

# A Possible Source of Contamination for Underwater Searches of Meteoritic Fragments

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**Abstract**—One search for the remaining of the meteor CNEOS 2014-01-08 in the Pacific Ocean has been planned and announced. The lack of consensus regarding atmospheric survival and the plausibility of a successful recovery motivates a discussion of possible terrestrial contaminants that can yield false positives while searching the ocean floor. A known industrial contaminant of the search of very small meteorite fragments, of sizes of order hundreds of microns, is discussed in the context of undersea searches with high prior uncertainty. Magnetic spherules are a common byproduct of the combustion of coal in power plants, coal powered steam engines, and metallurgical activity. This byproduct is commonly called fly ash. Fly ash can travel far from the source on air, it can deposit on land, it can be washed by water flow and deposit on the ocean floor. Fly ash is proposed as a possible contaminant in undersea searches under high uncertainty.

## I. INTRODUCTION

An expedition for an underwater search of the remaining of the meteor CNEOS 2014-01-08 has been planned and announced [1]. Of particular interest for this kind of search is the potential capture of magnetic spherules from the ocean floor. However, given the lack of consensus regarding atmospheric survival [2], [3], [4], [5], a discussion about a known source of industrial contamination is presented to explain the presence of spurious magnetic spherules in the absence of a meteoritic fragments.

## II. THE NULL HYPOTHESIS

In order to assess the hypothesis that these spherules originate from a meteor, it is first needed to discard terrestrial sources that could easily account for the finding. In this document we provide one possible terrestrial source that could generate spherules in the absence of atmospheric survival. This hypothesis must be ruled out as a necessary condition, although not sufficient, before considering a non-anthropogenic origin of this marker.

In other words, the null hypothesis  $H_0$  can be formalized as

$$H_0 : \text{spherules not from CNEOS 2014 - 01 - 08} \quad (1)$$

In this document, a subset of  $H_0$ , is presented ie: one possible source of contaminant that can produce a false positive interpretation. In order to accept the alternative hypothesis (that spherules are in fact from CNEOS 2014-01-08), the null hypothesis must be rejected with significant evidence.

## III. FLY ASH

Numerous reports throughout the past century have documented the existence of spherules [6], [7], [8] in fly ash, a sub-product of the combustion of coal in power plants, coal powered steam engines and industrial activity like metallurgy. These spherules can have sizes of hundreds of microns, can be magnetic [9], and are therefore subject to be mistaken by meteorite fragments. Furthermore, these spherules can travel with wind currents after being released to the atmosphere, and can be dragged to the ocean by water flow after landing. Fly ash has been found in remote locations in the Southern Hemisphere like Antarctica and the Falkland Islands [10], [11], [12].

## IV. CONCLUSION

Fly ash is one possible source that can account for the presence of magnetic spherules, even in the absence of atmospheric survival. Undersea searches of meteoritic fragments with high prior uncertainty must consider this and other possible sources of contaminants.

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