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Ground-truth Reference Dataset of 1001 Rocket Launches for Space Missions and their Infrasonic Signatures

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The infrasound technique is applied to monitor atmospheric explosions in the context of the Comprehensive Nuclear-Test-Ban Treaty and, among other purposes, to characterize large meteoroids entering Earth's atmosphere. Anyhow, for both types of sources, the exact location and time are initially unknown and sometimes difficult to precisely estimate. In contrast, rocket launches are well-defined ground-truth events generating strong infrasonic signatures. In this study, we analyse infrasound signatures of 1001 rocket launches for space missions recorded at stations of the International Monitoring System between 2009 and mid-2020. We include all surface- or ocean-based launches within this period with known launch time, location, rocket type, and mission name; whereas launches of sounding rockets and ballistic missiles for scientific and military purposes, respectively, are excluded from our study. We characterize the infrasonic signatures of over 70 different types of rockets launched at 27 different globally distributed spaceports and are able to identify infrasound signatures from up to 73% of the launches considered. We use this unique dataset to estimate the global detectability of such events and to characterize rocket infrasound. We provide the results as a DOI-assigned ground-truth reference dataset for supporting its further use in geophysical and atmospheric research.