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Projection of extreme precipitation over East Asia: Insights from HighResMIP

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Climate models project that extreme precipitation over East Asia will intensify at a rate exceeding thermodynamic scaling, due to dynamical changes. Yet, the influence of model resolution, which shapes the representation of these dynamics, remains uncertain. Using CMIP6 HighResMIP simulations, this study assesses the resolution sensitivity of extreme precipitation in the future projections.

In the historical climate, models show mixed sensitivity to resolution, with precipitation intensity either unchanged or enhanced at higher resolution. Future projections consistently indicate increases in both intensity and frequency of extreme events, with the largest frequency rise for the most intense cases. Resolution effects are modest over China but substantial in the Korea–Japan region. Despite the benefits of higher resolution, large inter-model spread persists due to uncertainties in the representation of dynamics. These results underscore that while high-resolution modeling is essential to capture regional-scale features, narrowing future projections ultimately requires reducing dynamical uncertainties.

Keywords: extreme precipitation, climate projection, resolution sensitivity, HighResMIP

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