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tilepy: rapid tiling strategies in mid/small FoV observatories

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The challenges inherent to time-domain multi-messenger astronomy require strategic actions to perform suited, optimized follow-up observations efficiently. Poorly localized events require dedicated tiling and/or targeted follow-up campaigns so that the source location can be efficiently covered, increasing the chances to detect the multi-wavelength counterpart. We have developed the python package “tilepy” to rapidly derive the observation scheduling of large uncertainty localization events by small/mid-FoV instruments. Developed initially to provide a rapid response to gravitational wave (GW) alerts by Imaging Atmospheric Cherenkov Telescopes (IACTs), they have been proven successful, as shown by the GW follow-up during O2 and O3 with the H.E.S.S. telescopes, and particularly in the follow-up of GW170817, where the first obtained tile covered the true location of the binary neutron star (BNS) merger.
We present “tilepy”, a publicly available python package tha comprises several mature follow-up scheduling strategies. These range from the use of parallel, low-resolution grids, to the full integration of sky regions and targeted observations using galaxy catalogs. These algorithms consider the visibility constraints of customisable observatories and allow to schedule observations in both astronomical darkness and in moonlight conditions. We will present a generalization and improvements that enable to use these rapid strategies in a large variety of observatories and for other astrophysical events, alerts showing large uncertainties in the localization, as Gamma-Ray Burst (GRB) alerts from Fermi-GBM or high-energy neutrinos. We will conclude by describing the latest developments that include a publicly available cloud computing platform that allows easy access to the “tilepy”scheduling without the need for a local installation. We will finally describe use-cases of this tool and illustrate the integration into the Astro-COLIBRI multi-messenger platform.

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