

# SUNSPOT CHROMOSPHERIC HEATING BY KINETIC ALFVÉN WAVES

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Sunspot atmospheric models show that sunspots have a higher temperature than the surrounding quiet Sun in the upper chromosphere although they are dark in the photosphere. This letter presents a comparison between acoustic wave heating and kinetic Alfvén wave (KAW) heating in sunspots from the photosphere through the chromosphere based on a semi-empirical model calculated by non-LTE procedure. The result suggests that the acoustic wave heating still is a possible dominating mechanism in the photosphere and in the lower chromosphere below 850 km similar to previous works. But in the upper chromosphere above 850 km the KAW heating is a more promising candidate that dominates the sunspot chromospheric heating. We speculate that this probably relates to the ionization exceeding one in a thousand in the upper chromosphere, so that the plasma processes such as the kinetic Alfvén wave dissipation play an important role in the atmospheric dynamics.