

Molecular emission from young galaxies

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In the last 5 years, molecular line emission has been discovered in distant galaxies, at redshift ranging from $z = 1.4$ to 4.7 , by means of long integrations with the existing mm arrays (IRAM, NRO, OVRO). These findings enable to study the dynamics of young galaxies, which are often undetectable in the optical domain because of the large dust extinction. Because of the distance, the emission from these galaxies is very dim, and current millimeter arrays have only been able to detect the “tip of the iceberg”, that is either exceptionally bright sources (analogous to the nearby ultra-luminous IR galaxies, perhaps the progenitors of giant elliptical galaxies) or gravitationally lensed objects. Moreover, the angular resolution of the current arrays is often insufficient to allow detailed modeling of the observed sources. ALMA will alleviate the limitations of the current instrument in several ways. It will provide an improvement in sensitivity of a factor 40, which will allow detection of more normal systems, as well as detailed studies of the brighter objects. The wide instantaneous frequency coverage of ALMA, combined with appropriate search strategies, will also allow blind redshift searches. High resolution images will allow detailed gravitational lens models to be developed when necessary. Studies of the chemical composition of the molecular medium at high redshift may even be possible through absorption line searches toward the line of sight of quasars.

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