Département d'Astrophysique

Séminaires du DAp

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Bat 713, salle de séminaires Galilée , CEA Saclay, Orme des Merisiers

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MAPPING CO THROUGH COSMIC TIMES: PREDICTIONS AND NEW LIMITS

We quantify the prospects for using emission lines from rotational transitions of the CO molecule to perform an ‘intensity mapping' observation during the Epoch of Reionization and at lower redshift. The aim of CO intensity mapping is to observe the combined CO emission from many unresolved galaxies, to measure the spatial fluctuations in this emission, and use this as a tracer of large scale structure. This measurement would help determine the properties of molecular clouds – the sites of star formation – in the very galaxies that reionize the Universe. We further consider the possibility of cross-correlating CO intensity maps with future observations of the redshifted 21 cm line.

Besides, as a tracer of the large-scale structure (LSS) itself, the CO gas content as a function of redshift can be quantified by its three-dimensional fluctuation power spectra. We then present a new procedure to measure the large-scale carbon monoxide (CO) emissions across cosmic history. As an illustration, we propose a novel use of Cosmic Microwave Background (CMB) data and attempt to extract redshifted CO emissions imbedded in the Wilkinson Microwave Anisotropy Probe (WMAP) dataset. We cross-correlate the all-sky WMAP7 data with LSS data sets, namely, the photometric quasar sample and the luminous red galaxy (LRG) sample from the Sloan Digital Sky Survey (SDSS) Data Release 6 and 7 respectively. We are not able to detect a cross- correlation signal with either CO(1-0) nor CO(2-1) lines at different redshifts, mainly due to the instrumental noise in the WMAP data. We discuss forecasts for current CMB experiment and an hypothetical future CO focused experiment, for which we propose to cross-correlate the CO temperature data with the Baryon Oscillation Spectroscopic Survey (BOSS) full spectroscopic quasar sample up to z = 3 to measure the cross-correlation with several CO rotational emission lines associated with LSS.

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