamura, M. 2019, Extrasolar Planetary Systems, Astrobiology, ISBN 978-981-13-3638-6. Springer Nature Singapore Pte Ltd.
2) Tamura, M. 2016, SEEDS - Strategic explorations of exoplanets and disks with the Subaru Telescope -, Proceedings of the Japan Academy, Ser. B: Physical and Biological Sciences, 92, 45
3) Kuzuhara, M., Tamura, M. et al. 2013, Direct Imaging of a Cold Jovian Exoplanet in Orbit around the Sun-like Star GJ 504, The Astrophysical Journal, 774, id. 11
4) Muto, T. et al. 2012, Discovery of Small-scale Spiral Structures in the Disk of SAO 206462 (HD 135344B): Implications for the Physical State of the Disk from Spiral Density Wave Theory, The Astrophysical Journal Letters, 748, id. L22
5) Minniti, D. et al. 2010, VISTA Variables in the Via Lactea (VVV): The public ESO near-IR variability survey of the Milky Way, New Astronomy, 15, 433

Professor Motohide Tamura belongs to the department of astronomy, the Graduate School of Science, the University of Tokyo, and is cross-appointed to the Director of the Astrobiology Center (ABC) of National Institute of Natural Sciences (NINS). Based on his nearly 40 years of experience of infrared astronomy, star/planet formation, exoplanet, and astrobiology, he has led the astronomical observations of exoplanets and disks using the direct imaging techniques on the 8.2-m Subaru telescope since 1990s. He has also led many infrared astronomical instrumentation projects including CIAO, HiCIAO, IRD for Subaru, SIRIUS and SIRPOL for IRSF, Polarization optics for Roman Space Telescope. Furthermore, he is leading infrared polarimetric observations of star forming regions over 30 years, revealing the magnetic-field or scattering-field structures inside dense molecular clouds, as well as one of the pioneers of submillimeter polarimetry of young stars.