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CH₄ abundance in Jupiter's upper atmosphere: A re-analysis of the ISO/SWS 3.3 μm non-LTE emission

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CH₄ plays a key role in the thermal structure of Jupiter's upper atmosphere and hence knowing its vertical distribution is crucial for its understanding. Methane concentrations have been inferred previously from the analyses of solar occultation, He and Ly- α airglow, and the ISO/SWS radiance measurements around 3.3 μm , showing all rather different values, particularly around the homopause. Even different analyses of the same ISO/SWS radiance spectra yield very different CH₄ volume mixing ratio profiles. Here, we present a new analysis of the ISO/SWS radiance spectra by using a comprehensive non-Local Thermodynamic Equilibrium (non-LTE) model and the most recent collisional rates measured in the laboratory. Further, we briefly discuss the potential effects of non-LTE on CH₄ 3.3 μm emission of temperate Jupiter exoplanets.