

Deuterium in molecular hydrogen as a marker for H₂ source apportionment: Preliminary Mexico City Results

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Major metropolitan areas routinely record elevated levels of molecular hydrogen (H₂) due to vehicular combustion of fossil fuels. In certain locations where liquid petroleum gas is used as a heating/cooking fuel and/or where large coal or oil fired power plants operate within close proximity to metropolitan areas, additional sources of H₂ may exist. We have measured concentration records of H₂ in Mexico City as part of the Milagro campaign and identified periods of high H₂ concentration (as high as 5 ppm), some of which are associated with peak traffic hours and others that are nighttime transients during periods of light traffic that may be associated with activity at the Tula power plant facility. The isotopic composition of H₂, in particular the deuterium content, holds the potential to lend insight into the fractional contribution of these disparate sources to the overall H₂ emissions from Mexico City. In Los Angeles, where the almost exclusive source of H₂ is vehicular traffic, the deuterium content of H₂ retains a strong first order relationship with inverse concentration and yields a basin-wide value for the deuterium content of vehicular source H₂ of -275 per mil. A small suite of samples collected in Mexico City during the Milagro campaign of 2004 yield a scattered distribution of deuterium content as a function of inverse concentration, all results being depleted to a greater degree than those recorded in Southern California. These results will be presented and discussed light of other laboratory tests and thermodynamic considerations.