

V23c **The mid-infrared instrument on the Thirty Meter Telescope (TMT). I.**

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The Thirty Meter Telescope (TMT) will have a fundamental impact on the future of ground-based mid-infrared (MIR) astronomy. Compared with 8m class telescopes, an improvement in spatial resolution by factor of 4 and sensitivity by factor of 15, as well as high Strehl observations, will be afforded in conjunction with a MIR adaptive optics system. The improved performance will enable MIR observations to unravel crucial and complex problems such as (1) planet formation in protoplanetary and debris disks, (2) properties of planets and small bodies in our solar system, (3) star formation and/or AGN (black hole) activities in the extragalaxies, (4) dark matter distribution probed with lensed galaxies, (5) dust formation/destruction around evolved stars and supernovae, and a lot of other applications. Fundamental to the science cases above are imaging, low-dispersion (R up to ~ 500) and high-dispersion ($R \sim 100,000$) spectroscopy, and MIR AO which enables diffraction limited resolution and high Strehl observations. Additional capabilities such as integral field unit and polarimeter option, are also under investigation. In the US, the Mid-Infrared Echelle Spectrograph ($R \sim 100,000$) was proposed for the TMT. As the Japanese MIR community are interested in adding/enhancing capabilities of the low-dispersion spectroscopy and the imaging, Japan and US team members recently started discussions for the collaboration of developing the instrument and making scientific observing plans. We introduce our activities and report the proposed science cases and instrument capabilities.