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CONSTRUCTING OPTIMIZED OBSERVATIONS - THE SOLAR SYSTEM SCIENCE OPERATIONS LABORATORY

Abstract

Planetary Science planning activities are often driven by spacecraft technical constraints, such as pointing and thermal limitations or link budgets. Therefore Science Operations Centers when deriving requirements usually put emphasis in giving the user the tools to deal with such constraints.

This is of course necessary, as otherwise planning would be impossible. However, science parameter requirements are sometimes left in the bottom of the development chain.

In order to improve the science planning for planetary missions a Science Observation Planning Tool was developed where the focus is put more on the optimization of the science goals. This tool allows for parametric analysis of science quantities, together with the most important technical constraints, in order to optimize the observation plan.

A first prototype was developed for the Venus Express mission. It uses SPICE, a planetary ancillary data library, to simulate the spacecraft surroundings as well as all the relevant scientific parameters, and allows the user to modify pointing parameters in order to optimize the observing conditions while keeping within the spacecraft constraints. This prototype entered production in a limited frame as a pointing analysis and implementation tool for the science operations of the Venus Monitoring Camera on board Venus Express.

With the success of the first prototype, a second prototype was developed as a multi-mission analysis tool, with any type of central body or even several targets. With the same core, the focus now was to further extend its functionality to extended periods, and to provide a large range of science analysis tools so that a science focused analysis tool can be used in different parts of the planning cycle, from the early study phases of mission analysis to the last week before an observation takes place in short term planning aiming to be implemented in future Solar System missions of the European Space Agency such as Jupiter Icy Moons Explorer (JUICE), Solar Orbiter or Marco Polo-R.

The Solar System Science Operations Laboratory (SOLab) provides a variety of science quantity plots, geometrical events and visual displays that help assess the feasibility of science observations and science campaigns. This paper will outline its capabilities as well as use cases, and demonstrate the added value such a tool provides to planetary science missions.