

infrasound detected by stations of the IMS network for estimating the characteristics of shock waves generated by large bolides

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Theoretical models suggest that the infrasound signatures of bolides carry valuable information about their source, potentially revealing characteristics such as type and altitude of the shock. To fully exploit infrasound for characterizing bolides, it is imperative to have ground truth and accurate atmospheric conditions. However, dynamic atmospheric changes occurring over minutes to hours can degrade the information carried by infrasonic waves, while unexpected propagation paths may lead to unanticipated signal detection or lack thereof. A notable example is the 23 July 2008 bolide over Tajikistan, detected at two infrasound stations of the CTBT IMS network, at distances of 1500-2100 km from the source. While propagation modeling using realistic atmospheric specifications predicted signal arrival at one station, the opposite was observed for the other station. This unexpected detection was attributed to acoustic energy trapped in a leaky stratospheric AtmoSOFAR duct, a phenomenon previously theorized but recently confirmed through high-altitude balloon-borne infrasound experiments. The primary mode of shock production in this event was a spherical blast generated by the main fragmentation episode. The efficacy of infrasound in characterizing such events will be explored further in this discussion.

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