



Follow-up of the activity and composition of the interstellar comet 2I/Borisov with MUSE

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The interstellar comet 2I/Borisov was discovered on August 20, 2019. It is only the second interstellar object to be observed crossing our Solar System, and the first one for which outgassing was detected directly [1]. Early observations indicated that 2I/Borisov is depleted in C₂, similarly to about 30% of Solar System comets [2,3]. Preliminary observations with the MUSE IFU performed in November 2019 confirmed that 2I is depleted in C₂ but also showed it is rich in NH₂ [4]. We present here results from the full observing campaign performed with the MUSE instrument.

MUSE is a multi-unit integral field spectrograph mounted on the UT4 telescope of the VLT [5]. The instrument covers the wavelength range from 480 to 930 nm with a resolving power of about 3000. It has a large field of view of 1'x1' and a spatial resolution of 0.2'', which makes it an ideal instrument to study extended sources. We observed 2I with MUSE on 16 different dates between November 14, 2019 and March 19, 2020. The observations started about one month before the perihelion passage and continued until the comet reached 3 au post-perihelion. This data sets constitutes a great opportunity to study the activity and coma composition of 2I over several months.

Our observations allow us to detect emission bands from C₂, NH₂, and CN. Using a Haser model [6] we derive production rates for those 3 species and follow their evolution. We also study the evolution of the ratio between those production rates, to monitor how the composition of 2I coma changes as a function of time and distance from the Sun.

References:

[1] Fitzsimmons et al., 2019, The Astrophysical Journal Letters, Volume 885, Issue 1, article id. L9, 6 pp.[2] Opatom et al., 2019, Astronomy & Astrophysics, Volume 631, id.L8, 5 pp.; [3] Lin et al., 2019, The Astrophysical Journal Letters, Volume 889, Issue 2, id.L30;[4] Bannister et al, 2020, submitted to ApJ Letters; [5] Bacon et al, 2010, Proceedings of the SPIE, Volume 7735, id. 773508; [6] Haser, 1957,Bulletin de la Classe des Sciences de l'Académie Royale de Belgique, vol. 43, p. 740-750

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