Slovak Video Meteor Network – Meteor Spectra –

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Introduction

Meteor spectroscopy has received much attention in recent years due to its indirect measure of the main element composition of small bodies of the Solar System, which offer important scientific benefits. Meteor spectra are emission lines containing in majority emission features belonging to meteoroid vapours, as well as some lines of atmospheric origin.

After the great success of the All-Sky Meteor Orbit System (AMOS) [2; 3], we upgraded the system by adding AMOS-Spec camera, for recording meteor spectra. The long-term AMOS-Spec program aims to measure the main element abundances of meteors detected by AMOS.

Installed in Modra Observatory station camera is based on AMOS camera, equipped with 30 mm f/3.5 lens (FOV $\sim$140° x 100°) and 500 grooves/mm grating. The minimal brightness of a meteor for our system (with optimal geometry of meteor flight in front of the camera, and meteor velocity) is around -2 magnitude.

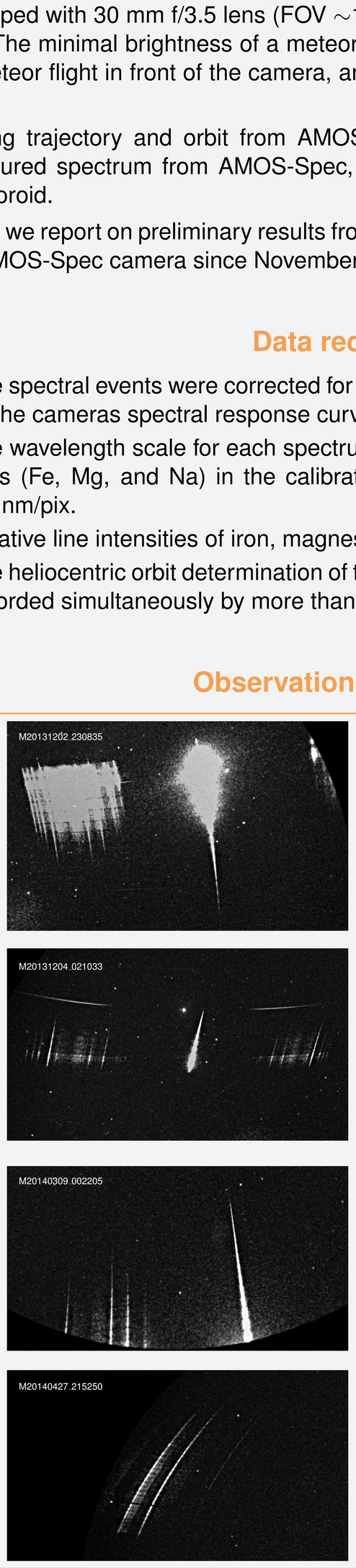
Having trajectory and orbit from AMOS, and merging it with simultaneously measured spectrum from AMOS-Spec, allow us to identify the source of the meteoroid.

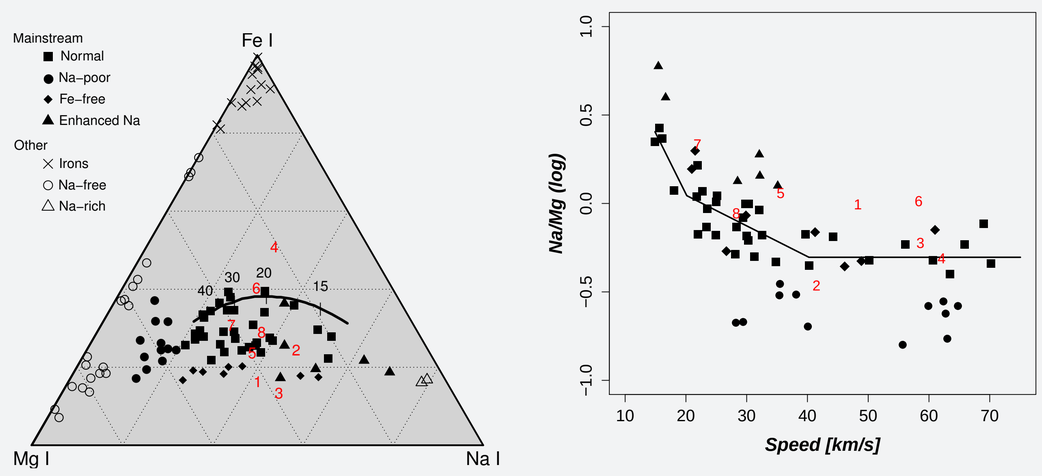
Here, we report on preliminary results from a sample of meteor spectra collected by AMOS-Spec camera since November 2013.

Data reduction

- The spectral events were corrected for dark current, flat-fielded, and multiplied by the cameras spectral response curve.
- The wavelength scale for each spectrum was determined by means of known lines (Fe, Mg, and Na) in the calibration spectrum, with spectral resolution 2.5 nm/pix.
- Relative line intensities of iron, magnesium, and sodium were obtained.
- The heliocentric orbit determination of the meteors was applied if an event was recorded simultaneously by more than one station.

Observations & Results





The measured relative intensities of the Mg I, Na I, and Fe I multiplets (right), and the Na/Mg line intensity ratio in meteors as a function of meteor speed (right). Our data (red) are compared to those derived by [1], defining several classes of meteors.

Summary

Since the AMOS-Spec camera operation we collected over 500 meteors. So far we captured 45 meteor spectra of variable quality, where among them are 15 cases of very good quality spectra. The collected data has been reduced and the first stage of spectral analysis has been conducted. Here we report the best eight cases. Moreover, meteors with captured spectrum have been simultaneously detected by other cameras of the AMOS to facilitate trajectory and orbit calculations.

Spectroscopy analysis is the most powerful scientific tool for studying celestial bodies. It shows its validity in the meteor field, and it is method of studying the chemical composition and other properties of meteoroids and their parent bodies. Nowadays spectroscopic observations of the meteors are mostly routinely carried on during meteor shower campaigns. However, a regular yearlong survey is needed to take full advantage of meteor spectroscopy. It was with this intention that the AMOS-Spec program has been created, to help us fill this gap.

No	Meteor ID	Mag	v_g [km/s]	a [AU]	e	ω [°]	Ω [°]	i [°]	Shower ID
1.	M20131202_230835	-6	48.3	10.6	0.914	210.5	270.8	81.0	#441 NLD
2.	M20131203_050007	-2	41.5	5.1	0.820	212.8	251.0	69.8	#336 DKD
3.	M20131204_021033	-5	58.6	15.5	0.984	120.8	71.9	128.7	#016 HYD
4.	M20140302_030933	-3	62.1	11.7	0.942	249.1	341.3	125.9	#516 FMV
5.	M20140309_002205	-7	35.6	2.7	0.925	311.1	348.2	3.4	#123 NVI
6.	M20140312_033755	-5	58.3	139.0	0.993	161.2	351.3	106.9	spo
7.	M20140427_193525	-3	21.9	4.2	0.816	242.2	37.3	17.9	#138 ABO
*8.	M20140427_215250	-8.7	28.3	3.03	0.877	290.2	37.366	7.1	#047 DLI

*P. Spurny, private communication.

References

[1] J. Borovička, P. Koten, P. Spurný, J. Boček, and R. Štork, Icarus, 174 (2005), p. 15.

[2] J. Tóth, L. Kornoš, P. Vereš, J. Šilha, D. Kalmančok, P. Zigo, and J. Világi, Publications of the Astronomical Society of Japan, 63 (2011), p. 331.

[3] P. Zigo, J. Toth, and D. Kalmancok, in Proceedings of the IMC, 31st IMC, La Palma, Canary Islands, Spain, 2012, (2013), p. 18.

Acknowledgement

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