Atmospheric, climatic and environmental effects of the super-size Los Chocoyos eruption 84 kyrs ago

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The Los Chocoyos eruption (Magnitude ~8, dated to 84 kyrs before present) was one of the largest volcanic eruptions during the past 100,000 years. Originating from present-day Guatemala, the eruption formed the current stage of the large Atitlán caldera. Los Chocoyos released more than ~1100 km^3 of tephra and the eruption is used as a widespread stratigraphic key marker during that time. The ash layers can be found in marine deposits from offshore Ecuador to Florida over an area of more than 10^7 km^2. Using the new erupted magma mass from Kutterolf et al (2016) and recent volatile measurements (Metzner et al 2014, Krüger et al 2015, Kutterolf et al 2015) we estimate that the Los Chocoyos eruption released >1045 Mt SO_2, ~1200 megatons of chlorine, and ~2 megatons of bromine, which classifies it as a super-size eruption. Considering these volatile emissions, the eruption must have caused massive effects on the atmosphere, climate and environment at that time, e.g. pronounced and long lasting ozone depletion with impacts on surface ultraviolet radiation.

We will present results of the impact of volatile injections from the super-size Los Chocoyos eruption on atmospheric composition, chemistry and radiation. We will use the newly developed coupled chemistry climate model CESM2(WACCM) taking the combined effect of both sulfur and halogen interactively into account. The model results will be compared with a sulfur-rich only volcanic eruption. The analysis will focus in particular on halogen and ozone chemistry, radiation, atmospheric circulation and surface climate changes.

Key words: Volcanic halogens, super-size eruption, paleo ozone hole

References

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