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Wind seismic noise introduced by external infrastructure: field data and transfer mechanism

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Background seismic noise generated by wind was analyzed at six co-located seismic and infrasound arrays with the use of the wind speed data. The main factors affecting the noise level were identified as (a) external structures as antenna towers for intrasite communication, vegetation and heavy solar panels fixtures, (b) borehole casing and (c) local lithology. The wind-induced seismic noise peaks in the spectra can be predicted by combination of inverted pendulum model for antenna towers and structures used to support solar panels, free- or clamped-tube resonance of the borehole casing and is dependent on the type of sedimentary upper layer. Observed resonance frequencies are in agreement with calculated clamped / free tube modes for towers and borehole casings. Improvement of the seismic data quality can be achieved by minimizing the impact of surrounding structures close to seismic boreholes. The need and the advantage of the borehole installation may vanish and appear to be even not necessary at locations with non-consolidated sediments because the impact of surrounding structures on seismic background may significantly deteriorate the installation quality and therefore the detection capability of the array. Several IMS arrays where the radio telemetry antennas are used for data delivery to the central site may benefit from the redesign of the intrasite communication system by its substitute with the fiber-optic net as less harmful engineering solution.