



Using Entropy to examine the mixed region between the Troposphere and the Stratosphere

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The troposphere and the stratosphere each have distinct chemical signatures of ozone and water vapour. It is possible to measure the extent of mixing by examining how these signatures have merged. Using tracer-tracer relationships between ozone and water vapour, a weighting is placed on different mixed states, which are then used to calculate the entropy (a measure of mixing in the system).

This study describes the use of entropy to provide a quantitative measure of mixing in the atmosphere. By using an entropy measure on ozone and water vapour measurements, it is possible to quantify the location and size of the chemically mixed region at the boundary between the stratosphere and troposphere.

Entropy is calculated on two different instruments, the high vertical resolution ozonesondes/hygrometers at Lauder, NZ and Boulder, CO, USA; and the low vertical resolution global data from the Atmospheric Infrared Sounder (AIRS) on the AURA satellite. Entropy has a high correlation with the thickness of the mixing layer, has a seasonal pattern as well as short term variation, and shows relationships with other physical variables, such as Total column ozone.