Communication of Science Plans in the Rosetta Mission

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Rosetta is a mission of the European Space Agency (ESA) to rendez-vous with comet Churyumov-Gerasimenko in mid-2014. The trajectories and their corresponding operations are both flexible and particularly complex. To make informed decisions among the many free parameters, novel ways to communicate operations to the community have been explored. To support science planning by communicating operational ideas and disseminating operational scenarios, the science ground segment makes use of Web-based visualisation technologies. To keep the threshold to analysing operations proposals as low as possible, various implementation techniques have been investigated. An important goal was to use the Web to make the content as accessible as possible. By adopting the recent standard WebGL and generating static pages of time-dependent three-dimensional views of the spacecraft as well as the corresponding field-of-views of instruments, directly from the operational and for-study files, users are given the opportunity to explore interactively in their Web browsers what is being proposed in addition to using the traditional file products and analysing them in detail. The scenes and animations can be viewed in any modern Web browser and be combined with other analyses. This is to facilitate verification and cross-validation of complex products, often done by comparing different independent analyses and studies. By providing different timesteps in animations, it is possible to focus on long-term planning or short-term planning without distracting the user from the essentials. This is particularly important since the information that can be displayed in a Web browser is somewhat related to data volume that can be transferred across the wire. In Web browsers, it is more challenging to do numerical calculations on demand. Since requests for additional data have to be passed through a Web server, they are more complex and also require a more complex infrastructure. The volume of data that can be kept in a browser environment is limited and might have to be transferred over often slow network links. Thus, careful design and reduction of data is required. Regarding user interaction, Web browsers are often limited to a mouse and keyboards. In terms of benefits, the threshold and turn-around times
for discussing operational ideas by using the visualisation techniques described here are lowered. An additional benefit of the approach was the cooperative use of products by distributed users which resulted in higher-quality software and data by incorporating more feedback than what would usually have been available.