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MISTRAL OBSERVATIONS OF THE C/2022 E3 (ZTF) COMET BY THE AIX-MARSEILLE M2 STUDENTS: FIRST SCIENCE RESULTS

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Abstract. The bright long period comet C/2022 E3 (ZTF) was observed using the MISTRAL spectrograph camera on the 1.93 m OHP telescope on 2023-02-10. We derived the production rates of (2.61+/-0.04)E26 and (2.51+/-0.07)E26 for C2 ($\Delta\nu = 0$) from our two sets of observations. These values are in close agreement with those reported for the same comet from previous independant observations. The Afρ dust proxy of 5100$\pm$80 cm is also in agreement with literature values at similar epochs.

Keywords: MISTRAL, OHP, Comet

1 Observations and reductions

The bright comet C/2022 E3 (ZTF) was observed in manual tracking mode for different exposure times, 120s and 240s, using the MISTRAL spectrograph camera on the 1.93 m OHP telescope on 2023-02-10 when the comet was at a distance of 1.20 au from the Sun and 0.39 au from the Earth. We used the blue mode covering the $\sim$4200-8000A range at resolution $\sim$750 with a 1.9arcsec width slit. All the acquired frames for different exposures were bias subtracted and then flat fielded using the spectral flat lamp present in the instrument (Tungsten). The cosmic rays were removed using the LACOSMIC package (van Dokkum 2001). The reduced and extracted 1D spectrum is shown in Fig.1.

Both the 120s and 240s spectra, even if slightly trailed, were used to compute the production rates of C2 ($\Delta\nu = 0$) emission band using a single aperture (200 pixel aperture) with the comet at the centre, as mentioned in Aravind et al. (2021). The 120s spectra that were better guided with a narrower dust continuum were used to extract spectra with apertures of equal widths moving away from the photo centre to compute spatial profile of the column density and hence the production rates with the help of Haser (1957) modelling. The HgArXe lamp available in the instrument was used in both cases to wavelength calibrate all the extracted spectra. The spectrophotometric standard, Hiltner600, observed on the same night using the same configuration was used to produce the sensitivity curve of the instrument and then flux calibrate the comet spectra. The Solar analog standard star HD19445 was observed on the same night to remove the dust reflected solar continuum present in the optical spectra. Even though, ideally, a separate sky frame of similar exposure is required to remove the sky background from the comet frames, we used the sky from a point source observed with a similar exposure time on the same night to remove the sky lines.

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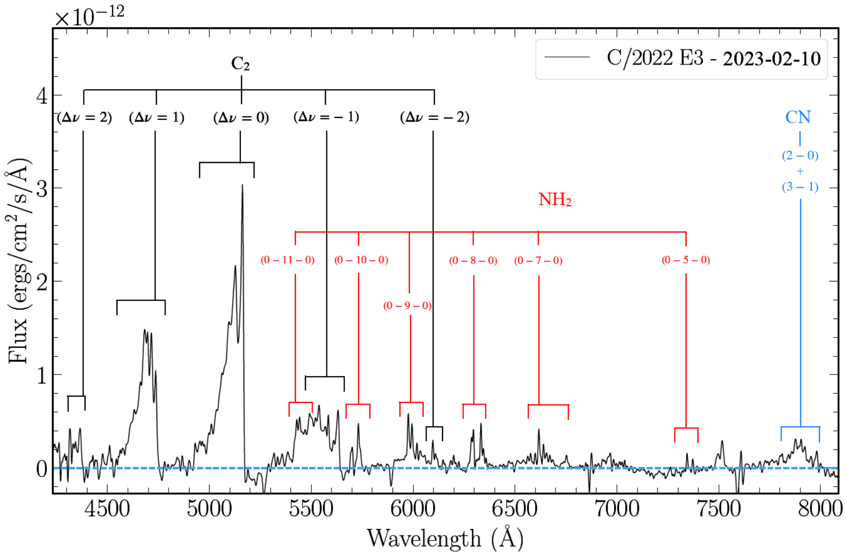

Fig. 1. Optical spectrum of comet C/2022 E3 (ZTF) observed using the MISTRAL spectrograph camera on the OHP telescope. The spectrum, obtained from the 240s frame, was extracted using a 29.2arcsec x 1.93arcsec aperture with the comet at the centre. The main cometary emissions are labelled.

2 Analysis

Several usual cometary emission bands were detected from C2, NH2 and CN radicals. The production rate of (2.61+/-0.04)E26 and (2.51+/-0.07)E26 for C2 ($\Delta\nu = 0$) were computed for the 240s frame and 120s respectively and are in good agreement with the values reported for the same comet from the TRAPPIST telescopes ((Jehin et al. 2022); ATel 15822). The Afρ, a proxy to the dust production (A'Hearn et al. 1984) computed for the green continuum narrow band filter (Farnham et al. 2000), from spectroscopic data using techniques as mentioned in (Aravind et al. 2022), was found to be around 5100$\pm$80 cm, which is again in agreement with the values reported from TRAPPIST for the comet at similar observational epochs.

3 Conclusions

With the help of these observations, the MISTRAL spectrograph camera on the OHP telescope proves to be reliable for cometary observations for a wavelength range of 4200A - 8000A. With proper differential tracking and required frames acquired in an orderly manner, longer exposure observation of fainter and more distant comets could be used to effectively analyse the column density profiles of the various emission bands marked in the figure, which can further be used to compute their production rates.

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