



## **Using Jupyter Notebooks for Interactive Space Science Simulations**

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Jupyter Notebooks can be used as an effective means to communicate scientific ideas through Web-based visualisations and, at the same time, give a user more than a pre-defined set of options to manipulate the visualisations. To some degree, even computations can be done without too much knowledge of the underlying data structures and infrastructure to discover novel aspects of the data or tailor view to users' needs. Here, we show how to combine Jupyter Notebooks with other open-source tools to provide rich and interactive views on space data, especially the visualisation of spacecraft operations. Topics covered are orbit visualisation, spacecraft orientation, instrument timelines as well as performance analysis of mission segments. Technically, also the re-use and integration of existing components will be shown, both on the code level as well on the visualisation level so that the effort which was put into the development of new components could be reduced. Another important aspect is the bridging of the gap between operational data and the scientific exploitation of the payload data, for which also a way forward will be shown. A lesson learned from the implementation and use of a prototype is the synergy between the team who provisions the notebooks and the consumers, who both share access to the same code base, if not resources; this often simplifies communication and deployment.