The Planetary Software Organization and Open Source Software Governance. J. Mapel[1], A. M. Annex[2], K. M. Aye[3], R. A. Beyer[4,5], J. Laura[1], and V. Silva[6]. [1]USGS Astrogeology Science Center, Flagstaff, AZ 86001 (jmapel@usgs.gov), [2]Johns Hopkins University, Baltimore, MD 21218, [3]Univserity of Colorado at Boulder, Boulder, CO 80309, [4]SETI Institute, Mountain View, CA 94043, [5]NASA Ames Research Center, Mountain View, CA 94043, [6]Arizona State University, Tempe, AZ 85281.

Introduction: The Planetary Software Organization works to promote open source software in the planetary sciences by helping software creators examine and improve their governance.

Governance is a component of all Open Source Software (OSS). Even if it is not stated formally, the contributors to an OSS project are making decisions and interacting with each other, users, and those not affiliated with the project [1]. Examining and improving the governance of an OSS project helps the project achieve its goals, such as facilitating planetary science [2].

The Technical Steering Committee (TSC) is the governing body of the Planetary Software Organization. It is modeled after the Node.js Technical Steering Committee [7]. The TSC is tasked with mentoring OSS projects and administering the Planetary Software Organization GitHub Organization. The fundamental decision making process of the TSC is lazy consensus.

Software Governance: There are three critical components of software governance: participation, processes, and transparency.

Participation. The contributors to OSS are a community of practice that work together to improve the software [1]. Who is a part of that community and who they are responsible to are the first component of governance. For example, a contributor could be someone who submits a pull request and they are responsible to the committer that reviews their pull request. In turn, that committer could be responsible to a project leader that sets the scope of the project.

Processes. The ultimate goal of OSS is to continuously improve. Software governance establishes the processes that guide this continuous evolution [2]. These processes vary depending on the project, but ideally all of them ensure the participants are collaborating to achieve the goals of the project. Processes often describe how participants in OSS are expected to interact. For example, a code of conduct describes what conduct is acceptable and what conduct is unacceptable.

Transparency. Participants in OSS are loosely affiliated and the majority of participants only contribute a small amount of work [1]. Transparent operations and decision making in a project keeps participants heading in the same direction and reinforces collective responsibility [3]. A contributor can work on a particular part of an OSS project and then move on. By having open discussions, the contributor can easily return to the OSS project if there is a bug or another contributor wants to modify that part of the project. For new participants, transparent processes and decisions demonstrate how to contribute to the OSS project and provide crucial onboarding points. Open discussions and commentary give new participants a place to contribute any expertise they have and opportunities to learn from and ask questions of other participants.

Planetary Software Organization Projects: The Planetary Software Organization is a collection of OSS projects that share ideas and best practices to improve their software governance. These projects are referred to as Top Level Projects (TLPs) and each TLP is invited to have a representative on the TSC.

Currently, there are two TLPs in the Planetary Software Organization: the Integrated Software for Imagers and Spectrometers project [4], and the PlanetaryPy Project [5].

The Planetary Software Organization also provides governance documents such as contribution guidelines and a code of conduct that can be used off-the-shelf. OSS projects are not required to join the Planetary Software Organization to use these documents. If a new OSS project wants to become a TLP, there is an application process where a mentor from the TSC is assigned to help the project with their governance until they meet the requirements for becoming a TLP.

Top Level Projects do not give up any of their autonomy or ownership by joining the Planetary Software Organization; they become collaborators with the other TLPs to make software for planetary science better. It is also not necessary that all TLPs share the same governance models. Depending on the maturity, scope, and goals of an OSS project there are many valid governance models. For example one project could be run by a single maintainer who accepts contributions from interested parties while another could have a highly differentiated core team that manages different components independently but works together to maintain alignment. The ultimate goal of the Planetary Software Organization is to promote and improve all types of OSS for planetary science.

The Technical Steering Committee: The Planetary Software Organization has its own governance which is led by the Technical Steering Committee (TSC). The

TSC membership consists of participants from the TLPs and each TLP is invited, but not required, to add a member to the TSC. Additional members can also be added by the TSC itself. The TSC hosts all of its documents and meeting notes on GitHub [6].

The TSC is a "do-ocracy" where members promote the topics that they are interested in. All TSC members can add items to meeting agendas to share their findings or seek input on problems. Similarly, all decisions are made via lazy consensus. Interested members discuss the topic and then if there are no objections a decision is made [3]. In extreme cases, a majority vote can be taken, but this is a last resort. This setup was chosen to mirror how OSS is developed. Participants can engage with the parts of the project they are most interested in but do not need to full engage with every component of the project.

References: [1] de Laat, P.B. (2007) *J Manage Governance, 11*, 165-177. [2] Chulani S. et al. (2008) *Proceedings of the 1st International Workshop on Software Development Governance*, 3-6. [3] Capra E. et al. (2008) *IEEE Transactions on Software Engineering, 34*, 765-782. [4] Sucharski T. et al. (2020) *ISIS 4.2.0 Public Release*. [5] Aye, M. et al., this conference, https://github.com/planetarypy/TC. [6] https://github.com/planetarysoftware/TSC. [7] https://github.com/nodejs/TSC.