

Pro-Am Collaborative Astronomy Observational Support for NASA CIOC/SidingSpring and ESA/Rosetta/67P/Churyumov-Gerasimenko(CG)

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Abstract

The Pro-Am Collaborative Astronomy (PACA) project evolved from the observational campaign of C/2012 S1 or C/ISON. The success of the paradigm shift in scientific research is now implemented in other comet observing campaigns. While PACA identifies a consistent collaborative approach to pro-am collaborations, given the volume of data generated for each campaign, new ways of rapid data analysis, mining access and storage are needed.

1. Facebook Group CIOC_ISON

The creation of CIOC_ISON, a professional - amateur astronomer collaboration network established on Facebook, with members from the scientific, amateur, science outreacheducation, public from around the globe in 2013, leveraging pro-am collaboration with social media proved to be a success. This approach provided a platform to showcase both science results and aesthetically beautiful images and also provided an alternate approach for lack of dedicated missions to Oort-cloud comets. Today, amateur astronomers, with sophisticated equipment and software, provide several valuable resources to the professional observers/astronomers: a large source of manpower, or extension of the professional astronomer's group via coordinated global networks of amateur astronomers; a vast collection of data that provides both legacy and temporal information; an alert-sounding mechanism and as ambassadors of science, help build bridges between the scientific and public communities.

2. New Campaigns

Since 2013, two new comet observing campaigns involving pro-am collaborations have been identified and are active: (1) C/2013 A1 (C/SidingSpring) and

(2) 67P/Churyumov-Gerasimenko (CG). While the model used for C/ISON is applicable, each of these campaigns are sufficiently different to establish two separate observing campaigns. The evolving need for individual customized observing campaigns has been incorporated into the evolution of PACA (Pro-Am Collaborative Astronomy) portal. Under the auspices of PACA, we currently focus on comets: from supporting observing campaigns for current comets, legacy data, historical comets; interconnected with social media and a set of shareable documents addressing observational strategies; consistent standards for data; data access, use, and storage, to align with the needs of professional observers.

2.1. CIOC_SidingSpring

Comet C/2013 A1 or C/SidingSpring, discovered by Rob McNaught at Siding Spring Observatory (SSO), Australia, is a dynamically new Oort-cloud comet, similar to C/ISON. However, it is nota sungrazer. C/SidingSpring is on course to swing by Mars on 19 October 2014. Characterization of Oort-cloud comets is of interest as they are relics of the early solar system and therefore, contain information about the conditions prevalent then; missions to Oort-cloud comets cannot be planned due to non-predictability of their appearance; and finally, it is through the observations of individual and now automated surveys, that Oort-cloud comets are discovered. Hence, the role of the amateur astronomers is indelibly important and it evolves with current technology, emergence of social media and the needs of the professional community. Another aspect of the CIOC_SidingSpring campaign is the fact the Mars community of amateur astronomers is also included to characterize the interaction of the planet with the comet. While several studies indicate that there is low risk of damage to the NASA assets at Mars ([1], [2]), the changing morphology of clouds/dust on Mars and the cometary activity observed draws upon both communities of Mars

and comets. With Mars undergoing its perihelion and closest approach to Earth in April; changing seasons from spring to summer, with equatorial clouds changing from cirrus to cumulus; changes in its North Polar Cloud (NPC), and the development of cyclones just south of the NPC, and global dust storms, makes it necessary to characterize seasonal/non-seasonal influences on the atmosphere prior to its encounter with C/SidingSpring. The comet currently beyond 5 AU, looks similar to the appearance of C/ISON at similar distances. Recent HST data indicates multiple jet activity has developed in the comet ([3]). Low activity has been observed by the network of amateur observers. Furthermore, the viewing geometry of the encounter of comet and planet will be best at southern latitudes, which is a challenge for observers located in the northern hemisphere.

2.2. 67P/Churyumov-Gerasimenko (CG): ESA/Rosetta Target

Comet 67P/Churyumov-Gerasimenko (CG) is the final target for ESA's mission Rosetta, launched in 2004 and woke up from a 3-year hibernation in 2014. Rosetta, including both a lander and orbiter, will rendezvous with the comet in May, monitor the comet and finally release the lander, Philae, in November 2014. An exciting and technically challenging mission, Rosetta seeks to study 67P as it develops activity on its journey to perihelion in August 2015. With an orbital period of 6.5 years, 67P belongs to the Jupiter Family of comets and believed to originate in the Kuiper Belt, just beyond the orbit of Neptune and has had seven apparitions from 1969 to 2009 and recently observed by the ESO/VLT ([4]). The challenge presented is that 67P will not be very bright and therefore, ground-based observations will be difficult, at best. A coordinated effort of ground-based professional and amateur observational campaigns is underway, with PACA providing the pro-am collaboration via several social media, and primarily through the Facebook group, PACA_67P. The participation of the amateur community will be multi-fold: individual, robotic telescope networks and larger telescopes (*eg.* 1-m class telescopes). Details of the observing campaign will be shared to invite the amateur community to participate; with PACA providing a one-stop location for information, requirements, observational information and data collation. These tasks define the new directions necessary for full engagement of the amateur astronomers, professional astronomers and mission.

3. Consistent Data Formats and Various Issues

Both observing campaigns identify several common data issues that need to be address to maximize the science return: consistent standards and policies for acquisition of data; format of data; its collection, quality assessment, collation and subsequent analysis; access and use by both professional and amateur communities and long term archival and sustained maintenance. Various solutions and their efficacy are being studied by PACA, to provide a one-stop portal for these issues.

4. Summary

The integration of science, observations by professional and amateur astronomers, and various social media provides a dynamic and evolving collaborative partnership between professional and amateur astronomers. PACA incorporates these observing campaigns and seeks to provide a comprehensive one-stop portal for comet campaigns.

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References

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