

spectroscopy/

This dataset contains the following subdirectories with data in the

Raw/

File	Object	Exposure(sec)	Grism
20130209pc0001.fits	Bias	0.00	None
20130209pc0002.fits	Bias	0.00	None
20130209pc0003.fits	Bias	0.00	None
20130209pc0004.fits	Bias	0.00	None
20130209pc0005.fits	Bias	0.00	None
20130209pc0036.fits	ISON	900.00	Grism600
20130209pc0037.fits	HeAr lamp	5.00	Grism600
20130209pc0038.fits	lampff	20.00	Grism600
20130209pc0039.fits	55Cancri	180.00	Grism600
20130209pc0040.fits	HeAr lamp	5.00	Grism600
20130209pc0041.fits	lampff	20.00	Grism600
20130209pc0042.fits	lampff	20.000	Grism600

Processed/

feb_ison.fits	ISON	900.00	Grism600
feb_solar.fits	55Cancri	180.00	Grism600
Flat.fits	Master Flat	20.00	Grism600

Derived/

'*ison_spectrum.tab*' is the text file of wavelength-calibrated comet spectrum. The first column is the wavelength in angstrom, the second column is the relative flux of the comet.

'*ison_continuum.tab*' is the text file of comet continuum obtained from the ISON spectrum. The first column is the wavelength in angstrom, the second column is the normalized continuum flux of the comet.

'*ison_continuum_subtracted.tab*' is the text file of the continuum-subtracted spectrum of the comet. The first column is the wavelength in angstrom, the second column is relative normalized flux.

'*solar_analog.tab*' is the text file of solar analog star 55 Cancri spectrum. The first column is the wavelength in angstrom, the second column is the relative flux of the solar analog.

'*solar_continuum.tab*' is the text file of solar continuum obtained from the solar analog star 55 Cancri spectrum. The first column is the wavelength in angstrom, the second column is the normalized flux of the solar analog.

'*albedo.tab*' is the text file of the reflectance spectrum of the comet. The first column is the wavelength in angstrom, the second column is the reflectance value. The reflectance spectrum is obtained by dividing the comet continuum with that of a solar continuum, which was obtained from the solar analog star 55 Cancri spectrum.

FOSC on Wise Observatory 40-inch telescope (T40).

The data was taken using the Faint Object Spectrograph and Camera (FOSC) mounted on the 1.0 m telescope of the Wise Observatory of Tel-Aviv University, Israel, located in the Negev desert, near the town of Mitzpe Ramon, about 200 km south of Tel-Aviv at an altitude of 875 m above sea level. Wise Observatory FOSC instrument was used on February 9th with a 15'-long 2"-wide slit aligned East-West, approximately in the direction of the apparent motion of the comet. The grism used for this observation, with 600 gr/mm, provides a dispersion of 3.1 Å/pixel. Along with the comet, a spectrum of a solar analog G8V star 55 Cnc was obtained, as well as the calibration spectra: flat-field halogen lamps (lampff), biases, and He-Ar lamps for wavelength calibration. The manual of the FOSC instrument is attached with this document.

Details of the grism used are as follows:

Grism/ Instrument	Frame size px	Slit Dimension WxL	Dispersion Å/px	Range Å	Resolution Å
Grism600/FOSC	340×1300	2"×10"	3.1	3200--7350	15

Reduction Procedure.

The spectroscopic data preprocessing was performed using standard routines of the IRAF software by bias subtraction and flat fielding using halogen lamp (flat-field lamp). The spectroscopic biases were combined using the IRAF utility *zerocombine* (an average value is taken for each pixel, after using a minmax algorithm for cosmic-ray rejection). The combined Master Bias was subtracted from each spectrum in the data. The halogen lamps (flat-field lamp) spectra were then combined to be used as a Master Flat in the reduction using IRAF utility *flatcombine* (average combine with an average sigma clipping factor of +/- 3 to reject cosmic rays). A response function of type spline3, order 25, was fitted to the segment of this Master Flat from which useful spectroscopic data would be extracted (i.e lines 200 to 3000 along the dispersion axis). The IRAF utility *response* used this response function to produce the final, normalized spectroscopic Master Flat.

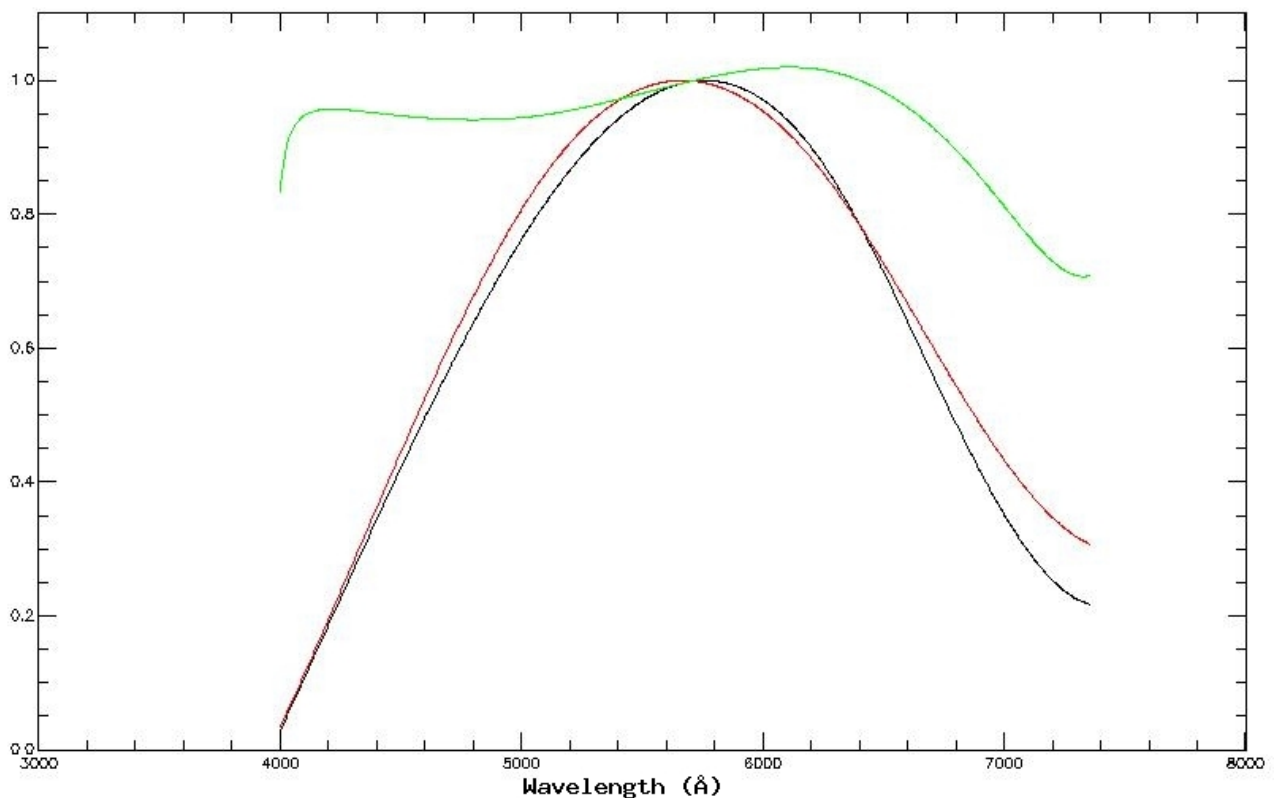
The one-dimensional spectra was obtained using the *apall* function in IRAF with multispec format. The region of interest for extracting the spectrum was considered to be 10 pixels around the optocenter (maximum of light). This algorithm allows us to (a) track and make a polynomial fit to the dispersion axis on the CCD, (b) extract a 1-D target spectrum from a region +/- 10 pixels around the optocenter at each point on the dispersion axis, (c) estimate the local background at each point along the dispersion axis, and (d) to subtract the modelled background from the raw spectrum. The local background here was obtained by a single polynomial fit to two regions, each 50 pixels wide, located +/-Y pixels on either side of the dispersion axis.

Derived Spectra.

Each 1-D spectrum was then wavelength-calibrated using a He-Ar arc spectrum. After that, since the seeing was very poor on that night with low S/N, to reduce the noisy appearance the comet spectrum was smoothed with a three-pixel ($\sim 10 \text{ \AA}$) running-mean filter. The wavelength-calibrated comet spectrum was fitted with a 3rd order polynomial function in IRAF using the *continuum function* to obtain the spectrum of the comet continuum. Comet continuum was then normalized by dividing by the maximum value to obtain the normalized continuum. Comet continuum was then normalized by dividing by the maximum value to obtain the normalized continuum. To obtain the continuum-subtracted relative comet flux, first the wavelength-calibrated comet spectrum was divided by the spectrum of the continuum, and then the normalized continuum was subtracted from the result. Both the continuum and the continuum-subtracted data was used for data analysis.

Reduction of solar analog star 55 Cancri spectrum followed the same reduction routine. The reflectance spectrum was obtained by dividing the normalized comet continuum by the normalized solar analog continuum.

The first figure shows the variation of reflectance with wavelength. Black line: normalized continuum of ISON spectrum; Red line: normalized continuum of solar spectrum; Green line: normalized ratio of both.



The second figure represents the variation of comet continuum-subtracted relative flux with wavelength.

