Blazar variability with the Vera C. Rubin Legacy Survey of Space and Time (LSST)

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Accepted for publication in the ApJS Focus Issue on Rubin Cadence (Preprint at https://arxiv.org/abs/2111.10172)

Conclusions:

• In the WFD, we favour visits with two snapshots of 15 s each to mitigate saturation of flaring and bright blazars. No cadence was found to perform much better than the 1.7 baseline cadence, whose main disadvantage is to pair visits in contiguous filters in the same night
• In DDFs, we expect only a few bright sources, so that the problem of saturation should have a limited impact, and cadences with single 30 seconds exposures, which provide much more sampling, may be adopted. However, with respect to the baseline, a more beneficial cadence should include shorter exposure sequences more often, and in particular intranight observations of the same DDF with more time spacing between visits in the same filter. A DDF observing strategy like that included in the “daily ddf” OpSim run represents a better choice than the baseline implementation, but this can be further improved introducing a more homogeneous sampling of the different variability time-scales, as also proposed by Eric Bellm in his cadence note.
• In both WFD and DDFs, visits with different filters in the same night are required to obtain colour indices with data close in time, which is necessary to avoid bias in colours due to variability; this means that the “samefilt” OpSim runs are detrimental.
• Colour variability and trends with brightness are stronger when colours are obtained with data in filters that are more separated in wavelength; therefore, in both WFD and DDFs the choice of filters to pair in the same night should prefer bands that are not contiguous.
• We favour an extension of the WFD footprint to the North, with an enlargement of the low-extinction extragalactic sky, which would also be reachable by many more observing facilities that could complement the Rubin-LSST monitoring. But this should be accomplished without decreasing the sampling.
• Observations at high air masses can be beneficial, as they can prolong the observing season and lead to smaller gaps in the light curves.
• Blazars are neutrino source candidates. ToO observations when neutrino facilities detect high-energy neutrinos of astrophysical origin could help clarify the origin of these particles.