M134-P002 **Room: Poster Session Hall** **Time: May 28**

Development of the Tunable Heterodyne Infrared Spectrometer using a quantum-cascade laser for atmospheric studies of the planets

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The Infrared Heterodyne Spectroscopy is the most sensitive and highest resolution spectroscopy in the middle infrared region, and has been expected to be a useful method of remote sensing of minor constituents in the Earth's atmosphere as well as the atmospheres of other planets.

To achieve high spectral resolution and sensitivity with compact instrumentation heterodyne systems are advantageous over direct-detection methods. Using gas lasers as local-oscillators restricts observations to the small mixer bandwidth range around the few laser lines. Utilization of the diode laser as a local lasers is a great advantage because of their wide operating wave-number region, wave-number tunability, small size and small power consumption. On the other hand, the diode laser is not well suited to observe the planetary atmosphere because of lacked sensitivity due to low power of the lasers. The use of tunable quantum-cascade lasers overcomes this limitations. Development of these new techniques has been recently started by the group in the U.S. and Germany [e.g., Kostiuk et al., 2001; Sonnabend et al., 2005,2006; Fast et al., 2006].

Over the past 20 years infrared heterodyne spectroscopy has been developed by our group in Tohoku University. The purpose of this study is to establish the technique of remote sensing of planetary atmosphere by the tunable heterodyne infrared spectrometer using a tunable quantum-cascade laser. Development of this system is achieved by constructing step-by-step approach as follows:

1. A driving method of a tunable quantum-cascade laser,
2. A development of a small in-situ detector system of minor constituents,
3. A development of the tunable heterodyne system,
4. Observation of Earth's atmospheric minor constituents by the ground-based heterodyne system