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Correcting infrasound wave parameter estimations using in-situ calibration on defective wind-noise reduction systems

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Infrasound signals can be detected using a time-delay of arrival approach to derive the back azimuth and trace velocity of the coherent wave. For these calculations, it is necessary to have a calibrated measure of the pressure. Although the calibration of microbarometers can be performed in a laboratory setting with specific metrological means such as those developed by the CEA, it is much more difficult to determine the transfer function of the wind noise reduction systems (WNRS), designed to reduce the wind associated noise. In-situ calibration of these WNRS's can be performed (as described by Gabrielson*) using a co-located reference sensor and comparing the response to that of the array sensor (considering only highly coherent signals) to determine the relative response of the WNRS. System defects, such as flooded pipes or blocked inlets, have significant impacts on the response, which in turn would influence the calculated infrasonic wave parameters. These defects can be characterized using in-situ calibration measurements. To demonstrate the importance of these measurements, experiments were undertaken at the infrasound station IS26, using a temporary detector whose defects on the WNRS can be produced. This will allow for the effects on real infrasound detections to be quantified and corrected using in-situ calibrations. Comparisons between models of these defects and experimental results allow for the characterization of their effects on infrasound parameter measurements and improvements of the models and WNRS designs.

* Thomas B. Gabrielson, "In situ calibration of atmospheric-infrasound sensors including the effects of wind-noise-reduction pipe systems", The Journal of the Acoustical Society of America 130, 1154-1163 (2011) https://doi.org/10.1121/1.3613925