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On the role of hydroxyl radicals in the self-cleansing capacity of the troposphere

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Abstract. Thousands of megatons natural and anthropogenic gases are released and subsequently removed from the troposphere each year. Photochemical reactions, initiated by hydroxyl (OH) radicals, oxidise most gases to products which are more easily removed by precipitation and dry deposition at the earth's surface. Since human-induced pollution emissions strongly affect OH formation and loss, large global changes in OH concentrations are possible. Global models and observations of trace gas distributions from global networks have been used to study geographical and temporal changes in tropospheric OH. Here we present a synopsis of recent studies, indicating that global mean OH has changed remarkably little in the past century, even though regional changes have probably been substantial. Globally, depletion of OH by reactive carbon gases has been compensated by increased OH formation by nitrogen oxides, an act of "inadvertent geo-engineering". However, OH analyses for the past 1-2 decades, partly based on methyl chloroform measurements, are inconclusive. Some work, assuming that methyl chloroform emissions have largely ceased, suggests a very strong downward global OH trend in the 1990s, inconsistent with modelling studies. The discrepancy could be much reduced by assuming continued small emissions of methyl chloroform. We recommend the continuation of high precision monitoring of this compound and improved analyses based on detailed meteorological-chemical models.

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