PDC 2021
Vienna, Austria

Please submit your abstract at
https://atpi.eventsair.com/7th-iaa-planetary-defense-conference-2021/abstractsubmission

You may visit https://iaaspace.org/pdc

○ **Advancements in NEO Discovery**
○ **Mission & Campaign Design**

Discovering and Characterizing Near Earth Objects with Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST)

R. Lynne Jones[a,1,*], Siegfried Eggl[a,1], Mario Jurić[a,1], Željko Ivezić[a,1]

[a]*Department of Astronomy and the DiRAC Institute, University of Washington, 3910 15th Ave NE, Seattle, WA, 98195, USA*

Keywords: Rubin Observatory, LSST, NEO discovery, NEO survey

Rubin Observatory's (Rubin) will carry out the Legacy Survey of Space and Time (LSST), which will detect a remarkable number of small bodies throughout the solar system. The LSST will have the capability to discover on the order of 100K Near Earth Objects (NEOs), 5.5M main belt asteroids, and 40K transNeptunian objects, with further discoveries of interstellar objects, comets, mini-moons and irregular satellites. With Rubin's 9.6 square degree field of view (3.2 Gigapixel camera) and 6.5m effective diameter mirror [1], it is expected to discover about 60% of the NEO population with $H < 22$, or about 70% of the population when combined with other ongoing surveys, a significant contribution toward planetary defense [2]. Including objects beyond $H = 22$,, the LSST will detect approximately 100K NEOs down to $H < 25$, and likely on the order of 250K when even smaller objects are considered. During the LSST, Rubin will continually image the sky for ten years in ugrizy filters, resulting in a rich dataset that will also be used for characterization studies.

We are currently fine-tuning the LSST survey strategy. The general survey footprint covering most of the visible southern sky with higher airmass extensions to follow the entire ecliptic and general survey strategy to observe each field throughout the ten year survey lifetime can be improved by small amounts to better serve our diverse science goals. Some of these fine-tuning options include introducing various degrees of non-uniform ('rolling') cadence or adding a twilight survey targeting NEO or interior-to-Earth's orbit objects. Many potential changes in the survey strategy have a minimal impact on completeness for small body populations across the Solar System, but can have varying impacts on characterization studies. We will present preliminary results of light curve and color determination simulated from LSST cadences, and discuss some further characterization metrics in development in the LSST Solar System Science Collaboration. We will show the results of completeness estimates for various LSST survey strategy options, and discuss the ongoing survey strategy optimization process, along with an updated timeline of the project.

References

[1] Ž. Ivezić, S. M. Kahn, J. A. Tyson, B. Abel, E. Acosta, R. Allsman, D. Alonso, Y. AlSayyad, S. F. Anderson, J. Andrew, J. R. P. Angel, G. Z. Angeli, R. Ansari, P. Antilogus, C. Araujo, R. Armstrong, K. T. Arndt, P. Astier, É. Aubourg, N. Auza, T. S. Axelrod, D. J. Bard, J. D. Barr, A. Barrau, J. G. Bartlett, A. E. Bauer, B. J. Bauman, S. Baumont, E. Bechtol, K. Bechtol, A. C. Becker,

*Corresponding author
Email addresses: ljones.uw@gmail.com (R. Lynne Jones), siegfried.eggl@gmail.com (Siegfried Eggl), mjuric@astro.washington.edu (Mario Jurić), ivezic@uw.edu (Željko Ivezić)
[1]Department of Astronomy and the DiRAC Institute, University of Washington, and and Rubin Observatory

J. Becla, C. Beldica, S. Bellavia, F. B. Bianco, R. Biswas, G. Blanc, J. Blazek, R. D. Blandford, J. S. Bloom, J. Bogart, T. W. Bond, M. T. Booth, A. W. Borgland, K. Borne, J. F. Bosch, D. Boutigny, C. A. Brackett, A. Bradshaw, W. N. Brandt, M. E. Brown, J. S. Bullock, P. Burchat, D. L. Burke, G. Cagnoli, D. Calabrese, S. Callahan, A. L. Callen, J. L. Carlin, E. L. Carlson, S. Chandrasekharan, G. Charles-Emerson, S. Chesley, E. C. Cheu, H.-F. Chiang, J. Chiang, C. Chirino, D. Chow, D. R. Ciardi, C. F. Claver, J. Cohen-Tanugi, J. J. Cockrum, R. Coles, A. J. Connolly, K. H. Cook, A. Cooray, K. R. Covey, C. Cribbs, W. Cui, R. Cutri, P. N. Daly, S. F. Daniel, F. Daruich, G. Daubard, G. Daues, W. Dawson, F. Delgado, A. Dellapenna, R. de Peyster, M. de Val-Borro, S. W. Digel, P. Doherty, R. Dubois, G. P. Dubois-Felsmann, J. Durech, F. Economou, T. Eifler, M. Eracleous, B. L. Emmons, A. Fausti Neto, H. Ferguson, E. Figueroa, M. Fisher-Levine, W. Focke, M. D. Foss, J. Frank, M. D. Freemon, E. Gangler, E. Gawiser, J. C. Geary, P. Gee, M. Geha, C. J. B. Gessner, R. R. Gibson, D. K. Gilmore, T. Glanzman, W. Glick, T. Goldina, D. A. Goldstein, I. Goodenow, M. L. Graham, W. J. Gressler, P. Gris, L. P. Guy, A. Guyonnet, G. Haller, R. Harris, P. A. Hascall, J. Haupt, F. Hernandez, S. Herrmann, E. Hileman, J. Hoblitt, J. A. Hodgson, C. Hogan, J. D. Howard, D. Huang, M. E. Huffer, P. Ingraham, W. R. Innes, S. H. Jacoby, B. Jain, F. Jammes, M. J. Jee, T. Jenness, G. Jernigan, D. Jevremović, K. Johns, A. S. Johnson, M. W. G. Johnson, R. L. Jones, C. Juramy-Gilles, M. Jurić, J. S. Kalirai, N. J. Kallivayalil, B. Kalmbach, J. P. Kantor, P. Karst, M. M. Kasliwal, H. Kelly, R. Kessler, V. Kinnison, D. Kirkby, L. Knox, I. V. Kotov, V. L. Krabbendam, K. S. Krughoff, P. Kubánek, J. Kuczewski, S. Kulkarni, J. Ku, N. R. Kurita, C. S. Lage, R. Lambert, T. Lange, J. B. Langton, L. Le Guillou, D. Levine, M. Liang, K.-T. Lim, C. J. Lintott, K. E. Long, M. Lopez, P. J. Lotz, R. H. Lupton, N. B. Lust, L. A. MacArthur, A. Mahabal, R. Mandelbaum, T. W. Markiewicz, D. S. Marsh, P. J. Marshall, S. Marshall, M. May, R. McKercher, M. McQueen, J. Meyers, M. Migliore, M. Miller, D. J. Mills, C. Miraval, J. Moeyens, F. E. Moolekamp, D. G. Monet, M. Moniez, S. Monkewitz, C. Montgomery, C. B. Morrison, F. Mueller, G. P. Muller, F. Muñoz Arancibia, D. R. Neill, S. P. Newbry, J.-Y. Nief, A. Nomerotski, M. Nordby, P. O'Connor, J. Oliver, S. S. Olivier, K. Olsen, W. O'Mullane, S. Ortiz, S. Osier, R. E. Owen, R. Pain, P. E. Palecek, J. K. Parejko, J. B. Parsons, N. M. Pease, J. M. Peterson, J. R. Peterson, D. L. Petravick, M. E. Libby Petrick, C. E. Petry, F. Pierfederici, S. Pietrowicz, R. Pike, P. A. Pinto, R. Plante, S. Plate, J. P. Plutchak, P. A. Price, M. Prouza, V. Radeka, J. Rajagopal, A. P. Rasmussen, N. Regnault, K. A. Reil, D. J. Reiss, M. A. Reuter, S. T. Ridgway, V. J. Riot, S. Ritz, S. Robinson, W. Roby, A. Roodman, W. Rosing, C. Roucelle, M. R. Rumore, S. Russo, A. Saha, B. Sassolas, T. L. Schalk, P. Schellart, R. H. Schindler, S. Schmidt, D. P. Schneider, M. D. Schneider, W. Schoening, G. Schumacher, M. E. Schwamb, J. Sebag, B. Selvy, G. H. Sembroski, L. G. Seppala, A. Serio, E. Serrano, R. A. Shaw, I. Shipsey, J. Sick, N. Silvestri, C. T. Slater, J. A. Smith, R. C. Smith, S. Sobhani, C. Soldahl, L. Storrie-Lombardi, E. Stover, M. A. Strauss, R. A. Street, C. W. Stubbs, I. S. Sullivan, D. Sweeney, J. D. Swinbank, A. Szalay, P. Takacs, S. A. Tether, J. J. Thaler, J. G. Thayer, S. Thomas, A. J. Thornton, V. Thukral, J. Tice, D. E. Trilling, M. Turri, R. Van Berg, D. Vanden Berk, K. Vetter, F. Virieux, T. Vucina, W. Wahl, L. Walkowicz, B. Walsh, C. W. Walter, D. L. Wang, S.-Y. Wang, M. Warner, O. Wiecha, B. Willman, S. E. Winters, D. Wittman, S. C. Wolff, W. M. Wood-Vasey, X. Wu, B. Xin, P. Yoachim, H. Zhan, LSST: From Science Drivers to Reference Design and Anticipated Data Products, Astrophysical Journal 873 (2019) 111.

[2] R. L. Jones, C. T. Slater, J. Moeyens, L. Allen, T. Axelrod, K. Cook, Ž. Ivezić, M. Jurić, J. Myers, C. E. Petry, The Large Synoptic Survey Telescope as a Near-Earth Object discovery machine, Icarus 303 (2018) 181–202.