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Seismoacoustic signature of the ocean storms at the center of Eurasia

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Signature of the ocean storms at the center of Eurasia are studied using data from Kazakhstani stations. Data from seismic and infrasound arrays that are part of the International Monitoring System of the Comprehensive Test Ban Treaty Organization are used, including PS23-Makanchy, AS058-Kurchatov, and IS31-Aktyubinsk. These data were amended with the local information acquired by the National Nuclear Center of Kazakhstan: seismic arrays ABKAR-Akbulak and KKAR-Karatau, and infrasound arrays KURIS-Kurchatov and MKIAR-Makanchy. Seismic and acoustic signals from ocean storms were detected using standardized correlation based method from 2014 to 2017. A seismo-acoustic source model has been developed to predict seismic and acoustic signals. WAVEWATCH3 data are used for the source model simulation. Microbaroms attenuation was calculated using vertical atmospheric profiles developed by the European Centre for Medium-Range Weather Forecasts. Microseism source parameters were corrected for the bathymetry effect. Afterward, actual and predicted microbarom and microseism parameters are compared and analyzed: data are compared between different arrays. The results show clear seasonal features in recorded microseisms and microbaroms indicating that the sources are of the same origin. Discrepancies are found for the predicted and observed microseism backazimuths. The results of this study combining microbarom and microseism observations reveal the strengths and weaknesses of seismic and acoustic methods while analyzing signals from strong storms, and lead to the conclusion that a fusion of two techniques brings qualitatively new results. In particular, it demonstrates its efficiency for locating a source of seismic noise using infrasound observations, predicting the source amplitude using microseismic observations, correcting seismic propagation anomalies due to heterogeneities in the propagation medium using accurate infrasound backazimuths, and inferring new observational constraints in the middle atmosphere using an enhanced description of the microbarom source. These findings are promising for a better description of the source (localization, intensity, spectral distribution) and coupling mechanisms of the ocean/atmosphere/land interfaces.