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The influence of subgrid surface-layer variability on vertical transport of a chemical species in a convective environment.

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We use a 2-D cloud-resolving model over a 256 km domain to examine the influence of subgrid-scale processes on the concentration and vertical transport of a chemical species (dimethyl sulphide, or DMS) in a deep convective marine environment. Two issues are highlighted. Firstly, deriving fluxes using a spatially averaged surface wind representative of a global model reduces the domain-mean DMS concentration by approximately 50%. Emission of DMS from the surface is greater in the CRM because it resolves the localized intense winds embedded in the dynamical structure of convective systems. Secondly, we find that the spatial pattern of DMS concentration in the boundary layer is positively correlated with the pattern of convective updraughts. Using a mean concentration field reduces transport to the upper troposphere by more than 50%. The explanation is that secondary convection occurs preferentially on the edges of cold pools, where DMS concentrations are higher than the domain mean.