

## Application Usability Levels: Their evolution and eco-system

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As space physics becomes both more interdisciplinary and more intertwined with commercial and government operations, there is a need for a framework to easily identify what projects can be used for specific applications and how close each project is to routine autonomous or on-demand implementation and operation. We have developed the Application Usability Level (AUL) framework and encourage publication of instrument-like papers for delivering and publicizing AULs to help the community quantify the progress of successful applications, metrics, and validation efforts.

In a given project within the AUL framework, there is typically a diverse eco-system of individuals necessary to ultimately produce a useful space weather product or productive research collaboration. For example, in the case of non-academic fields, users and researchers alike may benefit from a translator, i.e. a *broker*, who may help with the effective transition from research to operations. *Independent validators* are another essential player for validation efforts and comparing like products for a specified application. In many cases, the different players throughout the process will act in multiple roles as well as act in different roles for different projects and AUL pathways.

This paper we discuss the collaborative roles that lead from basic research to successful application within or outside the scientific community and provide examples of how this collaborative application ecosystem is maintained. We will also provide examples of space weather projects using the AUL framework, and show how it can contribute to the project's success. As always, a healthy eco-system can result in benefits for the end user and new exciting research opportunities.

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