Advances in Astronomy

Hindawi

Special Issue on

Advances in Studying Impact Phenomena and Daylight Bolide Events: Techniques and Approaches

CALL FOR PAPERS

Current telescopic surveys are aimed to identify meter-sized or larger asteroids before colliding with the Earth, as exemplified by successful observations of 2008 TC3 and recently, 2023 CX1. While a space-based infrared (IR) telescope monitoring system of the Earth's environment would greatly benefit the scientific community, many extraterrestrial impacts occur in broad daylight. A sobering example of a destructive daylight event is the Chelyabinsk bolide. However, energetic daylight bolides are often elusive and require innovative techniques to reconstruct trajectories and orbits. The near-Earth population of bodies is dominated by remnants of fragmented objects, only a few meters in diameter or smaller, which have the benefit of being the main source of meteorite falls. Notable examples demonstrating the relevance of these events are the three impacting asteroids recovered as meteorites: 2008 TC (Almahata Sitta meteorite), 2018 LA (Motopi Pan), and 2023 CX1.

There is a growing interest in the study of potentially hazardous asteroids (PHAs), not only in space, but also during various phases upon their entry into the Earth's atmosphere, to gain insight about their properties as well as infer their impact hazard capacity. The surprising entry of the Chelyabinsk bolide, which was not detected a priori, raised concerns about our monitoring capabilities from the ground. Moreover, there are casual reports of bright bolides or even meteorite falls occurring in broad daylight, but without any prior notice of the encounter, nor a recording of the fireball. Most small asteroids in the size range of one meter to about ten meters are of particular scientific interest because they produce meteorite falls. Depending on the entry geometry and the body's physical properties, a significant part of the kinetic energy propagates towards the ground in the form of shock waves, which may subsequently produce coupled seismic waves, or even formation of impact craters. Consequently, infrasound and seismic detections of shock waves are essential for shedding more light on these events. However, quite frequently, detection data using various sensing modalities, including casual witness reports are scattered or incomplete, and only in very rare cases leveraged towards obtaining more clues about specific bolide events.

This Special Issue aims to collate original research and review articles focusing on research initiatives with the goal of advancing these research topics. We particularly welcome submissions on new observational techniques and fireball events without any a priori warning, as well as review articles discussing the current state of the art in this field.

Potential topics include but are not limited to the following:

- Theory and observations of fireball entries
- Infrasound and seismic observations of fireballs
- Fireball network studies and implications for meteorite-dropping bolides, particularly in broad daylight
- Detection of bolides from space: trajectory reconstruction comparison with ground-based data
- Consequences of impacts with space debris
- Break-up models of asteroids and comets in Earth's atmosphere
- Bolides as a geohazard on Earth's surface: shock waves and excavation of craters

Authors can submit their manuscripts through the Manuscript Tracking System at https://review.wiley.com/submit?specialIssue=253653.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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