

# **Modeling of climate changes induced by injection of sulfur species to the stratosphere with Earth system model**

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The response of climate system to injection of  $\text{H}_2\text{S}$  in the stratosphere, that produce sulfate aerosol, is studied with Earth system model that includes atmospheric dynamics, oceanic dynamics, atmospheric chemistry and carbon cycle. Model runs simulate the response to geoengineering at the beginning of 21 century for different scenarios. Also, modeling of climate change in 20-21 centuries without geoengineering, as well as with geoengineering from year 2075 to stabilize climate at +2 degrees with respect to the beginning of 20 century, are performed. The strongest global cooling for fixed injection rate can be seen for scenario with injection near Equator at 22-24 km. It is shown also that for injection at the end of 21 century, several well-known shortcomings of this kind of geoengineering are not so pronounced as for hypothetical geoengineering at the beginning of 21 century. In particular, there is no significant decrease of precipitation in any region, no significant stratospheric ozone loss, no strong spatial dependence of temperature change.  $\text{CO}_2$  concentration in the atmosphere rise more slowly with geoengineering.