Searching for young proto-planetary disks from ALMA archival data

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Planets form in disks around their host protostars, but when and how disks form is still largely unanswered. We have obtained ALMA Cycle 0 data to observe VLA1623, a triple protostellar system located in the rho Ophiuchus star-forming cloud and found a disk structure towards VLA1623A, a very young source still wrapped in its cocoon of dust and gas. Our analysis of the gas in the disk revealed its motion to be Keplerian and to have a radius of at least 5 times the radius of Neptune's orbit (~150AU), but with a central protostellar mass of only 0.2 times our Sun's mass. Although such rotationally supported disks were commonly found in later stages of star formation, the proto-planetary disk around VLA1623A is the youngest ever found (Murillo, Lai et al. 2014, also see http://www.almaobservatory.org/en/press-room/press-releases/664-youngest-protoplanetary-disk-discovered-with-alma).
Models and simulations have previously predicted that Keplerian disks cannot form in the earliest phases of star formation. However, the discovery of VLA1623A's big Keplerian disk proves otherwise, suggesting that other factors may play a role in disk formation. This is in line with more recent studies that suggest that misalignment of magnetic field and rotation axes or turbulence may enhance early disk formation, producing disks of 100 times the Earth-Sun radius or larger. In order to advance our knowledge of planet formation, we would like to use the ALMA data archive to search for more proto-planetary disks and investigate the environment where proto-planetary disks are formed.