主論文の要約

論 文 題 目　Contribution of Organic Aerosols to Cloud Condensation Nuclei Concentrations at a Forest Site in the Kii Peninsula, Japan
（紀伊半島の森林における有機エアロゾルの雲凝縮核濃度に対する寄与）

氏名　鄧 彦閣 (DENG Yange)
所属　環境学研究科 地球環境科学専攻

SUMMARY Biogenic secondary organic aerosol (BSOA) accounts for more than half of the annual flux of organic aerosol (OA) to the atmosphere and its presence can increase the annual mean concentration of cloud condensation nuclei (CCN) by up to 45% globally. However, the hygroscopicity of BSOA and its contribution to CCN is not well characterized. This thesis investigates the hygroscopicity of OA and BSOA and their contributions to CCN at a forest site in the Kii Peninsula, Japan, where BSOA is likely an important part of OA. The size-resolved chemical composition, number-size distributions, and hygroscopicity under super- and sub-saturated water vapors conditions of atmospheric aerosols were observed during two intensive field campaigns (from 28 July to 28 August, 2014 and from 31 August to 22 September, 2015). During both observations, OA and sulfate accounted for on average more than 85% of the submicrometer aerosol mass concentration. OA dominated the aerosol mass in the afternoon hours as a result of the photochemical formation of BSOA, while sulfate presented negligible diurnal variation. The hygroscopicity of both ambient aerosols and OA had diurnal minima in the afternoon hours and increased with the increase of particle dry diameters. The hygroscopicity of fresh BSOA was calculated to be in the range from 0.086 to 0.122. The observation in 2014 suggests that the formation of BSOA increased the CCN concentrations and that new particle formation may enhance the increasement. The observation in 2015 suggests that the relative contributions of freshly formed BSOA and regionally transported OA to OA could explain 40% of the diurnal variations and size-dependence of the hygroscopicity of OA. The contributions of OA and fresh BSOA to CCN concentrations can reach 53% and 28%, respectively, in the time period of intensive BSOA formation. The diurnal variations and size-dependence of the hygroscopicity of OA strongly affect the predicted contribution of OA to CCN concentrations. The contribution of BSOA to CCN concentrations can increase substantially if aging of BSOA occurs.