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Transfer of ionizing radiation through gas and dust

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Cosmic dust provides a significant contribution to the absorption of electromagnetic radiation at all galactic scales. Hydrogen ionizing radiation ($h\nu \geq 13.6$ eV) emitted from star forming regions has to survive the large columns of gas and dust present in the galactic ISM of normal high-z galaxies before contributing to the IGM reionization process. Nevertheless, dust absorption is rarely self-consistently coupled with gas ionization in cosmological radiative transfer simulations and its impact on the timing of cosmic reionization poorly investigated. In this talk, I will first introduce a novel implementation of the cosmological radiative transfer code CRASH which supports the inclusion of an arbitrary number of dust species and accounts for the absorption of radiation by dust and the charging of grains associated with it. The results of several simulations adopting a Milky Way-like dust model both in idealized HII regions and realistic dusty galaxies will be critically discussed to show how the presence of dust grains sharpens the ionization fronts of expanding bubbles and reduces the ionization fractions of gas species at cosmic scales. We show how, depending on the total amount of dust in the high-redshift universe, the inclusion of dust in galaxy formation models can significantly change the ionization of the galactic ISM and impact the global reionization process.

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Yes

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