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The processes driving the water budget in the tropical stratosphere

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The water vapour in the stratosphere is a strong green-house gas. The usual picture makes its abundance depend first on the temperature of the tropical tropopause via saturation, and second on the activity of the scarce but intense troposphere-stratosphere transport by the very deep convection. This study, designed to identify the various processes at play at the regional scale, benefits from the insitu observations during the StratoClim campaign (August 2017) and the 100-m vertical resolution of a cloud-resolving simulation over the whole south Asia (key region for the stratospheric water budget during the boreal summer). With a combination of Eulerian budget and Lagrangian track of the air masses, we show how the three main driving processes compete: the convective injections via overshoots, the turbulent diffusion, and the freeze-drying episodes driven by large-scale gravity waves, and how much they contribute to the stratospheric humidity at different altitudes.