2.172 Cloud processing of iron-containing particles at a mountain site, southern China.

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Abstract:

Cloud processing is a particular occasion for changing chemical property of the iron (Fe)-containing particles, and has an important application for bioavailable Fe. The potential increase of secondary species on Fe-containing particles by cloud processing may be expected to increase bioavailable Fe. In this study, a ground-based counterflow virtual impactor (GCVI) coupled with a real-time single-particle aerosol mass spectrometer (SPAMS) was used to characterize source and chemical composition of Fe-containing cloud residues (dried cloud droplets) at a mountain site, southern China for nearly one month during the autumn of 2016. Four Fe-containing particle types were obtained including Fe-rich, Fe-elemental carbon (Fe-EC), Fe-vanadium (Fe-V), and Fe-Dust. Among the Fe-containing cloud residues, the Fe-rich particles related with combustion sources, contributed to 84%, the Fe-Dust particles constituted 12%, while the remaining 4% consisted of the Fe-EC and Fe-V particles. The Fe-rich cloud residues were found to be internally mixed with the abundant sulfate and nitrate. The calcium-rich particles in the Fe-Dust cloud residues were found to enhance the in-cloud formation of sulfate, nitrate, chloride, and oxalate. The formation of these acids might promote Fe dissolution. A sharply reduction of oxalate in the Fe-containing cloud residues appeared during daytime, suggesting that photolysis of Fe-oxalate complexes occurred even in the presence of cloud events. This work provides the differences in cloud processing of the Fe-containing cloud residues from various sources and thus might further affect the solubility of Fe in the atmosphere.