Far Infrared line cooling in Class 0 objects

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We have conducted with ISO-LWS a study of the far infrared line emission of a sample of 17 Class 0 objects and their associated outflows. At variance with more evolved young stars, such as Class I and pre-main sequence stars, the investigated spectra show a copious molecular emission in the form of CO, H_2O and, to a minor extent, OH transitions. Our analysis demonstrates that the bulk of the emission arises from very small, dense and warm regions, where the ambient gas is heated by non-dissociative shocks, associated with the high energetic outflows characterizing this early phase of star formation. However, several questions remain still unanswered. Given the poor spatial and spectral resolution of ISO, emission coming from multiple regions or excited by different mechanisms has remained unresolved; the role of water, predicted to be a dominant ingredient by shock models, is still not conclusive due to the large uncertainty affecting the abundance determinations; the contribution to the overall gas cooling due to important molecular lines emitted in the sub-mm range is remained unknown. The spectral and spatial resolution of the instrumentation aboard FIRST are well suited to investigate these questions and definitively define the energetic in the outflows from these very young protostars.