Project Title: The ALMA survey to Resolve exoKuiper belt Substructures (ARKS)
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Project code: 2022.1.00338.L

Introduction:

This data delivery is for the target HD131488. It includes the continuum image at 0.89 mm, 12CO J=3-2 cube, and 13CO J=3-2 cube, using only ALMA data belonging to this large program. This system was observed with two antenna configurations: a compact and an extended 12m array configuration.

The main goal of these observations was to resolve the radial structure of the dust and gas and the kinematics of the CO gas in this debris disc.

Content of the data delivery:

The data products include the continuum image (*.cont.fits) and associated primary beam image (*cont.pb.fits), as well as 12 and 13CO image cubes:

- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.cont.fits, continuum image (not primary beam corrected).
- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.cont.pb.fits, continuum primary beam image (which can be used to perform a primary beam correction).
- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.12CO.fits, 12CO J=3-2 image cube (not primary beam corrected).
- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.12CO.pb.fits, 12CO J=3-2 primary beam (which can be used to perform a primary beam correction).
- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.12CO.mask.fits, 12CO J=3-2 Keplerian mask used for cleaning.
- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.13CO.fits, 13CO J=3-2 image cube (not primary beam corrected).
- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.13CO.pb.fits, 13CO J=3-2 primary beam (which can be used to perform a primary beam correction).
- member.uid__A001_X2d20_X2e86.lp_sebamarino.HD131488.13CO.mask.fits, 13CO J=3-2 Keplerian mask used for cleaning.

Files are named with the following prefix:

member.**Group_oui_id.lp_username.target.**

Sources present in the image with coordinates from Gaia eDR3 in the ICRS reference frame at J2000 epoch.

Source	RA (h m s)	Dec (d m s)	Notes
HD131488	14 55 08.0288	-41 07 13.4014	Target star

Data processing methods:

a) **Data calibration:** The raw measurement sets were calibrated using the ALMA pipeline provided in CASA.

b) **Data reduction:** We reduced the calibrated MS files using CASA version 6.4.1.12 as follows. We first transformed the MS files to the barycentric reference frame using the task mstransform and kept only the target observations. We then time-averaged the data using 60s bins using the task split. Subsequently, we spectrally averaged the data by 2 and 1GHz for the short and long baseline data, respectively, using the task split to study the continuum. The time and spectral averaging kept the effect of bandwidth smearing below 5% at a radius equal to twice the size of the belts' outer edges.

c) **Data correction:** Before imaging the reduced data, we perform an additional step to correct the data to align the phase centre, absolute flux, and scale the weights of each execution block using a model as a reference. This is explained in detail in Marino et al. 2026.

d) **Imaging:** We imaged the continuum using the task tclean in CASA. We use Briggs weighting with a robust parameter of 2. We use the multiscale option, setting the scales to roughly 0, 1, 3 and 9 times the beam size to recover better larger-scale structures. While cleaning, we manually masked the dirty image, only including regions with positive emission and updated these masks between cleaning cycles to include lower surface brightness regions as imaging artefacts disappeared. We stopped cleaning once the residuals outside the mask appeared like Gaussian noise to visual inspection without large-scale artefacts.

   The 12 and 13CO gas was imaged using the task tclean in CASA. We use Briggs weighting with a robust parameter of 2. We use a Keplerian mask to include only regions and velocities where gas is expected to emit. For more details about the imaging of gas lines, see Mac Manamon et al. 2026.

The data reduction and data correction scripts can be found at https://github.com/SebaMarino/ARKS-data-reduction