

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 12](#)

Atmos. Chem. Phys., 6, 4383-4394, 2006

www.atmos-chem-phys.net/6/4383/2006/

© Author(s) 2006. This work is licensed under a Creative Commons License.

## Three-dimensional effects in polarization signatures as observed from precipitating clouds by low frequency ground-based microwave radiometers

A. Battaglia<sup>1</sup>, C. Simmer<sup>1</sup>, and H. Czekala<sup>2</sup>

<sup>1</sup>Meteorological Institute, University of Bonn, Bonn, Germany

<sup>2</sup>RPG Radiometer Physics GmbH, Meckenheim, Germany

**Abstract.** Consistent negative polarization differences (i.e. differences between the vertical and the horizontal brightness temperature) are observed when looking at precipitating systems by ground-based radiometers at slant angles. These signatures can be partially explained by one-dimensional radiative transfer computations that include oriented non-spherical raindrops. However some cases are characterized by polarization values that exceed differences expected from one-dimensional radiative transfer.

A three-dimensional fully polarized Monte Carlo model has been used to evaluate the impact of the horizontal finiteness of rain shafts with different rain rates at 10, 19, and 30 GHz. The results show that because of the reduced slant optical thickness in finite clouds, the polarization signal can strongly differ from its one-dimensional counterpart. At the higher frequencies and when the radiometer is positioned underneath the cloud, significantly higher negative values for the polarization are found which are also consistent with some observations. When the observation point is located outside of the precipitating cloud, typical polarization patterns (with troughs and peaks) as a function of the observation angle are predicted. An approximate 1-D slant path radiative transfer model is considered as well and results are compared with the full 3-D simulations to investigate whether or not three-dimensional effects can be explained by geometry effects alone. The study has strong relevance for low-frequency passive microwave polarimetric studies.

[Final Revised Paper](#) (PDF, 494 KB) [Discussion Paper](#) (ACPD)

Citation: Battaglia, A., Simmer, C., and Czekala, H.: Three-dimensional effects in polarization signatures as observed from precipitating clouds by low frequency ground-based microwave radiometers, Atmos. Chem. Phys., 6, 4383-4394, 2006. [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, 15 Jan 2009: Kinetic modeling of nucleation experiments involving SO<sub>2</sub> and OH: new insights into the underlying nucleation mechanisms

02 | ACPD, 15 Jan 2009: Comparisons of WRF/Chem simulations in Mexico City with ground-based RAMA measurements during the MILAGRO-2006 period

03 | ACPD, 15 Jan 2009: Technical Note: In-situ quantification of aerosol sources and sinks over regional geographical scales