

Molecular composition of comet 46P/Wirtanen

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Abstract

Comet 46P/Wirtanen, the former Rosetta target, is a short-period Jupiter-family comet which made its closest approach to the Earth on 16 December 2018 at 0.077 AU. An international observing campaign [1] was established to follow this very favourable apparition. We observed comet 46P with the IRAM-30m and NOEMA radio telescopes between 11 and 25 December 2018 and with the Nançay radio telescope from September 2018 to February 2019. A dozen molecules (OH, HCN, HNC, CH₃CN, CH₃OH, H₂S, CS, H₂CO, NH₂CHO, CH₃CHO, CH₂OHCH₂OH, H₂CS, C₂H₅OH) were detected or tentatively detected and significant upper limits on the abundance of several others were obtained. This is the first Jupiter-family comet in which we could clearly detect complex organic molecules (such as formamide, acetaldehyde and ethylene-glycol). We will compare their abundances relative to water with those measured in other comets. While the composition of 46P appears relatively normal in methanol (~3.3% relative to water) and rich in H₂S (~0.9%), the comet shows strong depletion in HNC, HC₃N, CS, HCOOH and HNCO in comparison to other comets observed at similar heliocentric distances. The field of view of the observations was relatively small (500-1000 km) and these later molecules might have appeared under-abundant if coming from a distributed source in the coma of larger scale-length. The comet is also CO poor (CO/H₂O < 1.2%). Upper limits on the abundance of a dozen of other molecules and constraints on isotopic ratios will be presented.



Figure 1: Comet 46P/Wirtanen at closest approach on 16.1 Dec. 2018 and the Pleiades. © N. Biver

