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Noise-Immune, Cavity-Enhanced Spectroscopy and Ultra-Sensitive Atmospheric In-Situ Measurements

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Development is underway at JPL to apply an extremely sensitive absorption-spectroscopy technique to in-situ measurements of trace atmospheric gases and stable-isotope compositions. Ye, Hall, and co-workers at JILA pioneered this technique to demonstrate unprecedented sensitivity and coined the name "Noise-Immune, Cavity-Enhanced, Optical-Heterodyne Spectroscopy, " or NICE-OHMS. We anticipate in-situ instruments based on the NICE-OHMS technique to open new levels of sensitivity and precision in trace-gas detection and stable-isotope analysis on Mars and Titan. This will provide invaluable constraints and tests for models of planetary atmospheres. This talk will briefly describe the technique, discuss some interesting applications, present the status of the JPL NICE-OHMS apparatus, as well as future developments.