



HAL
open science

Interaction of Aerosol Particles and Clouds

Andrea Flossmann

► **To cite this version:**

Andrea Flossmann. Interaction of Aerosol Particles and Clouds. *Journal of the Atmospheric Sciences*, 1998, 55 (5), pp.879 - 887. 10.1175/1520-0469(1998)0552.0.CO;2 . hal-01905503

HAL Id: hal-01905503

<https://uca.hal.science/hal-01905503>

Submitted on 30 Apr 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

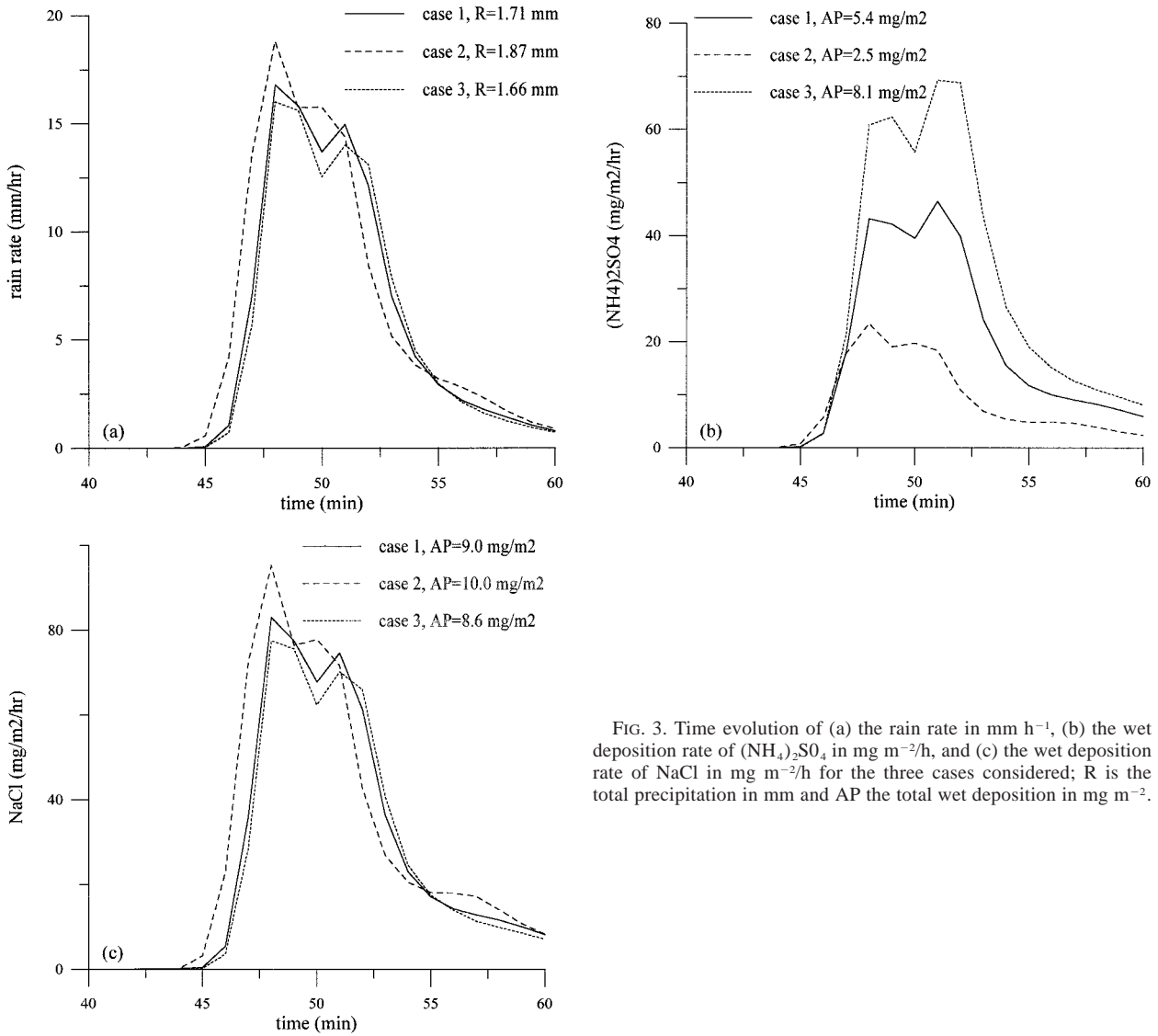


FIG. 3. Time evolution of (a) the rain rate in mm h^{-1} , (b) the wet deposition rate of $(\text{NH}_4)_2\text{SO}_4$ in $\text{mg m}^{-2}/\text{h}$, and (c) the wet deposition rate of NaCl in $\text{mg m}^{-2}/\text{h}$ for the three cases considered; R is the total precipitation in mm and AP the total wet deposition in mg m^{-2} .

the downdraft is also associated with a general warming of the air. Next to the cloud top we find now relative humidities of 70%–80%.

Figures 4b and 4c give the change in the aerosol particle concentrations. Both the small and the large particle concentrations experience an increase above cloud top. The reasons, however, are different and will be discussed below separately for Figs. 4b and 4c.

Figure 4b shows the change in the Aitken particle concentration. Due to the relatively high supersaturation ($S_{\text{max}} \sim 2\%$) created by the cloud, some of the Aitken particles serve as cloud condensation nuclei. Consequently, we see a decrease in the region of the cloud and its immediate vicinity. Besides this, we detect an increase of Aitken particle concentration above 3 km. This is above the region affected by the humidity increase (compare Fig. 4a) and is situated inside the in-

version. These particles obviously belong to the air above the boundary layer and were probably lifted aloft with the rising cloud top. This is emphasized by Fig. 5a, which shows the total number of Aitken particles for case 2. As initially the air above the MBL was particle free, the number concentrations given here already represent the changes. We see here that no layer of Aitken particles exists above 3 km. Instead, we see an increase of the number of Aitken particles in the region of the cloud itself. This is caused by the venting of the cloud and that only a small part of the Aitken particles served as CCN. The increase of the particle concentration in cloud due to venting is overcompensated in cases 1 and 3 (see Fig. 6a) by the nucleation scavenging going on at the same time, that imposed a net decrease compared to the original values.

Figure 4c shows the change in the large and giant

