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## The transition from practical to intrinsic predictability of midlatitude weather

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In this study the transition from current practical predictability of midlatitude weather to its intrinsic limit is investigated. For this purpose, estimates of the current initial condition uncertainty of 12 real cases are reduced in several steps from 100% to 0.1% and propagated in time with a numerical weather prediction model (ICON at 40km resolution) that includes a stochastic convection scheme. It is found that the potential forecast improvement through initial condition perfection is 4-5 days, which can essentially be achieved with an initial condition uncertainty reduction by 90% relative to current conditions. With respect to physical processes, this reduction of the initial condition uncertainty is accompanied with a transition from rotationally-driven initial error growth to error growth dominated by latent heat release in convection and due to the divergent component of the flow. With respect to spatial scales, a transition from large-scale up-magnitude error growth to upscale error growth and an acceleration of the initial growth rate is found. Reference experiments with a deterministic convection scheme show a 5-10% longer predictability interval, but only if the initial condition uncertainty is small. These results confirm that planetary-scale predictability is intrinsically limited by latent heat release in clouds through an upscale-interaction process, while this process is unimportant on average for current amplitudes of the initial condition uncertainty.