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Alcohol chemistry in the Galactic Center molecular clouds. A gigantic Hot Core.

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Abstract. We have carried out a systematic study of CH_3OH, C_2H_5OH, $(CH_3)_2O$, $HCOOCH_3$, $HCOOH$, CH_3COOH, H_2CO and CS in different Galactic Center (GC) molecular clouds. Figure 1 shows the relative abundances of those molecules with respect to CH_3OH in the GC as function of the CH_3OH abundance. The CH_3OH abundance between sources in the GC varies in nearly two orders of magnitude. The abundance ratio of these molecules relative to CH_3OH is basically independent of the CH_3OH abundances and only varies in a factor of $\sim 4-8$. The abundance ratio of CS relative to CH_3OH seem to vary by a factor of 60. Our data are compared with observations of the same molecules in short-lived objects like the hot cores. The abundance and the abundance ratios of the complex molecules relative to CH_3OH in massive hot cores are similar to that found in the GC clouds. Alcohol related chemistry is believed to be driven by gas phase reactions after evaporation of alcohols from grain mantles. Gas phase chemistry based in the ejection of alcohols from grains (see Charnley et al. 1995; Horn et al. (2004)) can not explain the observed abundances of $HCOOCH_3$ in the GC and the rather constant relative abundances of the other complex molecules. Our data suggest that basically all the molecules related to alcohol chemistry could be produced on grain mantles and/or depleted from gas phase after their formation. This interpretation requires frequent shocks in the GC region to keep the high abundances of these molecules in gas phase and a rather uniform average composition of the icy grain mantles. The molecular clouds associated with the Sickle and the Thermal Radio Arches (TRA), which seem to be affected by UV radiation, see Rodriguez-Fernandez et al. (2001), show lower abundances of C_2H_5OH relative to CH_3OH which could be explained by shock ejection and photo dissociation conditions.

Keywords. astrochemistry, Galaxy: center, radio lines: ISM, ISM: molecules, ISM: abundances

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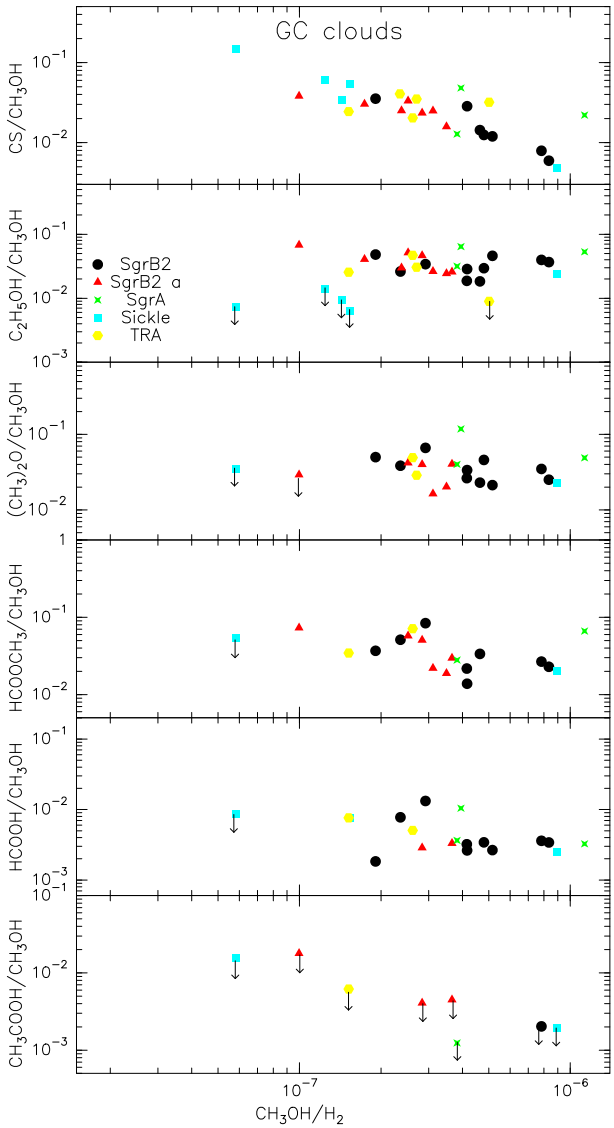

Figure 1. GC clouds relative abundances of complex organic molecules with respect to CH_3OH.