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On the formation of radiation fogs under heavily polluted conditions

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Abstract. We have studied the effect of gaseous pollutants on fog droplet growth in heavily polluted air using a model that describes time-dependent sulfate production in the liquid phase and thermodynamical equilibrium between the droplets and the gas phase. Our research indicates that the oxidation of SO_2 to sulfate has a significant effect on fog droplet growth especially when hygroscopic trace gases, for example HNO_3 and NH_3 are present. The increased sulfate production by dissolution of hygroscopic gases results from increased pH (caused by absorption of ammonia) and from the increased size of the fog/smog droplets. Our results indicate that unactivated fogs may become optically very thick when the droplet concentrations are on the order of several thousand per cubic centimeter of air.

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