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**Asteroid impacts or social media misinformation – what’s worse? Introducing an effective media communication strategy for planetary defense**

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**Abstract**

Social media has become part of our lives, and for many it is already the main source of information. During the Covid pandemic it became clear that misinformation can put people’s lives at risk. Science communication is relying on trusted sources and the accuracy of the information provided. The planetary defense community is aware of this and is successfully raising the public’s awareness about planetary defense in general and ongoing missions and activities within the field.

However, discussions within the planetary defense community on the use of social media for real-time events such as close flybys are currently mainly revolving around wanting to avoid spreading fake news and to debunk any potential inaccuracies, leading to a reluctance in sharing information with the media due to concerns of being misunderstood or misrepresented. This in turn fuels the circle of a lack of trusted sources with accurate information as the media has difficulty to find accurate information or contacts to clarify their questions if they attempt to do just that, leaving the field to inaccurate fear-inducing posts.

In view of the upcoming close flyby of asteroid Apophis on 13 April 2029 and the associated International Year of Asteroid Awareness and Planetary Defense, the planetary defense community needs to work on closing this communication gap.

This paper outlines why misinformation is and will always be a part of the social media landscape and proposes a strategy for the planetary defense community to effectively use social media communication for planetary defense and concludes with recommendations on how to bring the planetary defense community and the media closer together to address some of the existing communication issues.

*Keywords: social media, misinformation, science communication, communication strategy, trust*

## **1. Introduction**

Social media has become a part of our lives, and for many, especially young people, it is the main source of information [1]. During the Covid pandemic it became clear that misinformation can put people's lives at risk [2].

Consumers are facing further challenges and increased uncertainty especially when dealing with an uncommon potentially threatening event like an asteroid impact in addition to the uncertainty about the accuracy of the available information.

Science communication is becoming more and more important as our daily lives are increasingly dependent on science and technology. A key role of science communicators lies in translating the language of the experts and making scientific information more easily understandable for the general public by using simpler words and explaining formulas, as well as outlining what is important in a scientific message.

A key attribute of science communication is accuracy and good timing. Researchers and scientists on the one side want to convey information correctly, while the public is equally expecting to be receiving accurate information and at a relevant time. The challenge lies in translating the scientific meaning into plain language that is understood by the public without compromising on accuracy. This is especially important when communicating about issues that affect the quality of life or can even save lives, e.g. natural disasters and health topics. Trust is another important component to be considered as we have all seen during the COVID pandemic.

## **2. Current situation within the planetary defense community**

Within the planetary defense (PD) community it is a given that it is a question of when, not if, an asteroid is predicted to impact Earth and accurate information will have to be provided to the public. While no one can be certain of when this would be, there is a date when an asteroid flyby will make mainstream news: 13 April 2029. The close flyby of asteroid Apophis will be an opportunity to practice accurate science communication to the public.

The UN has declared 2029 as the International Year of Asteroid Awareness and Planetary Defense. The primary goal of the IYPD 2029 is to educate leaders and the public on the subject of asteroid close approaches and the potential of a future significant impact event. We hope this effort will support the generation resilient societies by enhancing preparedness, human safety and, most importantly, debunking the misinformation about catastrophic impacts.[3]

The International Asteroid Warning Network (IAWN) and the Space Mission Planning Advisory Group (SMPAG), which are the two entities established in 2014 as a result of UN-endorsed recommendations, are important mechanisms at the global level for strengthening the coordination in the area of planetary defense. The United Nations Office for Outer Space Affairs (UNOOSA) acts as secretariat to SMPAG and works with both IAWN and SMPAG in addressing this global issue. In the event of a credible impact prediction, warnings would be issued by the IAWN, the SMPAG would propose

mitigation options and implementation plans for consideration to the Member States [4,5].

Shortly after its creation a communications workshop was held for IAWN about asteroid impact warnings and mitigation plans. One of the workshop recommendations was that 'IAWN should sponsor briefings and workshops for reporters to improve NEO education within the mass media community' [6].

One of the SMPAG work plan items, 5.6 Communication guidelines in case of a credible threat, aims to develop communications guidelines to be used by SMPAG members in the event of a credible real world impact threat when announcing and discussing SMPAG activities and recommendations with the public, governmental authorities, and the international community [7].

ESA had already released a document in 2016 that acknowledged the importance that communication with the media and the public will be an important part of the effective distribution in the case of a credible threat, and that it is addressed separately in a so-called ESA SSANEO Crisis Media Communication Plan, which contains processes, procedures and timelines for communication to media and public during a credible NEO threat and is still to be written [8].

In 2018 the US government released the National Near-Earth Object Preparedness Strategy and Action Plan which was superseded by the 2023 National Preparedness Strategy & Action Plan for Near-Earth Object Hazards and Planetary Defense. Both documents contain a goal (5.5 and 5.3 respectively) to develop among other things, informational material for different audiences providing basic education, and include an integrated information package for use with social media, internet, and traditional press release formats for relevant information. This is to be done in the short term by NASA, FEMA, DHS and OSTP [9,10]

Also in 2023, NASA released its Planetary Defense Strategy and Action Plan which includes Goal 8 Enhance Strategic Communications Related to Planetary Defense, and especially goal 8.2 Enhance leadership messaging of planetary defense to increase scientific knowledge, raise awareness and improve preparedness when addressing general public, Congress, media and partners [11]. This is in line with the NASA Policy Directive dealing with the 'Notification and Communications Regarding Potential Near-Earth Object Threats' that covers communication with the public and the media [12].

A lot has changed in the 10 years since the IAWN communication workshop. Most notably is the absence of the words 'social media' from the report as this was no concern at that point in time and the focus was fully on traditional media. As can be seen from the more recent documents, the subject of communications is being taken seriously, however most communication strategies or plans are yet to be written and few mention social media. Those that do, focus on an official distribution flow of information.

This shows that the planetary defense community has currently no dedicated communication strategy for social media. The focus is only on traditional media

professionals and social media is approached with tools for the traditional media which are insufficient in this context.

### 3. The Gap

While the goals of both the PD community as well as the media at large overlap, which is to bring accurate information to the public in a timely manner, there is an interesting dynamic ongoing between the PD community and the media preventing just that in one particular field where it is most needed.

Generally, science communication works well when it is about the mid to long-term, e.g. basic information, upcoming missions, recent results, etc. However, once we get into the short-term to real-time communication the situation changes.

For example, in 2023 there were 66 objects detected just days around their closest approach to Earth, coming closer than the moon. Most of them were less than 10-15 meters in diameter and thus posed no danger if they had hit the Earth [13]. Social media often picks up those harmless detections and paints a catastrophic scenario and potentially leaves the public scared.

Picking out the example of 2023DW, a 50-meter asteroid that when discovered had a small probability of impact in 2046. About two weeks after the discovery the story gained traction on social media including misinformation (images of kilometer sized impactors) and uncertainty fueling the fear. The fact that follow up observations ruled out an impact just two weeks later went largely unnoticed on social media.

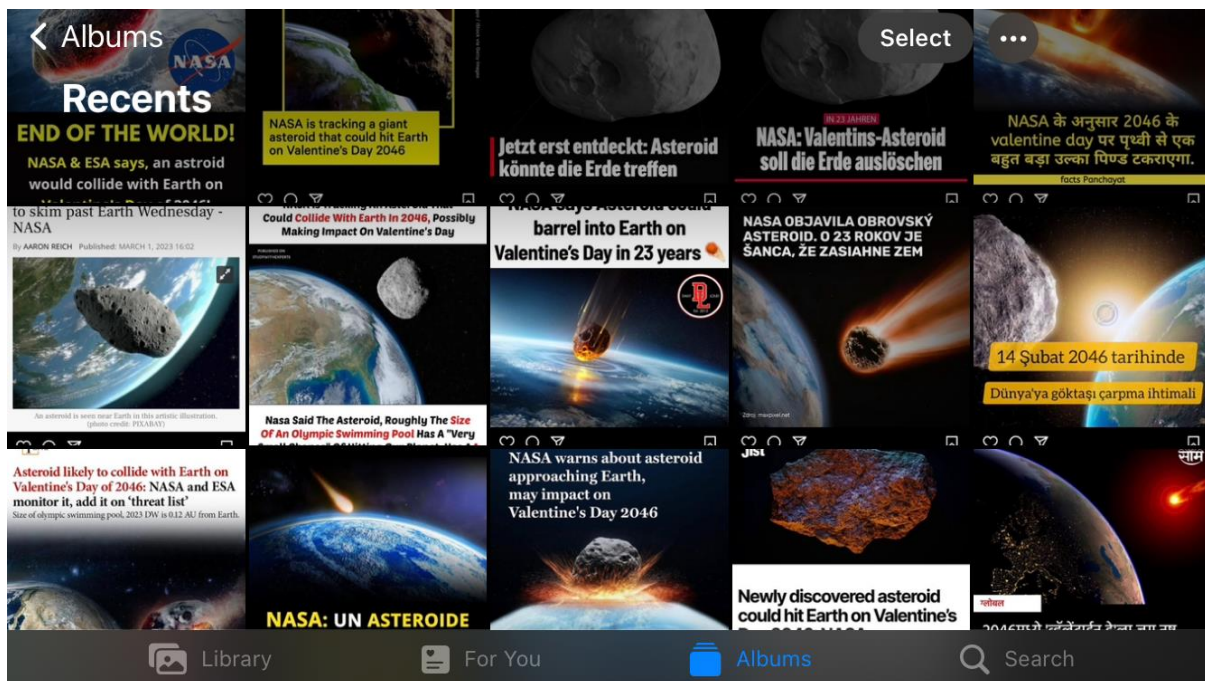


Fig. 1. Sample of 2023DW headlines in various languages on Instagram [14]

It is understandable that the public would get concerned, fearful or even lose sleep about it [15], while the science community would get frustrated at the inaccuracy of the information provided and the unnecessary emotional turmoil caused. The concern

among the planetary community in particular and the scientific community in general may be further heightened as there still exists the lingering acceptance of believing myths that such “warnings” can cause panic and chaos or lead to a cry wolf effect. Social science has shown these concerns to be unfounded and wrong [16,17].

Here we also see why it is so seemingly difficult to prevent and address this type of misinformation:

1. Social media picks the objects seemingly at random. There are many similar objects that never get the spotlight.
2. Fear is a powerful catalyst for human behavior. People are more likely to click on headlines that are scary than on those that are not, and clicks are currency in social media and therefore desired.
3. Even if you ‘debunk’ the misinformation the attention will have mostly moved elsewhere in the meantime and most people will not even get the update.

This is where we find ourselves in a bind. Either the PD community or the media could set the record straight and provide accurate information to the public dissipating their fears.

However, the PD community faces two problems:

1. Resources: these flybys are very common and as such do not bother the experts, and speaking to each and every flyby would strain their resources.
2. Trust: the fact that misinformation is already out there is perceived by the experts as being misunderstood and misrepresented by the media as they had already communicated the general facts which are not being portrayed accurately, being backed by the belief among experts that misinformation on social media can be avoided by just providing accurate information and educating the media and science communicators. In an attempt to reduce further misinformation, the specialists are now careful about sharing more information with the media out of concerns to be misunderstood again, and aiming to debunk and correct all misinformation out there while providing carefully crafted and verified information which takes time and a lot of work, resulting in less information given instead of more.

The media outlets on the other hand who are interested in providing accurate information to the public have difficulty finding understandable information. There is no official source to turn to for clarification and the available niche websites only make sense to experts, leaving the media and the public looking for answers. As a result, the dominating news, especially within social media feeds, are the ones containing misinformation that the PD community desperately wants to avoid. Even if the PD community decides to issue a sanctioned statement it is usually too late for most news outlets to care as the attention has moved elsewhere.

Before we discuss what can be done about it, let’s have a closer look at the actors involved and to understand a crucial element about the nature of social media.

#### **4. Social media system and how it is used by different participants for science communication**

Unlike traditional media, social media relies hugely on the level of engagement from the audience. This is the reason why the phrase “like, share and subscribe” has become a meme in the young community. Social media content must follow the following steps to be successful: have an attractive thumbnail or a catchy title, have pleasant visuals and dynamic content - which reflects the title and the thumbnail, and have a call to action. Why? Because every viewer is a potential buyer, every click brings profit and each engagement has substantial value.

This explains why some content creators will go to outrageous thumbnails and questionable content, as it is easier to attract attention by posting about a “dangerous asteroid approaching Earth” than “6037 (1998 EG) is flying by Earth at a distance of 6.08 million kilometers”.

We also need to understand that different social media platforms host various types of content creators, thus the level of misinformation and content quality is going to shift a lot.

TikTok and Instagram are considered fast paced environments, where people are more prone to engage with familiar faces and short formats - the video message should be shorter, not longer, and there is little chance people will read the caption. The audience tends to be younger and more emotion-driven, a lot of users are not familiar with fact-checking and content creators sometimes do not know how to find the original source or verify their messaging.

Historically, X.com, formerly Twitter, has always relied on short text messages, where the author must often choose between writing a full 140-character long message or attaching a link to an external source. Yet, authors on Twitter are aware of online trolls and can expect backlash in the comments, unlike the more fast paced social media.

And then there is LinkedIn which is directly affiliated with a content creator’s image and professional reputation; thus it is an unlikely place to imagine finding fake news or unverified messaging. And on LinkedIn people barely get paid for posts, yet a post can cost one’s whole career.

A big bulk of online content creation has also been given over to AI bots and software, which in the scope of minutes, if not seconds, searches the internet for said subject and provides a plausible quality video or post to be spread across social media. Such material tends to be favored by social media algorithms and by the general public, as the scripts and videos are made exactly to comply with the current requirements of a chosen network. Also, AI chat bots such as chat GPT are still lacking in critical thinking and necessary fact checking, and having no human doing the verification, are more likely to release false claims and semi-truthful materials.

The planetary defense community, as much as any other group, should understand that different creators on various platforms have different goals and reasons behind posting online. For some, it is a means of sharing their knowledge, which is scientifically proven and verified. Yet, there are still many users of social media platforms, who have the goal of earning money by creating viral content, which is often less than accurate, but catchy. However, we cannot underestimate the general public’s

intelligence as most people are fully aware of the social media environment with the constant lure of click bait in an attempt to get their attention and engagement.

The media plays a crucial role in disseminating information about asteroid approaches and near-Earth objects (NEOs) to the general public. The coverage of these events can have a significant impact on public perception, awareness, and understanding of asteroid risks.

#### Sensationalism vs. Scientific Accuracy

Media coverage of asteroid approaches often walks a fine line between sensationalism and scientific accuracy. While some outlets may focus on the potential catastrophic consequences of an asteroid impact, others may downplay the risks or provide inaccurate information.

#### Sources and Expertise

Reputable media outlets typically rely on expert sources, such as astronomers, planetary scientists, and officials from space agencies, to provide accurate and timely information about asteroid approaches. These experts can offer context, explain the risks and consequences of an asteroid impact, and provide updates on the asteroid's trajectory and predicted effects.

Looking at the different types of media involved, their ways of working, their agendas and their roles in this situation at hand, we can divide them into three groups:

##### 1. Traditional media

Traditional media refers to print media and broadcast media. Print media includes newspapers, magazines, and books, while broadcast media includes television and radio. The main characteristic of traditional media is one-way communication in which information flows from the sender to the recipient with no feedback from the latter. [18]

##### 2. Social media

Social media refers to the means of interactions among people in which they create, share, and/or exchange information and ideas in virtual communities and networks.[19] Content is created by the users.

Social media outlets differ from old media (e.g. newspapers, TV, and radio broadcasting) in many ways, including quality, reach, frequency, usability, relevancy, and permanence.[20]

Interestingly, the language used on most social media posts does not differ from the headlines of the traditional media.

Turning to the phenomenon of fake news. It is important to note that people spread this kind of information to speak about dangers from asteroid and its portrayal on social media for various reasons. A key one lies in the fact that the language used is often dramatic and emotive, used to create a sense of urgency, anxiety and fear, which can be exploited for attention and engagement. Thus, by spreading false or exaggerated information about asteroid hazards, individuals or groups can drive traffic to their websites, increase their social media following, or even influence public opinion to promote a particular ideology or agenda.

Fake news articles may also use technical jargon or scientific terms to create a sense of authenticity and credibility, even if the information is false or misleading. Often, they also fuel conspiracy theories or anti-government sentiment.

A study has shown that sharing content is rewarded and thus becomes habitual due to the structure of social media platforms. If accuracy rather than popularity would be rewarded the amount of fake news that gets shared drops significantly. [21]

The spread of fake news about asteroid hazards can have serious consequences, including the creation of unnecessary fear and anxiety, the erosion of trust in scientific institutions and the media, and the distraction from real issues and concerns.

Fake news can also undermine efforts to educate the public about real asteroid hazards and the importance of planetary defense.

### 3. Science communicators

Science communicators are a broad group of people: scientific experts, science journalists, science artists, medical professionals, nature center educators, science advisors for policymakers, and everyone else who communicates with the public about science.[22] Science communicators can be found in both, traditional media as well as social media.

## 5. Strategy for effective social media communication for planetary defense

With the nature of social media in mind, the planetary defense community should thus rethink their current approach and use social media to their advantage by focusing on the opportunities rather than spending all their energy on worrying about fake news and ways to debunk it.

Instead, an effective strategy for social media communications is needed. As the most valuable currency in communications with the public is trust, the planetary defense community can either attempt to build a source of trust from scratch (e.g. IAWN) or support already existing strong, reliable and trustworthy brands, groups or individuals that people will turn to when they need information. It is certainly easier to support an existing source, but for regions or languages that are currently underserved in that regard the goal should then be to build or at least help build such sources.

There are two use cases to consider. First, creating awareness and education related to the topic among the general public. Second, in case of an actual detection of a risk of an asteroid impact, to provide clear, correct, and transparent information, especially when not all information is yet available.

Mileti [16] pointed out that there is no single credible spokesperson. There are three reasons why. First, different people in the public have different ideas about who is and who is not credible. Second, people's ideas about credibility change over time. Third, spokesperson credibility and warning message belief are different, and the former does not guarantee the latter. The most credible early warning source is not a single spokesperson at all. It is a group of different people and organizations. Creating a

mixed panel to be the source of public warnings requires that many agree to partner to be a warning co-source long before a particular event occurs.

In this paper we will focus mainly on the first use case, creating awareness and educating the public. The same channels active in these fields can also become active in a warning scenario.

Let's look at the task at hand. Creating public awareness and education about asteroids and the potential risks they pose. What is the desired outcome? Why is it important? The planetary defense community is, in a nutshell, dedicated to protecting Earth from asteroid impacts to prevent loss of property and life, and the resulting suffering. While the public at large would have no active role to play in the detection or deflection of such an event, having an educated public will allow an open discussion about the roles and responsibilities that come along with the task of protecting Earth from asteroids as well as the resources and funding required to sustain it. The public can influence politicians and policy makers. Having an educated public will also help in case a threat emerges, to distinguish to some level accurate information from inaccurate information which has practical implications on their personal lives.

Education efforts from organizations, such as the Asteroid Foundation, fundamental in establishing the United Nations declared International Asteroid Day on 30 June, are already ongoing on a global scale. However, the reach is limited to space and science enthusiasts and the resources available on the website are mostly in English with very few resources in other languages.

Social media is a real time experience, and the majority of posts are related to current events. Thus, we can expect that during specific events, such as a close flyby of an asteroid or an anniversary, such as Asteroid Day on 30 June - the day of the Tunguska event in 1908, public interest will be heightened as well, and it would be an ideal time to post educational material and share relevant content.

The planetary defense community should coordinate the creation of curated content and information material ahead of time, and its distribution to a wide range of sources (government agencies, civil groups, science communicators, educators, volunteers, media representatives, etc.) around the world. Creating a coordinated collaboration network of institutions, organizations and individuals to create and disseminate the material would be advantageous. The 2029 International Year provides a great opportunity to do so.

Additionally, the importance of creating a social media persona, that will explain the official messages and spread them across their profiles on social media should be recognized. This could be a member of one of the existing institutions, or a so-called "brand ambassador": a specific social media representative who will be in touch with the institutions in charge - e.g., the IAWN, SMPAG, NASA, ESA, etc. similarly to company ambassadors on the internet: Bailey Burns for Blue Origin or Kellie Gerardi for Virgin Galactic.

Curated material for social media includes not just accurate information, which is often perceived by the public as boring and emotionless text. It requires accurate graphics and images as it needs to appeal to both the mind and the eye. This holds true not just

for the planetary defense community but aerospace as a whole. The most accurate information can only do so much if it is accompanied by an image of a giant asteroid smashing into Earth which is all that a google image search on asteroids will currently yield.

Further considering that English is the world's commonly spoken language and the default language in international business, tourism, technology, and much more. Almost 1.5 billion people speak English [23]. However, more than 80% of the world's population, that's over 6.5 billion people, do not and therefore do not have access to most of the scientific information available. Considering that there are 4.8 billion social media users worldwide, representing 60% of the global population [24], it becomes crucial that the content and material is made available in different languages.

This way, once an event is occurring, useful basic information would already be available in the local language and as many sources as possible can provide and disseminate it to their followers and people who seek it out. Fake news will do its thing anyhow, and just like an asteroid on an impact trajectory, sometimes all it takes is a nudge to make it pass.

## **6. Conclusion and Closing the Gap**

It is useful to be aware of the dynamics within social media and to understand that it is just not possible to completely get rid of fake news and misinformation related to asteroid flybys and impact predictions neither by education, debunking nor pre-bunking. While all those strategies have their place, fake news will always be part of the game. In times of doubt, uncertainty or fear, such as a potential asteroid impact, people will turn to a trusted source for information. Trust is thus the most valuable currency when communicating with the public

In terms of science communication for real-time and short-term events concerning planetary defense, there is clearly a mismatch between the expectations of the PD community and the output of the media.

While the gap and the difficulties to closing it are real, there are some truths to be taken into account as well when addressing the issue.

Not every misinformation needs to be debunked. Fear leads to clicks which are currency in social media. Accepting those facts that cannot be changed, allows communicators to focus their energy where it can make a difference.

At the same time, the dissemination of misinformation should best be prevented. This can be done aiming for several vital goals:

1. Creating more collaboration between the scientific, technical and social media/journalists. Scientists and journalists should work together to ensure that information about planetary defense is accurate, fact-checked, and communicated effectively to the public.

2. Presenting Accurate Information in an Engaging Way: Scientists, journalists, and social media influencers should work together to present accurate information about planetary defense in an engaging and accessible way, using storytelling techniques and multimedia formats to capture the public's attention. A library of authenticated resources can be created ahead of time, translated and distributed to a wide range of already established trusted sources of experts, journalists and science communicators.

3. Educating the media and bloggers, making a priority of sharing and explaining data, building a young and responsible community of science communicators: educational institutions and media organizations should prioritize media literacy and critical thinking skills, empowering individuals to evaluate the credibility of sources and identify misinformation. People should understand and respect the value of spending time on factchecking. Platforms could verify accurate science communicators for added trust.

4. Government and Institutional Support: Governments and institutions should provide support for fact-checking initiatives, promote media literacy, and encourage the development of technologies that can help combat misinformation.

Additionally, individuals can protect themselves from false news and disinformation by following a diversity of people and perspectives, being skeptical about news sources, and learning how to judge news sites and protect oneself from inaccurate information.

It is also important for news organizations to call out fake news and disinformation without legitimizing them, by relying upon their in-house professionals and well-respected fact-checkers. [25]

Addressing these challenges and implementing these strategies requires a collective effort from scientists, journalists, social media companies, governments, and individuals. By working together, we can combat misinformation and promote factually checked and accurate information about planetary defense to foster a more informed and engaged public and ensure that accurate information is available to the public, while minimizing misinformation and fake news.

The best way to oppose misinformation is the truth. The key is to strengthen trusted sources among the media, science communicators and social media by having the PD community provide easy to find accurate information for real-time and short-term events along with a point of contact for clarifications. This will raise the public's awareness of how asteroid observations and impact predictions work to help reduce misinformation. The 2029 International Year is a perfect opportunity to do so.

Lastly, we need a paradigm change within the PD community. It's not just the media that needs to be trained in the topic of planetary defense, it's also the PD community that needs to be trained on how to convey the correct information to the media.

In the end the PD community and the media are working together on providing reliable and accurate information to the public in plain language that can be understood.

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