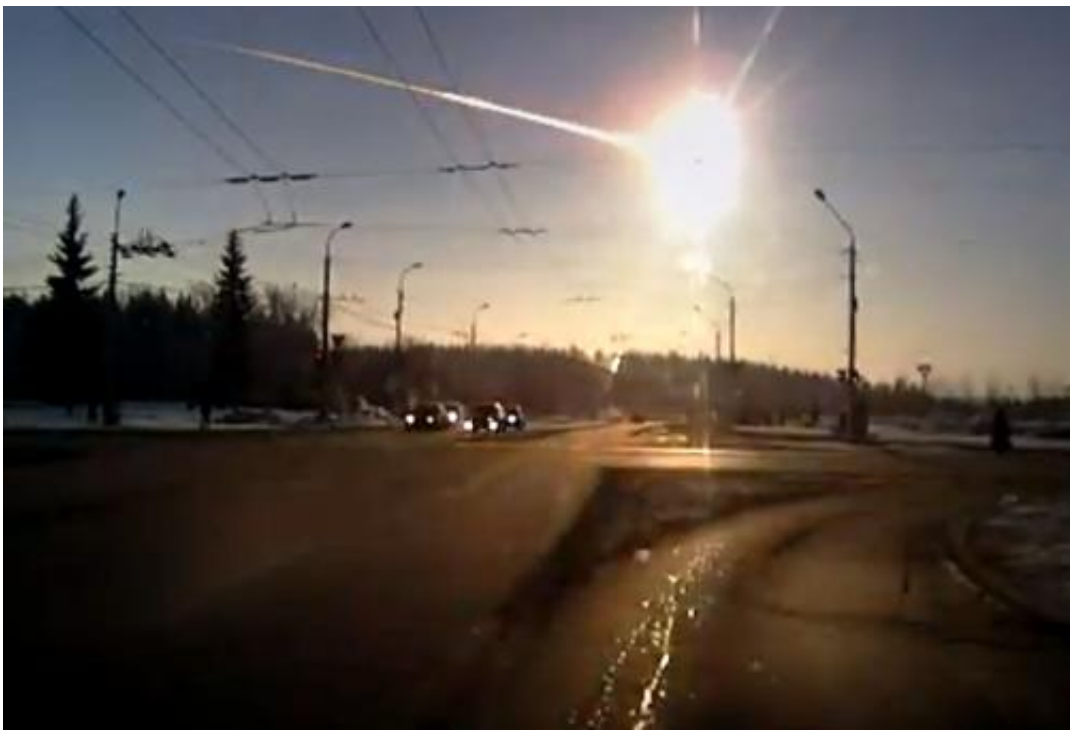
Astronomers stress need for characterizing population of nearby potential Earth-impactors

October 15 2013, by Dan Majaess

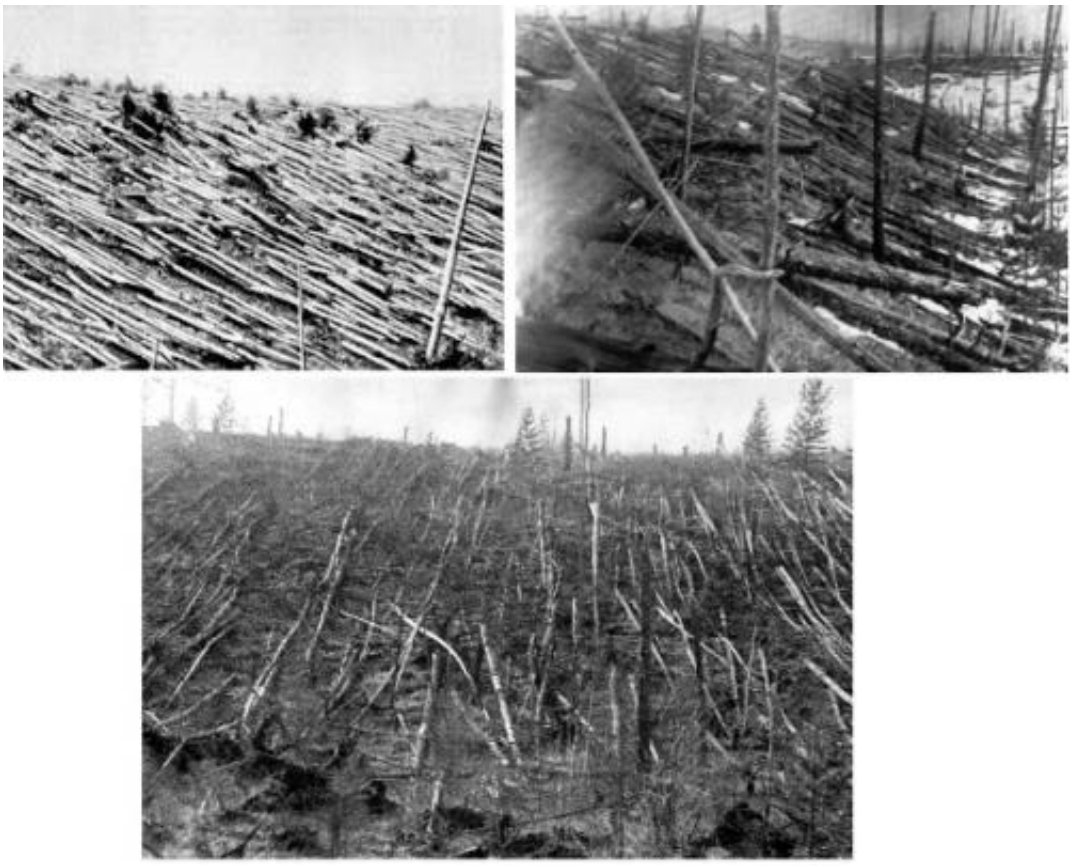


Frame grab from a video of the Feb. 15, 2013 Russian fireball. Credit: Aleksandr Ivanov

The meteor explosion over Russia in February 2013 raised concerns that even small asteroid impactors may wreak some havoc given our heavily populated cities. A new study by NASA scientists aims to improve our understanding of such asteroids that are lurking in Earth's vicinity. The

team, led by Amy Mainzer, noted that only a mere fraction of asteroids comparable in size to the object that exploded over Russia have been discovered, and their physical properties are poorly characterized.

The team derived fundamental properties for over a hundred near-Earth objects, and determined that many are smaller than 100 meters. Indeed, the team notes that, "In general … [asteroids] smaller than 100-m are only detected when they are quite close … and the smallest … were detected when they were only 2-3 lunar distances away from Earth."



In 1908 the Tunguska meteor explosion toppled millions of trees in a rather remote part of Siberia. A new study by Mainzer et al. 2013 characterized 100+ objects lurking in the vicinity of the Earth that are on the order of the Tunguska impactor.

Essentially, a large fraction of these bodies may go undetected until they strike Earth, analogous to the case of the asteroid that exploded over Russia in February.

The team's results rely partly on observations from the Wide-field Infrared Survey Explorer (WISE), which is a space-based telescope that mapped the entire sky in the mid-infrared. Observations taken in the infrared, in concert with those taken in the optical, can be used to infer the fundamental properties of asteroids (e.g., their diameter and chemical composition).

On a somewhat positive note, Mainzer remarks that 90% of near-Earth asteroids larger than 1-km are known, and those potential impactors are most worrisome as they may cause widespread fatalities. The dinosaurs suffered a mass-extinction owing, at least in large part, to a 10-km impactor that struck Earth 65 million years ago. However, Mainzer notes that the survey completeness drops to 25% for nearby 100-m asteroids, and it is likely to be less than 1% for 20-m asteroids like that which exploded over Russia (Chelyabinsk). The Tunguska event (see the image below) is likewise speculated to have been on the order of that latter size.

The team highlights that approximately 10,000 near-Earth objects have been discovered to date, 900 of which are 1-km or larger, and 3500 objects appear to be 100-m or smaller. "Because their small sizes usually make them undetectable until they are very nearby the Earth, it is often difficult for the current suite of asteroid surveys and follow-up telescopes to track them for very long.

Consequently, the fraction of the total population at small sizes that has been discovered to date remains very low," noted Mainzer.

In closing, Mainzer emphasizes that, "It is, however, clear that much work remains to be done to discover and characterize the population of

very small NEOs [near-Earth objects]."

The findings have been accepted for publication in the *Astrophysical Journal*.

More information: Mainzer, J. et al. 2013. The Population of Tiny Near-Earth Objects Observed by NEOWISE,*Astrophysical Journal (ApJ)*. arxiv.org/abs/1310.2980

Source: Universe Today