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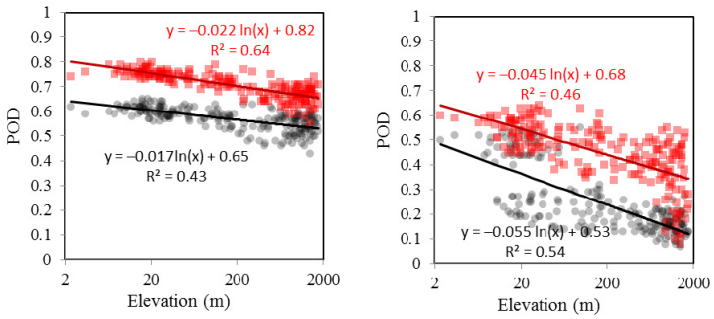
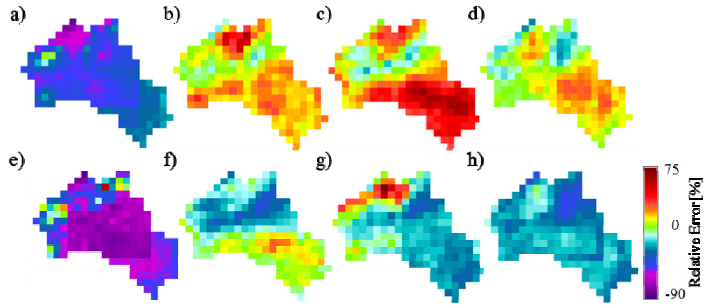


←Figure 1. Probability of detection (POD) of G_Gauge (red square) and G_MVK (black circle) in summer (left) and winter (right) against elevation.



←Figure 2. Seasonal relative error for G_Gauge in 2006–09: a) winter, b) spring, c) summer, and d) autumn, and G_MVK in 2006–09; e) winter, f) spring, g) summer, and h) autumn. Better agreement can be shown in mild colors such as in cyan, green, and yellow close to zero as in the legend.

- GSMaP_Gauge (G_Gauge) and GSMaP_MVK (G_MVK) products were compared against ground Radar-AMeDAS in terms of spatiotemporal performance variabilities across the Tone River basin, Japan.
- The probability of detection commonly had negative log-linear relationships to the elevation and this trend was more significant in winter than summer, indicating the seasonal topographic effect on rainfall detection ability (Fig. 1).
- Both products underestimated precipitation intensity particularly in winter (Fig. 2, panels *a* and *e*), and G_Gauge overestimated the intensity notably in summer (Fig. 2, panels *c* and *g*).
- At any scale, local application of these products should consider seasonal changes and topographic effects. For further improvements of the GSMaP products at the basin scale, we suggest including high resolution gauge-based network data to enhance accuracy.