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Large-eddy resolution simulation of organised convection on a small island

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The land-sea contrast in turbulent surface fluxes on small flat islands offers a real-world scenario that regularly results in organised convection. This contrast results in a thermally driven circulation that tilts downwind of the island, leaving a warm plume in the wake of the island. Convection that forms in the warmed wake of the island is organised into a band aligned parallel to the flow. These thermally forced convective bands, or 'cloud trails', have been observed to extend more than 100 km downwind of islands in a wide range of environments. For example, Bermuda in the Subtropical Atlantic and Nauru in the Tropical Pacific. Cloud trails are found to be controlled by a combination of low-level humidity which controls the height of the lifting condensation level, and the land-sea contrast in turbulent surface fluxes which controls the strength of thermal circulation (i.e. lift) downwind of the island. Convective precipitation within a cloud trail, or in the background environment, results in cold pools that can act against the organisation due to the thermally forced island circulation. In the present study, idealised simulations at high (100 m) resolution are performed. Analysis aimed at a deeper exploration into the lifecycle of cloud trails and the processes involved in the initiation of convection and the maintenance of convective organisation are presented.