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Validation of a general microbarom source model using global infrasound observations of the International Monitoring System

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Between 0.1 and 0.6 Hz, the coherent ambient infrasound noise is dominated worldwide by signals, so-called microbaroms, originating from the ocean. With an energy peaking around 0.2 Hz, microbaroms are generated by second order non-linear interactions between wind-waves at the ocean surface and are able to propagate all around the globe through the stratosphere and thermosphere. Monitoring these signals allows characterizing the source activity and probing the properties of their propagation medium, the middle atmosphere. Here we present the first quantitative validation of global microbaroms modelling against worldwide observations. Modelling microbaroms at ground-based stations is a complex process that requires accounting for sea-wave modelling, infrasound generation from wave interactions, infrasound propagation over thousands of kilometers and infrasound detection at stations. In this study, this process was represented by three main parameters: a wave action model, a source model and an attenuation law through the atmosphere. The global modelling is run for two values of each parameter and the results are quantitatively compared with the global reference database of microbaroms detected by the International Monitoring System over seven years. This study demonstrates that the new source model improves the prediction rate of observations by around 20 percent points compared to existing reference models. The performance is enhanced when combining a wind-dependent attenuation and an ocean wave model that includes coastal reflection.