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Evaluating characteristics of Indian monsoon convection in high-resolution models with ground-based weather radars

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Operational ground-based weather radar data provide a unique opportunity to evaluate simulations of convection in high-resolution models. This is especially advantageous for tropical regions such as India where convection is frequent and interacts with the large-scale circulation. Here, storms derived from 15 Indian operational radars are directly compared to modelled storms at two convection-permitting resolutions, 1.5 and 4.4 km, for a period of 3 weeks during the peak 2016 monsoon season. We objectively identify different morphological properties of storms for 6 regions of India, that is to say their heights, sizes, and intensities. Both model resolutions are found to simulate too much shallow convection compared to radars for all 6 regions. Modelled convection is also frequently too wide and intense, but the 1.5 km model performs noticeably better. Modelled storms also exhibit a maximum area around the freezing level, higher than observed by radars, especially at 4.4 km resolution. We discuss various potential microphysical and dynamical reasons for the major differences seen, thus demonstrating the power of radar-based evaluation of monsoon convection for the Indian region.