INFRARED SPECTROSCOPY

Drs. Harold Larson and **Uwe Fink** head a team of postdocs and graduate students engaged in an observational program using the techniques of Fourier spectroscopy. Since planetary atmospheres are cool, they are composed of molecules whose absorption bands lie in the infrared region of the spectrum. Fundamental information can be obtained regarding the composition of the atmosphere and the temperature and pressure levels at which the absorptions occur.

The study of astronomical sources at wavelengths of 1.4 μm, 1.9 μm, 2.7 μm, etc. requires special high altitude telescope facilities. For more than a decade, LPL astronomers have pioneered in conducting astrophysical studies from NASA-operated airborne observatories. The current program employs the Kuiper Airborne Observatory, a 91 cm telescope mounted in a modified C-141 aircraft, for spectroscopic studies of star-forming regions and of the atmospheres of the outer planets. This high altitude program includes supplemental work at conventional mountain-top telescopes, and spectral analyses require laboratory experiments and computer modeling. The experimental techniques of Fourier transform spectroscopy are employed in all aspects of this program, and the development of these unique instruments represents a long-term effort of the program.

One of the major scientific goals of this project is determining the compositions of the atmospheres of the outer planets. Typical results have included the detections of H_2O and PH_3 on Jupiter and CH_3D on Saturn. These results are important input to more general theories of the chemical and physical structures of the atmospheres of these planets. As groundbased and airborne observational opportunities become more completely explored, these goals will most likely lead to a continuation of the program from earth-orbiting telescopes.

Interpretation of spectra is not limited to bodies with atmospheres, since mineral and ice absorptions also occur in the infrared. These can be used as diagnostic features for studying the surface compositions of satellites and asteroids.