

Marc Buie [June 6th at 2:57 PM](#)

Let me share some strategic information about our campaign. This is likely to be of general interest but is extremely important for those that wish to use their own equipment for this campaign. If you are in this category, this is required reading and there will be required responses at some point along the way. We have already learned a great deal about the Patroclus-Menoetius (PM) binary from our previous eight (!) occultation campaigns. Thanks to these data we have answered many questions, some of them pleasant surprises. For instance, we now have a measurement of the relative masses of the two bodies, a measurement that not even Lucy was expected to get. One consequence of this situation is that the scientific value in pursuing an additional occultation depends entirely on the campaign design and the achieved results. While we can't control the weather, we can control our plan. The primary goal of this campaign is to constrain the polar axis of the two bodies and of the two, Menoetius is the more critical. Past observations suggest a very unusual shape and that shape ties directly into the determination of the bulk densities of the two. The main scientific question we want to answer is if the two bodies have the same bulk density or not. The more precise that statement is, the more constraining it becomes on formation models. For instance, this same measurement applied to the Pluto-Charon binary clearly showed a significant difference in the bulk densities that can only be explained by compositional differences as well as requiring the two bodies to form separately and then brought together later. We don't expect this for the PM binary but there's essentially no constraining data yet on such things. This goal imposes important design constraints on the campaign. We need a grid of stations with uniform spacing laid out for each body. No single site can see both objects this time. I have simulated what this event gives us and I no longer see the need for a 100-telescope deployment (50 for each body). That would have been an epic undertaking and an equally epic dataset but would be quite costly. After some analysis I have decided on a 30-station deployment, nominally 15 per object, will be sufficient. The nominal spacing between stations will be around 10 km. Now, the 30 stations I mention could be just the Lucy-provided equipment and we add extra stations to that, or, the extra stations could be in addition to the 30. I consider this decision to be something to address later when I have more information. How extra stations are used is an important question and factor. Consider two cases. 1) take a 15-station pattern with a fixed spacing and add one station in between two of the stations in the pattern. 2) Change the pattern to be a 16-station pattern with slightly tighter spacing. From my analysis guided by instinct and experience, shifting to a 16-station pattern is more valuable scientifically. I'm almost willing to say, if a station cannot be added to the full pattern it's not worth deploying. Another factor concerns those of you inclined toward deploying multiple stations. This is a great trick that can add a lot of data if successfully executed. However, the harm caused by a station that just couldn't be deployed is serious. For this campaign, gaps are bad. Consider a possible assertion, "I can definitely do N stations but I might be able to do M stations if things go well" (where $N < M$). When you combine "gaps are bad" with wanting uniform spacing, this campaign is not well served by planning to deploy M stations. Only sign up to what will ensure a 100% chance of success. I want you to be very conservative on this point. As for the equipment itself, aperture can be a concern. If you are using a 20-cm aperture or larger, I'm not concerned. If your aperture is smaller then I need you to make a case, including suitable test data, that your system will work. I don't have a ready-made set of criteria for this so I'll take this up on a case-by-case basis with those of you in the category.

Regarding timing: 1 millisecond timing accuracy. Worse than this will compromise the value of your data, potentially creating a gap. If you are using a GPS-based VTI or a QHY174, I won't question your system. If you have anything else, I need to see a detailed description of what your plan is, how the system works, how it is validated, and how you will provide data with good timing. If accepted, this description will be important when it comes time to pull together the publication of results. For all "extra" stations, you will be responsible for providing all raw data and documentation for your station. If you are taking video data, I need you to also do the data analysis needed to get a time-calibrated lightcurve. This goes double for data that are not tracked. I want you to be mindful of how big of a workload you are passing off to me. In the past I've worked triple-overtime to "save" a sub-standard dataset due to extremely low SNR or bad documentation or both. Let's not do that anymore. As an inducement to be responsible, a dataset that does not add significantly to the result and has too many problems will likely be relegated to an acknowledgement-only level of participation in the publication. Also, not providing raw data will put your efforts into the same category as a visual observation. One last item for extra stations. This is a team effort and the deployment is built around working together. The bulk of the observers and stations will be co-located for the full deployment cycle (except for the time of observation). I would like for the extra stations to be present for team activities as well. If your schedule precludes this level of participation, please make sure to let me know (privately) about what you can and can't do. These considerations will be taken into account when building the final plan. Also note that deploying an extra station does not mean you won't be eligible for support but it does mean an extra layer of evaluation and accommodation to integrate you into the plan. Please know that I consider many of these issues to be somewhat touchy subjects for all included. I hope you appreciate that I respect everyone's participation and efforts and my approach for this campaign is designed to make sure we aren't wasting our time and we get the best possible science - a result we can all be proud of.