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Solid particles in the tropical lowest stratosphere

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Abstract. We report in situ and remote observations proving occasional occurrence of solid particles in the tropical lowest stratosphere, 200 km from deep convective events. The particles were found during field campaigns in Southeast Brazil (49.03 W 22.36 S). They occur in the altitude range from 17.5 to 20.8 km, at temperatures up to at least 10 K above the expected frost point temperature. While stability of ice particles at these altitudes is unexpected from a theoretical point of view, it is argued that these observations are indications of tropospheric air masses penetrating into the stratosphere during convective overshoots. It is argued that the intrusion of tropospheric air must have carried a large amount of water with it, which effectively hydrated the lowest stratosphere, and consequently suppressed sublimation. This conclusion is further supported by a separate water vapor mixing ratio profile obtained at the same observation site.

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