Link CASA to the Astropy ecosystem

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ABSTRACT
We propose to make ALMA data more accessible to the broader astronomical community by establishing a rich suite of analysis tools that extend the existing CASA toolkit. In doing so, we will also provide a framework demonstrating how open source tools can be used within CASA. We will make the Astropy ecosystem accessible from within CASA and produce tools for interoperability with CASA. This project will demonstrate a testing framework to ensure compatibility between CASA and community-provided tools. It will develop compatibility tools to convert files of different formats to and from CASA formats. The study will define the standards (application program interfaces, APIs) for interoperation between CASA and community packages and implement tools that meet these standards.

The study will require the effort of an experience software developer over 1 year to implement new functionality and incorporate existing tools into CASA compatible python packages.

Development will include:

1. A robust pipeline to reproject 3D data from one coordinate grid to another, allowing ALMA data to be compared to 3D data sets from other facilities.
2. A framework for using bright spectral lines to identify the signal containing regions in other parts of the data cube.
3. A unified interface to signal identification tools and workflows.
4. Tools and documentation for conversion between CASA and community formats for images, spectra, and regions.
5. Infrastructure for remote data access via cube subsets.
6. Integration of community-developed tools (pyspeckit, xclass, gausspy, multicube) into a common framework.
7. Parallelization of analysis tasks within spectral cube.
8. A curated repository for user-submitted workflows, i.e., Jupyter notebooks analogous to CASA guides for the reduction and analysis of ALMA projects.