Review of: "ALR_Sim_tracks - trajectory simulator software to assist the search for favourable trajectories for the exploration of the triple Asteroid 2001-SN263 from the Laser Altimeter point of view"

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General

The SW is very specific for the application of asteroid observation that seems peculiar. Perhaps the same SW, integrating other models (concerning additional equipment for sensing and environment) would be applicable for planetary observation. Some considerations on this aspect would be worth to be done.

Section 2

The nomenclature and acronym list could be defined before Figure 1 and 2. In this moment the variables are described after the figures. This fact makes more difficult the reading and comprehension.

Para. 2.1 Input parameters. It is correctly stated that "The parameters that model a target or instrument are usually more or less accurate models of them." Accounting this sentence it would be expected the possibility to elaborate parameters with linked error ranges. Even if this SW is only applicable for the selection of the trajectories, and not for a complete end to end simulation, the initial conditions of the trajectories should be affected by realistic uncertainties. If the SW can only execute singular test cases, the possibility to expand its capability to simulate Monte Carlo cases could be accounted for future developments.

Para. 2.1.1 Target parameters. The approach for the simulation of asteroid shape and kinematic behavior is simplified. This is correctly declared. However the successive description and figures show results that would be applicable only in the very specific cases of a perfect ellipsoid. Indeed, a celestial object with an odd morphology rotating around its maximum inertia axis would present surfaces continuously changing their orientation and distance from the orbiting altimeter.

This aspect seems not peculiarly taken into account in the description of the performances even if in the end of the paper something is said about SW evolutions about " *replacing simplified models of the target (in the case of 2001-SN263, a scalene ellipsoid was used, according to [7]), with ones that are more faithful to its actual geometry*".

Para. 2.1.2 Instrument parameters. Among the uncertainties related to the instrument the category of backscattering is specific because in reality concerns the mutual relationship of the laser altimeter with the terrain. The backscattering in

turn is depending on the incidence angle of the laser beam and on the distance but is also deeply influenced by the nature and density of the terrain. A SW module could be identified ad hoc to handle potential different backscattering profiles among a suite of realistic cases because locations considered observable at the highest latitude could be not observable in the reality. If this is already present it could be declared.

Para. 2.1.3 Spacecraft parameters. This section includes possible reference attitude Sun pointing or Nadir pointing. For performance reliability, an enhancement could be obtained in the direction of the SW to include GNC/AOCS errors parametrized by the user in the frequency domain to obtain, in the time realizations, uncertainties with variable numerical amplitude, in dependence on the length of the observed time horizons.

Para. 2.3.1 Fig 4.a and Fig 4.c have to be compared like Fig 4.b with Fig 4.d. However for this second comparison the titles of the figures are misleading. It could be easier for reading the indication in the titles that are both in the inertial heliocentric frame.

Section 3. The title could be changed into "Flexibility of the simulator to other optical instruments" removing the question mark.

Section 4. This section of conclusions and comments could be separated in two sections, the former relevant to the future developments and the latter to the conclusions. In addition the conclusions could include the summary of the SW functionalities currently located in the prologue of Paragraph 2.4, leaving as introduction for the successive sub-sections only the sentence "*The modules that make up the software are listed below and the function of each is described. In the MATLAB environment, subroutines are functions called within the main program.*"