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Probing the transient and variable night sky with the Dutch-led multi-colour BlackGEM array

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In recent decades, numerous telescopes have been built to identify transients and periodic variables in the night sky. These telescopes have provided a boom in our understanding of the wide variety of transients and their progenitor systems in many astrophysical contexts. While the Northern hemisphere has enjoyed several dedicated telescopes observing both transient and periodic phenomena on various time-scales, the Southern hemisphere is relatively under-explored in comparison. The BlackGEM array is comprised of three telescopes with 6 filters located at the La Silla observatory in Chile and is tasked with rapidly identifying and characterising the electromagnetic counterparts to gravitational wave events detected by the LIGO-Virgo-KAGRA array. In addition to gravitational wave follow-up, BlackGEM and its predecessor MeerLICHT regularly identify transients of all types and provide dedicated high-cadence time-series observations of select fields down to 20th magnitude. In the talk, I will discuss the initial results of the BlackGEM mission and its five observing programs aimed at exploring
variability of the faint sky at multiple time scales. Specifically, I will present our sample of various transients as well as the initial
populations of O&B star binaries, compact binaries and compact pulsators contemporaneously observed in multiple filters. Finally, I will present the ongoing mission of BlackGEM to probe the multi-colour variability of the faint Southern sky.

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