

Aerosol processing in clouds in the regional model COSMO

S. POUSSE-NOTTELMANN* AND U. LOHMANN

Institute for Atmospheric and Climate Science, ETH Zurich,
Zurich, Switzerland

(*correspondence: sara.nottelmann@env.ethz.ch)

Aerosol particles undergo significant modifications during their residence time in the atmosphere, between their formation or emission and their removal. Processes like coagulation, coating, water uptake and aqueous surface chemistry alter the aerosol size distribution and composition. At this, clouds play a primary role as physical and chemical processing inside cloud droplets contribute considerably to the changes in aerosol particles. Globally averaged, atmospheric particles are cycled three times through a cloud before being removed from the atmosphere [1].

An explicit and detailed treatment of cloud-borne particles will be implemented in the regional weather forecast and climate model COSMO/CCLM. The employed model version includes a two moment cloud microphysical scheme [2] that has been coupled to the aerosol microphysical scheme M7 [3] as explained in [4]. So far, cloud-borne aerosol number and mass were not considered. Distinction between in-droplet and in-crystal particles will be made to more physically account for processes in mixed-phase clouds, such as the Wegener-Bergeron-Findeisen process and contact and immersion freezing.

The new scheme will allow an evaluation of the cloud cycling of aerosols. Global simulations of aerosol processing in clouds have recently been conducted by Hoose *et al.* [5]. Our investigation regarding the influence of aerosol processing on the aerosol size distribution will apply the approach developed by Hoose *et al.* [6] on a regional scale using a cloud-system resolving model with much higher resolution. Emphasis will be placed on orographic mixed-phase precipitation.

[1] Pruppacher & Jaenicke (1995) *Atmos. Res.*, 38, 283-295.

[2] Seifert & Beheng (2006) *Meteorol. Atmos. Phys.* 92, 45-

66. [3] Stier *et al.* (2005) *Atmos. Chem. Phys.*, 5, 1125-1156

[4] Muhlbauer & Lohmann (2008) *J. Atmos. Sci.*, 65, 2522-

2542. [5] Hoose *et al.* (2008) *Atmos. Chem. Phys.*, 8, 6939-

6963. [6] Hoose *et al.* (2008) *J. Geophys. Res.*, 113, D07210.

Temporal and spatial variations in hydrothermal budgets of degassing metals across a full eruptive cycle: 9°46'-9°50'N East Pacific Rise

M.F. MEANA PRADO¹, K.L. VON DAMM^{1,2}, J.G. BRYCE¹,
M.D. LILLEY³ AND J.E. DIBB^{1,2}

¹Dept. of Earth Sciences ²Institute for the Study of Earth,
Ocean & Space Univ. of New Hampshire, Durham, NH
03824 (florencia.prado@unh.edu)

³School of Oceanography, Univ. of Washington, Seattle, WA
98195

The influence of eruptive activity in fluid trace metal abundances, especially those that have been shown to degas from shallow magma bodies (1) is not fully quantified. Accordingly new metal abundance data across a full eruptive cycle will provide insight into links between crustal and magmatic processes and contribute to improved approximations of element cycling in the oceans and the significance of these metals in hydrothermal ecosystems. Recent analytical developments have enhanced the capability to determine hydrothermal metal concentrations in spite of their low abundances and the difficulty in quantifying their sinks and sources.

During the last decade, frequent sampling of hydrothermal vents at the Ridge2000 Integrated Study Site (ISS) has provided a spatially diverse range of samples to characterize the evolution of vent fluid chemistry throughout the eruption cycle (1991-2006). This unique sample set includes particulate, precipitate and dissolved hydrothermal fluid samples collected in a time window ranging from just after the first eruption at the site (April 1991) through late 2007, following the 2005-6 eruption. The sample subset also includes brine and vapor fluid samples as well as fluids with a large CO₂ range(2). Samples have been analyzed for complete trace metal budgets of ²¹⁰Pb, Pb and Cd which have degassing potential in magmatic and hydrothermal systems (1). Preliminary results show that vapor phase vent sites located at the maximum of the CO₂ degassing signal (9°50.3'-50.8'N) contain elevated ²¹⁰Pb/Pb ratios relative to vent sites south of the degassing maximum (9°46.3'-47.2'N). Furthermore, high levels of CO₂ are associated with increasing concentrations of Cd as well as ²¹⁰Pb. The metal contents of fluids associated with lower CO₂ generally do not correlate well with CO₂ but contain relatively higher metal abundances, consistent with their high chlorinities and longer fluid residence time in the crust (3).

(1) Rubin K. (1997), *Geochim. Cosmochim. Acta* 61 3525-3542. (2) Lilley MD *et al.*(2003) *Nature* 422 878-881. (3) Von Damm *et al.*(1997) *Earth Planet. Sci. Lett.* 149 101-111.