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Observational evidence of large changes of Earth's atmospheric thermal structure in the 21st century

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Historically, retrieving the detailed structure of atmospheric temperature trends from observations has been demanding. For decades, observations of upper-air temperature have either lacked the necessary vertical resolution, or the horizontal coverage. This has resulted in limited knowledge about the important transition zone around the tropopause. Recent advances in satellite measurement techniques provide new insight into the thermal structure of the upper troposphere/lower stratosphere region. This is a prerequisite for understanding the complex processes of this part of the atmosphere. With unprecedented resolution, latest climate observations from GPS Radio Occultation satellites reveal a significant warming of the atmosphere. The tropical upper troposphere has already warmed about 1 K in the 21st century alone, and the stratospheric trend structure indicates a possible change in stratospheric circulation.