

Home

Online Library ACP

- ▣ Recent Final Revised Papers
- ▣ [Volumes and Issues](#)
- ▣ Special Issues
- ▣ Library Search
- ▣ Title and Author Search

Online Library ACPD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper

Impact
Factor
4.865

ISI
indexed



▣ Volumes and Issues ▣ Contents of Issue 16

Atmos. Chem. Phys., 8, 5017-5031, 2008

www.atmos-chem-phys.net/8/5017/2008/

© Author(s) 2008. This work is distributed under the Creative Commons Attribution 3.0 License.

Repeatability and randomness in heterogeneous freezing nucleation

G. Vali

Department of Atmospheric Science, University of Wyoming, Laramie, WY 82071, USA

Abstract. This study is aimed at clarifying the relative importance of the specific character of the nuclei and of the duration of supercooling in heterogeneous freezing nucleation by immersed impurities. Laboratory experiments were carried out in which sets of water drops underwent multiple cycles of freezing and melting. The drops contained suspended particles of mixtures of materials; the resulting freezing temperatures ranged from -6°C to -24°C . Rank correlation coefficients between observed freezing temperatures of the drops in successive runs were >0.9 with very high statistical significance, and thus provide strong support for the modified singular model of heterogeneous immersion freezing nucleation. For given drops, changes in freezing temperatures between cycles were relatively small ($<1^{\circ}\text{C}$) for the majority of the events. These frequent small fluctuations in freezing temperatures are interpreted as reflections of the random nature of embryo growth and are associated with a nucleation rate that is a function of a temperature difference from the characteristic temperatures of nuclei. About a sixth of the changes were larger, up to $\pm 5^{\circ}\text{C}$, and exhibited some systematic patterns. These are thought to arise from alterations of the nuclei, some being permanent and some transitory. The results are used to suggest ways of describing ice initiation in cloud models that account for both the temperature and the time dependence of freezing nucleation.

▣ [Final Revised Paper](#) (PDF, 1008 KB) ▣ [Discussion Paper](#) (ACPD)

Citation: Vali, G.: Repeatability and randomness in heterogeneous freezing nucleation, Atmos. Chem. Phys., 8, 5017-5031, 2008. ▣ [Bibtex](#) ▣ [EndNote](#) ▣ [Reference Manager](#)



Search ACP

Library Search

Author Search

News

- ▣ [Sister Journals AMT & GMD](#)
- ▣ [Financial Support for Authors](#)
- ▣ [Journal Impact Factor](#)
- ▣ [Public Relations & Background Information](#)

Recent Papers

01 | ACPD, 17 Nov 2008:
Carbonaceous aerosols at urban influenced sites in Norway

02 | ACPD, 17 Nov 2008:
Introduction: European Integrated project on Aerosol Cloud Climate and Air Quality interactions (EUCAARI) – integrating aerosol research from nano to global scales

03 | ACPD, 17 Nov 2008:
Statistical analysis of non-methane hydrocarbon variability at a European background location (Jungfraujoch, Switzerland)