5 months of AMOS on the Canary Islands

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We present the technology, its installation and the first results from the AMOS meteor system on the Canary Islands. Since March 15 2015, a pair of AMOS automatic all-sky cameras (at Observatory Teide (Tenerife) and Roque de los Muchachos (La Palma) of the Astronomical Institute of Canary Islands) has been observing regularly to record meteors on every clear night.

1 Introduction

The motivation for installing the AMOS camera (All-Sky Meteor Orbit System) on the Canary Islands, specifically at Observatorio del Teide, Tenerife (OT) and Observatorio del Roque de los Muchachos, La Palma (ORM) of Instituto de Astrofisica de Canarias (IAC), was to obtain better coverage of part of the southern sky meteor activity from what is climatically one of the best observatories in the world. In addition, we sought confirmation for some of the possible new meteor showers included in the working list of the temporary list of meteor showers of the IAU Meteor Data Center and among these to identify possible meteor streams of asteroidal origin as we discussed in our previous papers (e.g. Tóth et al., 2011).

For this reason, we developed new AMOS-CI cameras with a resolution of 1600x1200 pixels, resolution 6.8 arcmin/pixel and 20 frames per second. The field of view (FOV) is 180x140 degrees. AMOS-CI has a new generation of outer shelter and logic of autonomous observations compared with the previous version (Zigo et al, 2013).

2 Installation

Following the AMOS tests of 2014 from the OT and ORM observatories (Tóth et al., 2014) and the approval of the AMOS-CI project and the application by the IAC, installations were carried out in March 2015 at both OT and ORM with the assistance of the local staff. Both cameras have been operating regularly since March 15, 2015 on every clear night. The only technical issues were quite minor, with cleaning of the optical component being necessary during the final 5 months of camera operation (March 15 – August 16, 2015). No major repairs or important maintenance have been needed so far.

Figure 1 − The AMOS system observing overnight at Full Moon at Observatory Teide, Tenerife, IAC.

3 Observation and results

Only 9 nights (6%) in the last 5 months (154 nights) produced no observations, compared with 94% of nights that were clear or partially clear. Technical issues only caused us to miss a few hours of observation, accounting for less than 1% of the observing time.

The fields of view of both cameras are very similar, with the AMOS-CI camera at ORM merely having a slightly restricted field of view in the eastern direction due to the higher elevation of the horizon. On the other hand, the image intensifier of the camera at ORM is more sensitive and this has resulted in a higher number of detected meteors. Sky background differences between both stations are negligible in terms of the AMOS system sensitivity. In total, the two cameras detected 14098 single station meteors (9225 at ORM, 5626 at OT). The ratio between the stations is 1.64, indicating that the limiting magnitude for meteors is about a half magnitude higher for the AMOS-CI camera at the ORM station, assuming an average population index of 3. The AMOS sensitivity differences will be used for population index estimation. We were able to calculate 1539 orbits from double-station observations which equates to 27% of the single station meteors from the OT station. 22 meteor streams were detected with more than 5 orbits (*Figure 2*).

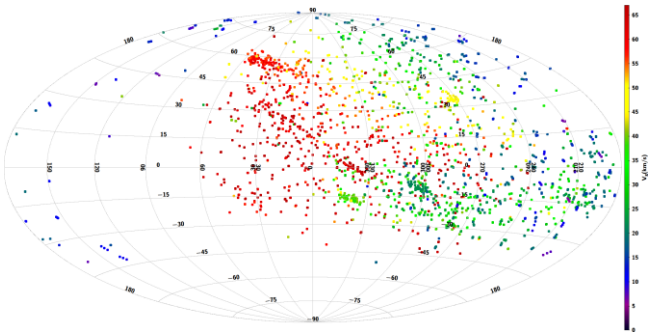

Figure 2 − The radiant distribution of 1539 meteors with orbits from AMOS-CI (March15 – August15, 2015).

The activity of sporadics and shower meteors detected by the AMOS-CI cameras fluctuated with the phase of the Moon, as can be seen in *Figure 3*. Major showers were detected, along with many minor ones.

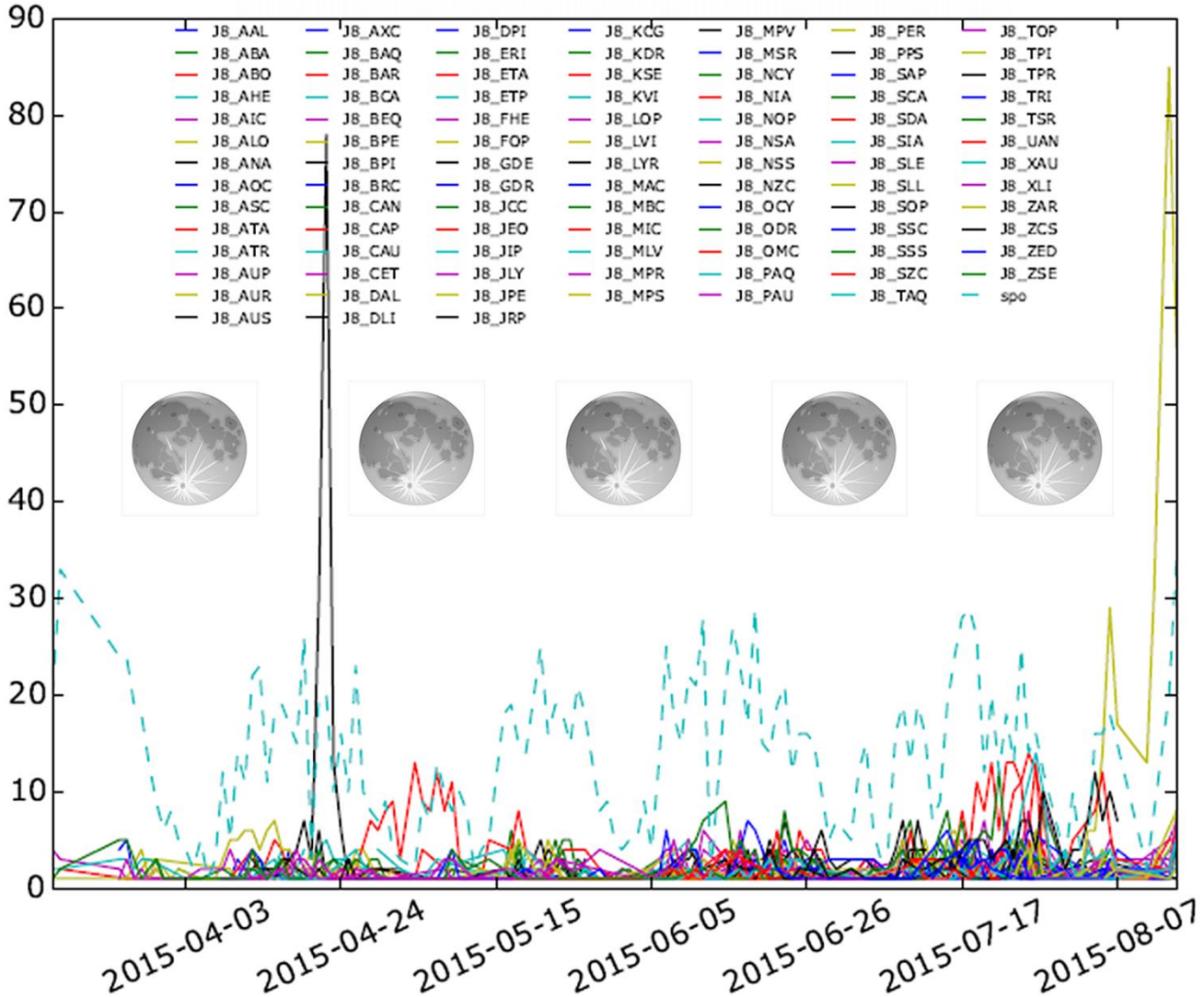

Figure 3 – Variation of meteor activity from AMOS-CI at ORM (March15 – August15, 2015). The Full Moon symbol represents the phase around bright Moon, sporadics are depicted by dashed green line, and meteor shower activity with more than 3 members per night (93 meteor showers from IAU MDC catalogue, single station data) are depicted by color solid lines. Activity of the Lyrids, η-Aquariids, SIA, SDA, CAP and Perseids are clearly visible.

Two Arietids (a daytime meteor shower) were observed from both stations (during the early hours of June 7 and of June 11). We were able to determine orbits for both (MeteorTrajectory software, Kornoš et al., 2015) (*Table 1*).

Table 1 – The daytime Arietid (171 ARI) orbits detected by AMOS-CI cameras. The reference orbit from the IAU MDC catalogue (Jopek and Kanuchova, 2013) based on radar data by Brown et al., 2008 is also shown.

Source (data_time UT)	q (AU)	e	i
2015_06_07_050816	0.0681	0.986	30.5
	± 0.0027	0.003	1.3
2015_06_11_050837	0.0691	0.974	26.9
	± 0.0091	0.011	3.4
IAU MDC (Brown et al. 2008)	0.082	0.959	24.8

Another interesting observation occurred during the night of May 19, 2015 at $23^h17^m33^s$UT. We observed a fireball likely to have produced meteorite fall (P. Spurný, calculation and personal communication). The predicted 40 g meteorite would have fallen on the western slopes of the Tenerife island in the National Park Teide (*Figure 4*).

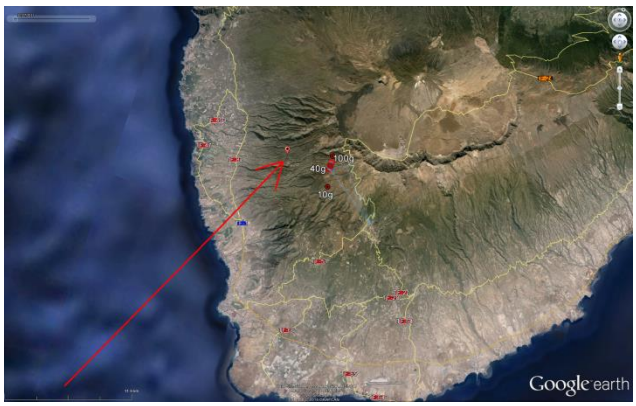

Figure 4 −Projection of fireball (May 19, 2015) trajectory.

We organized a recovery expedition and searched an area of 700x200 meters during June 8–12, 2015. The whole area was searched by 7 people (*Figure 5*), but no meteorite was found.

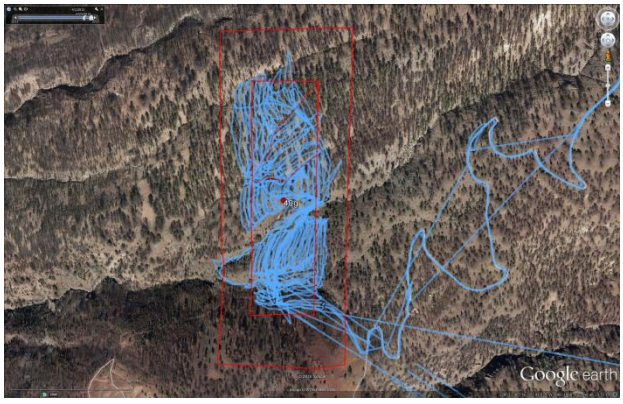

Figure 5 – GPS trails of the recovery expedition in the predicted area of the meteorite fall from May 19, 2015. The inner rectangle is 700x200 m wide in projection.

4 Conclusion

We have successfully developed; tested and installed the AMOS-CI cameras on the Canary Islands and have briefly described the first results from 5 months of regular observations. To our surprise, we observed a meteorite dropping fireball after 3 months of observation, which probably came down on the Tenerife island. This was unexpected, because the surface area of the islands is very small. The AMOS-CI system was honored by the Spanish King Filipe VI. inauguration on June 27, 2015.

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