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Plain Language Summary:

This study examined a stationary line-shaped precipitation system (SLPS) event that occurred on 1 September 2015, using observational data and high-resolution numerical experiments. In the numerical experiments, we found that the SLPS formed in a low-level convergence zone of the westerly with the warm and moist south-southwesterly from the Kii Channel. New convective cells developed to the north of Awaji Island and were moved northeastward by the middle-level southwesterly. This cell formation process was repeated and resulted in the formation of the SLPS.

Figure 1. (a) Total precipitation amounts (mm) over the Kinki district from 0940 UTC to 1200 UTC 1 September 2015, observed by the JMA radar network. (b) Accumulated rainfall amounts (mm) over the Kinki district from 1000 UTC to 1200 UTC 1 September 2015, obtained in the simulation (CTL). (c) Moisture flux convergence ($10^{-6} \text{ g kg}^{-1} \text{ s}^{-1}$) and horizontal wind vectors at a height of 521 m at 1200 UTC 1 September 2015, derived from the CTL result. Warm and cold colors indicate moisture flux convergence and divergence, respectively. Mountain regions higher than a height of 521 m are masked by gray color.

Highlights:

- The south-southwesterly was present along the edge of the Pacific high-pressure system and flowed through the Kii Channel into the Kinki district. On the other hand, the westerly was present on the west side in associated with an extratropical cyclone located to the north of Japan.
- The SLPS formed along the low-level convergence zone of the westerly and the warm and humid south-southwesterly in the Kinki district.
- The sensitivity experiments for the orography around the occurrence area of the SLPS indicated that the orography was not an essential factor for the formation of the SLPS in this event. The orography just modifies the location of the SLPS.