Tungsten isotopic composition in terrestrial rock samples: Constraint on the homogenization of the Hf-W system after the giant impact event

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The age of terrestrial core formation can be constrained by Hf-W chronometry [e.g. 1, 2]; however, most of previous studies assumed achievement of equilibration of the Hf-W system after the final giant impact event. In contrast, some studies indicate that a perfect homogenization of W isotope in the mantle was not achieved [e.g. 3].

We analyzed W isotope ratio of numerous rock samples using MC-ICP-MS (Isoprobe, Neptune), and examined whether perfect homogenization was achieved during the core formation [4]. The samples exhibit the same W isotope ratios within the uncertainty of isotope analyses. These results suggest that a homogenization was achieved in the Earth's mantle after the final giant impact within the detection limit of isotope analyses. Hayden and Watson [5] reported higher W diffusivity than that of Pt and Ir. Such diffusion effect might explain the small or lack of heterogeneity in the mantle. We will investigate the influence of the grain boundary diffusion.

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Development of global aerosol forecasting system

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Introduction

An aerosol climate model, SPRINTARS, has been developed for simulating global distributions, radiative forcings, and effects on the climate system of all main tropospheric aerosols [1, 2, 3, 4]. Several results with SPRINTARS was cited by the Forth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4). In this study a forecasting system for global aerosol distributions and its radiative forcing is developed based on SPRINTARS (http://sprintars.net/indexe.html).

Global Aerosol Forecasting System

SPRINTARS is fully coupled with a general circulation model, MIROC, developed by a Japanese research group, CCSR/NIES/FRCGC [5]. In the present forecasting system, the horizontal resolution is T106 (approximately 1.1° by 1.1°) and the vertical resolution is 20 layers. SPRINTARS treats main tropospheric aerosols, that is, carbonaceous (black carbon (BC) and organic carbon (OC)), sulfate, soil dust, and sea salt. The aerosol transport processes include emission, advection, diffusion, sulfur chemistry, wet deposition, dry deposition, and gravitational settling. SPRINTARS also calculate the aerosol direct and indirect effects.

In the present forecasting system, the wind and temperature are nudged by the Global Forecast System (GFS) data provided by NOAA. Emissions of soil dust and sea salt aerosols are calculated inside the model at every time step, and those of BC, OC, and precursor gases of sulfate are prescribed by several emission inventories. Active fire data from MODIS, Fire Information for Resource Management System (FIRMS), provided by University of Maryland and GSFC/NASA [6] are used for semi-realtime aerosol emissions from biomass burning. The forecasting system are automatically performed every day and simulated results are uploaded to the SPRINTARS homepage about 23 UTC.

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