

Sporadic sodium layers and the average vertical distribution of atmospheric sodium: comparison of different layer strengths

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In an earlier study of sporadic sodium layers (Ns), observed by lidar at São José do Campos (23° S, 46° W) we found that, although individual profiles give the impression that Ns layers involve sodium additional to the normal background layer, there is very little difference between the long-term averages of profiles with and without the presence of Ns. This led us to conclude that Ns layers result from the redistribution of an omnipresent source, rather than an additional source mechanism. We have now extended this study to investigate whether or not the relative magnitude of Ns layers influences this conclusion. To this end we manually characterized all the profiles obtained in the time interval from 1900 to 2200 LT for the years 1993 to 2004. This involved registering the upper and lower limits to each Ns layer observed, the height of the peak and the sodium concentration at each of these three points. We then computed average profiles for Ns layers of differing strengths, with strength defined as the concentration at the peak divided by the mean of the concentrations at the upper and lower boundaries. For strengths up to 4 the results confirmed our earlier conclusion but, for Ns layer strengths greater than 4 we found a significant difference between the average profiles with and without Ns. For the strong Ns layers both the average abundance and the average peak sodium concentration were about 13% greater than for layers without Ns. This suggests that a different mechanism might be responsible for very strong sporadic layers.