Geophysical Research Abstracts
Vol. 21, EGU2019-3425, 2019
EGU General Assembly 2019

Fidelity of infrasound and acoustic-gravity wave measurements with balloon-borne sensors

Oleg A. Godin
Physics Dept., Naval Postgraduate School, Monterey, CA, USA (oagodin@nps.edu)

Most of the data on infrasound and acoustic-gravity waves (AGWs) in the atmosphere is gathered with either ground-based pressure and acceleration sensors or satellite-borne sensors, which primarily exploit the processes that take place in the upper and middle atmosphere. There is a growing interest in the community in supplementing these measurements with sensors carried by free-flying, long-living balloons. Placing additional sensors at stratospheric heights promises new insights into AGW fields in the atmosphere and their coupling to physical process in the ocean, solid earth, and ice shelves as well as advances in detection and characterization of natural and man-made infrasonic sources. Using balloon-borne AGW and infrasound sensors is also actively studied for exploration of Venus and other planets. While allowing the measurements to be made at desired altitudes and suppressing the flow noise by moving with the wind, balloons also scatter waves and inevitably distort the ambient wave field. Balloon-induced measurement distortions prove to be rather different from the well-understood effect of a rigid boundary on ground-based sensors. The amplitudes of incident waves and the waves scattered by a balloon are comparable at distances of the order of the balloon radius. Moreover, resonance scattering of infrasound occurs at frequencies close to the frequencies of free oscillations of the balloon. This paper aims to quantify the balloon-induced distortions in the signal from a distant source of infrasound and AGWs, in the noise power spectrum, and in the cross-correlation function of diffuse noise. Fidelity of measurements made with pressure and acceleration sensors will be compared. A technique will be discussed for compensation of the measurement distortions at the data processing stage. The feasibility of using balloon motion and resonance vibrations to enhance detection and localization of compact sources will be investigated.