

Study on the effect of volcanic eruption at Mt. Baekdu using the simulations from a climate model

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Aerosols emitted by volcanic activities reduces the solar radiation that reaches the earth's surface by scattering the sun-light in the stratosphere, which results in the cooling of the atmosphere. Mt. Baekdu, located at the border between China and North Korea, is a dormant volcano which has recently attracted national attention for its possibility of eruption. It's attracting many academic interests also, for the eruption in the A.C. 946 was as strong as Pinatubo [1].

In this study, we examined the effect of the volcanic aerosols on the climate of East Asia through experiments with artificial Mt. Baekdu's eruption. The model used in this study is UM version 10.0, which developed at UKMO [2]. The model has the spatial resolutions of 192x144 (1.875°x1.25°) horizontally and the 85 vertical levels with model top at about 85km, and which includes the most part of the mesosphere. In order to investigate the influence of the volcanic activity, it is assumed that the comparable amount of sulfur dioxide from the eruption of Pinatubo would be emitted. We simulated two experiments to investigate the seasonal effects of the eruption in stratosphere and each eruption was assumed to occur at the location of Mt. Baekdu on the 11th day after the integration started, and the experiment were integrated for 3 years. Each experiment consists of 10 ensemble members, and the initial conditions for each experiment were generated using a random perturbation method. The differences between the experiments and the control run, in which no eruption was assumed to occur, were used to show the impacts of sulphate aerosols on the climate of the East Asia.

Our model results simulated a hemispheric ensemble mean e-folding time for the removal of sulphate aerosol would be about 725 days for the summer case, and this e-folding time would be significantly longer than that of the Pinatubo eruption, which was estimated to be a year [3]. The results also showed that the bulk of volcanic aerosols would stay near the North Pole similar to the previous studies [4]. The eruption's impacts on global and East Asia climate will be investigated further, and the detailed results will be presented later.

[1] Guo (2001). [2] Davies (2005). [3] Barnes Hoffman (1997). [4] Kravitz (2011)