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Physical characterization of the active asteroid (6478) Gault from a multi-apparition campaign (2018–2020)

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(6478) Gault is a main-belt asteroid that was found to display cometary activity in late 2018-early 2019 [1]. During its 2018-2019 apparition, Gault experienced several activity events leading to the development of up to three distinct tails [2,3,4]. Many hypotheses such as impacts with smaller objects, YORP induced spin-up [5], sublimation of volatiles [6], or even the presence of a satellite in a highly eccentric and chaotic orbit, were considered to explain these events.

In this talk we present new photometric and spectroscopic observations of Gault obtained during the 2018-2019 and 2020 apparitions. These observations were obtained both when Gault was active (during the 2018-2019 apparition) and when it was found to be inactive during the 2020 apparition. For the first time we determine an accurate rotation period with high confidence of P=2.4929 ± 0.0003 h with a low amplitude of only 0.06 mag. This rotation period associated with a low lightcurve amplitude is consistent with a bulk density no smaller than 1.85 g cm3 in order for its activity to be triggered by the YORP spin-up mechanism. Our spectral analysis is consistent with Gault being of ordinary chondrite-like composition. Several spectra and a large datasets of broad band spectro-photometric observations obtained over the two oppositions do not show any sign of spectral variation over time.

Finally, we did not find any statistically significant signal of non-gravitational accelerations due to its activity even after the addition of previously unidentified detections of Gault dating back to 1958, which increased its orbital arc by a factor of almost 2.

These results were published in [7].

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