

The potential impact of solid rocket propellants on the atmosphere: An overview

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It is known that during a launch of solid or liquid rocket motors several interactions of the exhaust gases with the atmosphere cause local depletion of the ozone layer. In connection with these growing launch activities, more detailed investigations of the interaction of the rocket plumes, and more specifically the exhaust gases and particles of the propellants interacting with the atmosphere will be necessary. This could allow for precise answers about the environmental impact of the foreseen large number of launches, which exceeds by far the current launch rate of about 40 launches per year.

The chemical composition and conditions within a rocket plume are very complicated and multidimensional. To assess the possible impact of the exhaust gases on the atmosphere the composition of the combustion products after the nozzle exit needs to be investigated. In the case of the solid rocket propellants this problem is huge because there is a large number of oxidizers and fuels, different in contents and structure, currently used in space launchers.

The goal of this paper is to perform an overall monitoring of solid rocket propellants, which are used today, and of their chemical contents. This would allow users to evaluate the precise composition of the combustion products in the exhaust gases and therefore the potential chemical reactions leading to the depletion of the ozone layer and the formation of NO_x and H_2O .