TITAN AEROSOL AND GAS EXPERIMENT FOR THE HUYGENS PROBE

G. C. Carle, D. R. Kojiro, V. Oberbeck, B. J. O'Hara, J.B. Pollack, J.R. Valentin
NASA - Ames Research Center,
A. Bar-Nun
University of Tel-Aviv,
M. J. Cohen
PCP, Inc.,
J. P. Ferris
Rensselaer Polytechnic Insititute,
J. M. Greenberg
University of Leiden
and
T. W. Scattergood
State University of New York - Stony Brook

The Cassini mission is a joint undertaking of the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) to explore the Saturnian system with a Saturn orbiter and a Titan probe. The launch vehicle and the Saturn orbiter are the responsibility of NASA while the Huygens Probe (the detachable Titan probe) is the responsibility of ESA. The spacecraft will be launched in 1996 and the Huygens Probe will arrive at Titan in 2003.

The Cassini Mission - Huygens Probe provides a unique opportunity to obtain detailed information about the atmosphere and, possibly, the surface of Titan. Titan possesses a substantial nitrogen atmosphere containing methane and many other organic compounds. Although the conditions on present day Titan are significantly different from the primitive Earth, Titan provides a venue for both comparative planetology and the study of certain aspects of exobiology on a planetary scale. For example, within Titan's atmosphere, irreversible conversion of methane, presumably dominated by photochemical reactions, into more complicated models which settle to and remain on the surface is taking place. Aerosols play an important role in the atmospheric processes on Titan. An understanding of these processes will help clarify prebiotic chemical and physical processes not only on Titan, but also on primitive Earth. The Huygens probe offers an opportunity to determine how organic particles are formed and grow which will, again, clarify their role on the early Earth.

A powerful analytical instrument, capable of addressing the above exobiology and other science questions, was recently proposed by the authors for the Huygens Probe. It is comprised of an aerosol and gas sampler and processor and a gas chromatograph - ion mobility spectrometer. The instrument will be able to measure complex organics that make up the collected aerosols to the ~1 ppm level. Gases will be measured to the ~10 ppb. Because the Titan atmosphere is expected to be quite complex, a gas chromatograph - ion mobility spectrometer is used to provide unequivocal identification of the components of the analytes.

Further details of the science questions to be investigated will be discussed and the proposed instrument will be described. Expected results and their implications will also be addressed.