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The Radio Meteor Zoo: involving citizen scientists in radio meteor research

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Abstract

BRAMS (Belgian RAdio Meteor Stations, http://brams.aeronomie.be) is a project of the Royal Belgian Institute for Space Aeronomy (BIRA-IASB, http://www.aeronomie.be) and partially funded by the Solar-Terrestrial Centre of Excellence (STCE, http://www.stce.be). Its main goal is to study meteoroids by using radio techniques. The BRAMS network consists of one beacon in the south of Belgium and about 25 receiving stations distributed all over the country. Many of these receiving stations are hosted by radio amateurs and astronomy enthusiasts.

Processing the observations is not an easy task. Each station generates a spectrogram every five minutes, so the whole network generates 7200 spectrograms per day. Most meteor reflections are visible as short vertical lines, for which we have developed automatic detection algorithms. However, especially during meteor showers more complex reflections occur (called overdense reflections) for which the human eye remains the best detector.

Therefore, the BRAMS researchers, in collaboration with the Zooniverse team (http://www.zooniverse.org/), have launched a citizen science project called the Radio Meteor Zoo (RMZ, http://www.radiometeorzoo.eu/) in August 2016. With the RMZ, thousands of citizen scientist eyes are manually identifying meteor echoes during meteor showers. Today the RMZ has more than 6000 volunteers who have classified meteors in almost 36000 spectrograms. Thanks to our volunteers we were able to generate activity curves for several meteor showers.

Communication with citizen scientists in the RMZ serves several goals: first we recruit new volunteers by giving lectures about meteors research at public observatories and during astronomical events (e.g. the "Night of the Stars" in August). We also get them involved into scientific research by showing them the results of their effort, i.e. the activity curves of the meteor showers. Thirdly we want to keep them motivated, e.g. by asking them to process spectrograms that are challenging yet not too complex. The penultimate goal is to teach them about meteor research. This is done through the background information pages and through a forum where they can interact with each other and the BRAMS researchers. Finally we disseminate the aggregated results to external platforms in order to share the results with other (citizen) scientists.

Based on lessons we have learned from the RMZ, we are preparing some improvements in our communication strategy and the user interface, e.g. by providing automatically feedback to the volunteer during the classification process. We also plan to train a machine learning algorithm with our large database of already processed spectrograms to automatically detect complex meteor reflections.