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Title:The ionized and hot gas in M17 SW: SOFIA/GREAT THz observations of [C II] and ¹²CO J = 13-12
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Abstract:Aims. With new THz maps that cover an area of ∼3.3 × 2.1 pc ² we probe the spatial distribution and association of the ionized, neutral and molecular gas components in the M17 SW nebula. Methods. We used the dual band receiver GREAT on board the SOFIA airborne telescope to obtain a 5.′7 × 3.′7 map of the ¹²CO J = 13-12 transition and the [C II] 158 μm fine-structure line in M17 SW and compare the spectroscopically resolved maps with corresponding ground-based data for low-and mid-J CO and [C I] emission. Results. For the first time SOFIA/GREAT allow us to compare velocity-resolved [C II] emission maps with molecular tracers. We see a large part of the [C II] emission, both spatially and in velocity, that is completely non-associated with the other tracers of photon-dominated regions (PDR). Only particular narrow channel maps of the velocity-resolved [C II] spectra show a correlation between the different gas components, which is not seen at all in the integrated intensity maps. These show different morphology in all lines but give hardly any information on the origin of the emission. The [C II] 158 μm emission extends for more than 2 pc into the M17 SW molecular cloud and its line profile covers a broader velocity range than the ¹²CO J = 13-12 and [C I] emissions, which we interpret as several clumps and layers of ionized carbon gas within the telescope beam. The high-J¹²CO emission emerges from a dense region between the ionized and neutral carbon emissions, indicating the presence of high-density clumps that allow the fast formation of hot CO in the irradiated complex structure of M17 SW. The [C II] observations in the southern

PDR cannot be explained with stratified or clumpy PDR models. © 2012 ESO.
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