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NEMO - a global near real-time fireball monitoring system

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ABSTRACT

NEMO, the NEar real-time MOnitoring system, is a project for world-wide monitoring of bright fireballs. It is currently under development and will be a combined world-wide database for large fireball events operating in near real-time. Its foundation is an alert system to collect information on fireball events and one goal of the project is to analyse and combine data of these events from various data sources to maximize the scientific output. The alert system is based on social media, allowing very fast notifications. In combination with local meteor or fireball detection systems, often first scientific information can be provided. For large events, further data sources are investigated, like re-entry predictions or risk lists for known NEOs (near-Earth objects). One of the world-wide data sources is the infrasound monitoring system operated by the CTBTO (Comprehensive Nuclear-Test-Ban Treaty Organisation). It

has the capabilities to detect the energy released by entering objects via infrasound waves that traverse the atmosphere.

To enhance the knowledge of extra-terrestrial objects in the size range of decimetres to metres is one of NEMO's aims. These large meteoroids or small asteroids impact the Earth's atmosphere frequently. They cause bright fireballs but are not large enough to allow a reliable detection by NEO surveys. The characteristics and fluxes of this extra-terrestrial material are a topic of current research and an important factor to consider for space safety.

This talk will give an overview of NEMO and its detection procedure and will focus on the combination of various sources and complementary data for the analysis of bright fireballs. This will be illustrated by an example of a NEMO event: the Russian daytime fireball from 21 June 2018. Causing a lot of public attention, this bright fireball triggered NEMO's alert system and was recorded with at least ten infrasound stations. Through the analysis and combination of different data sources, it was possible to compute a source energy of about 2.4 kt TNT as well as a size of the initial asteroid of about 4 m in diameter.

This project is a cooperation between ESA and the University of Oldenburg as well as CTBTO and BGR (Bundesanstalt für Geowissenschaften und Rohstoffe).

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