ACOUSTICS2008/3396
Acoustic Anemometry on Mars

Jean-Pierre Williams and Ian McEwan
California Institute of Technology, Division of Geological and Planetary Sciences, MC 150-21, Padadena, CA 91125, USA

Acoustic anemometers provide wind measurements with high sensitivity, temporal resolution, and accuracy, and are in many ways superior to the hot wire technique anemometers currently and previously flown to Mars. An anemometer is under development that employs an internal model of how sound is changed by a particular gas mixture with respect to wind speed and temperature to derive these values. This is done by measuring the transfer function (attenuation and phase versus frequency) of sound between two transducers with a very wide spread-spectrum signal and comparing this with its internal model. While sonic anemometry is the premier technique for research studies of winds on Earth, the acoustic properties differ substantially from atmosphere to atmosphere and it is not valid to assume that an existing terrestrial system can provide heritage for a planetary instrument. Further, current multi-gas acoustic models rely on constants derived from experiments performed in conditions far from the planetary application intended here. Since the parameters of the model must be well defined in our approach, the instrument's ability to accurately measure transfer functions will be used in experiments to improve our knowledge of the behavior of various calibrated gas mixtures over relevant temperatures and pressures.