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Droplet Size Spectrum: **The size distribution of cloud droplets, called the droplet size spectrum, is usually displayed as a histogram of the number of droplets per cubic centimeter in various droplet size intervals.**

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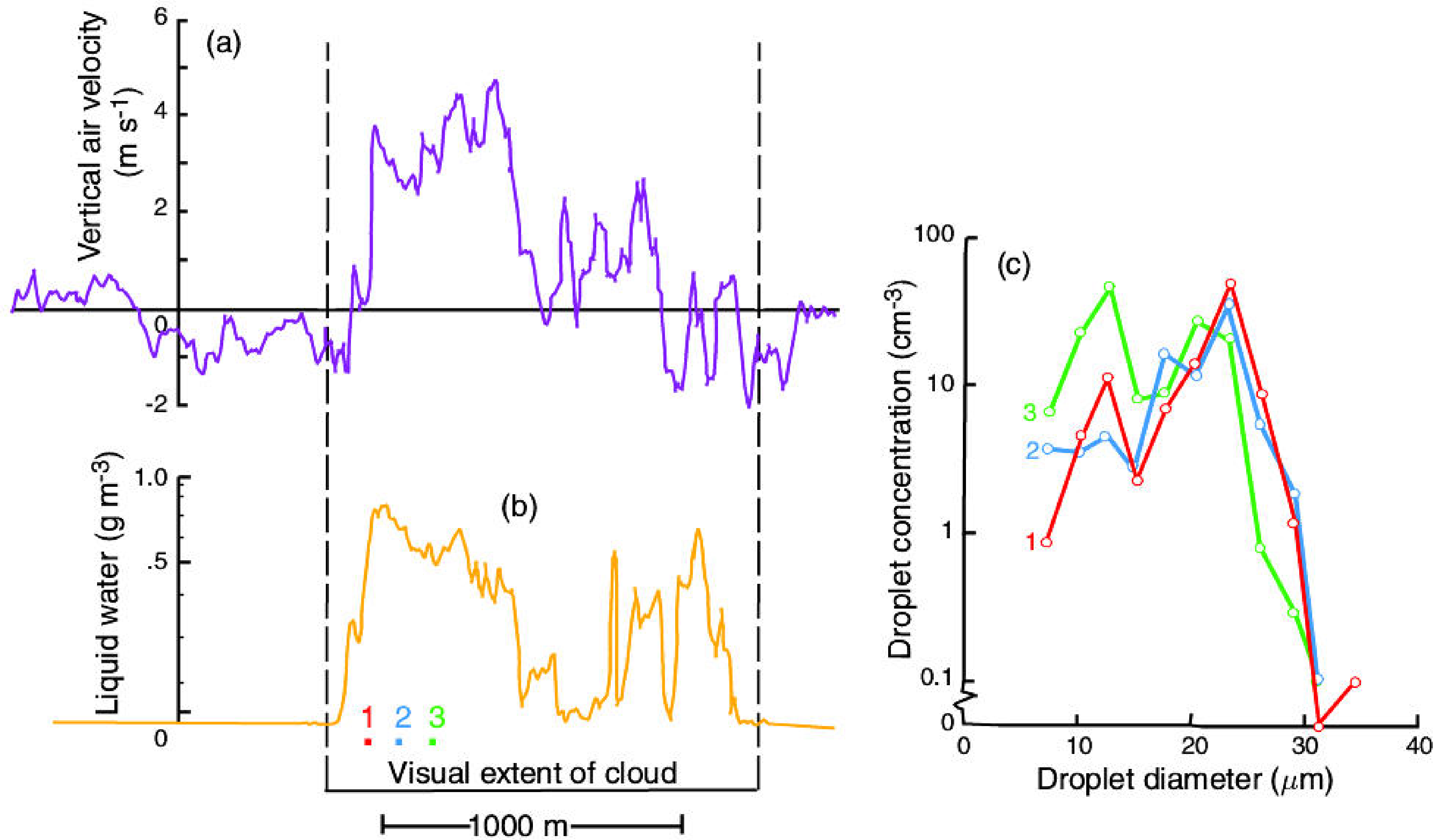
The resistance of the wire is used in an electrical feedback loop to maintain the temperature of the wire constant. The power required to do this can be calibrated to give the LWC.



(a) Vertical air velocity (b) liquid water content (LWC), and (c) droplet size spectra at points 1, 2, and 3 in a small, warm, non-raining cumulus cloud.

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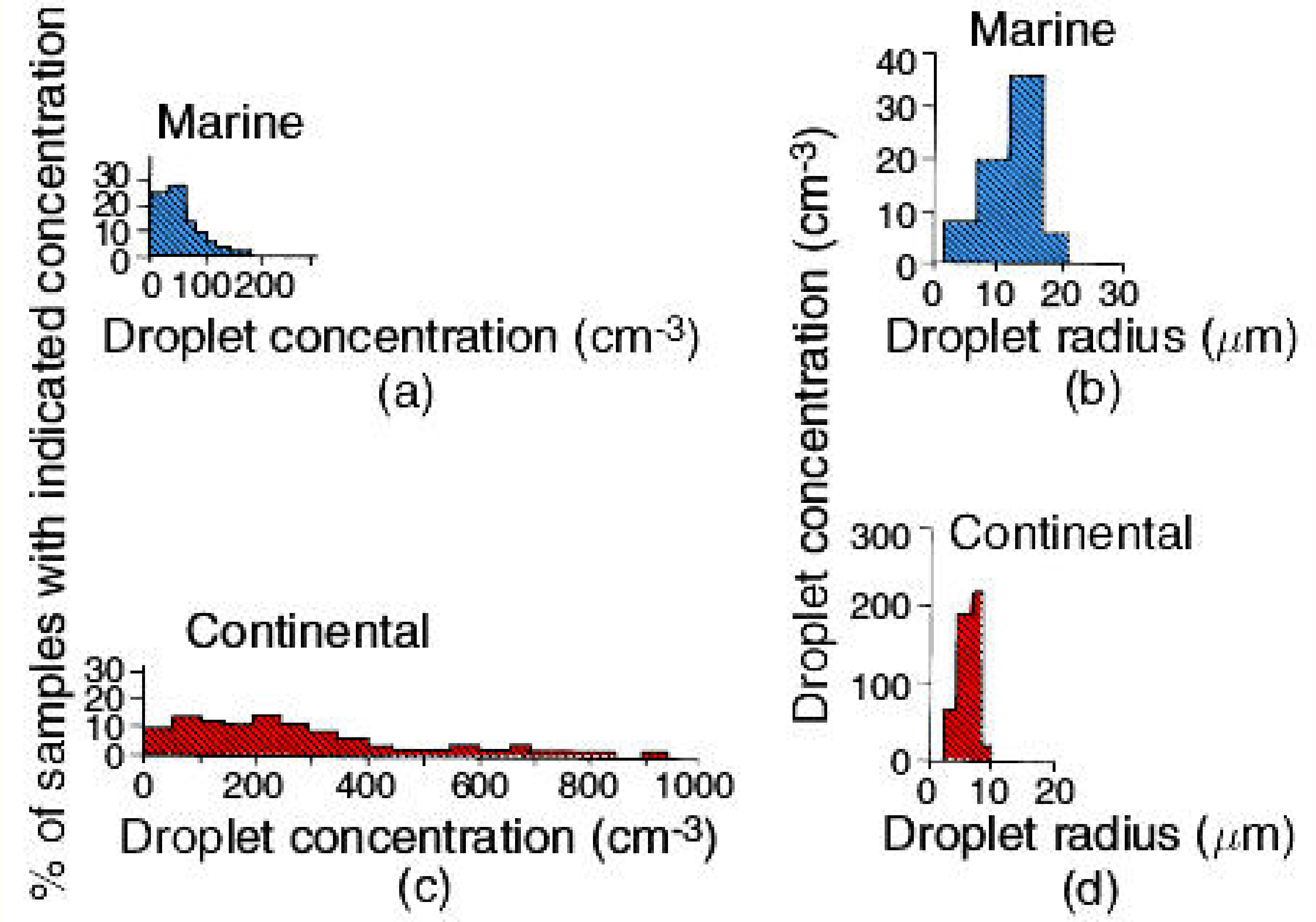
The droplet spectrum measurements shows droplets ranging from a few micrometers up to about $30\,\mu$m in radius.



(a) Percentage of marine cumulus clouds with indicated droplet concentrations. (b) Droplet size spectrum in a marine cumulus cloud. (c) Percentage of continental cumulus clouds with indicated droplet concentrations. (d) Droplet size spectrum in a continental cumulus cloud.

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The droplet size spectrum for the continental cumulus cloud is much narrower than that for the marine cumulus cloud, and the average droplet radius is significantly smaller.

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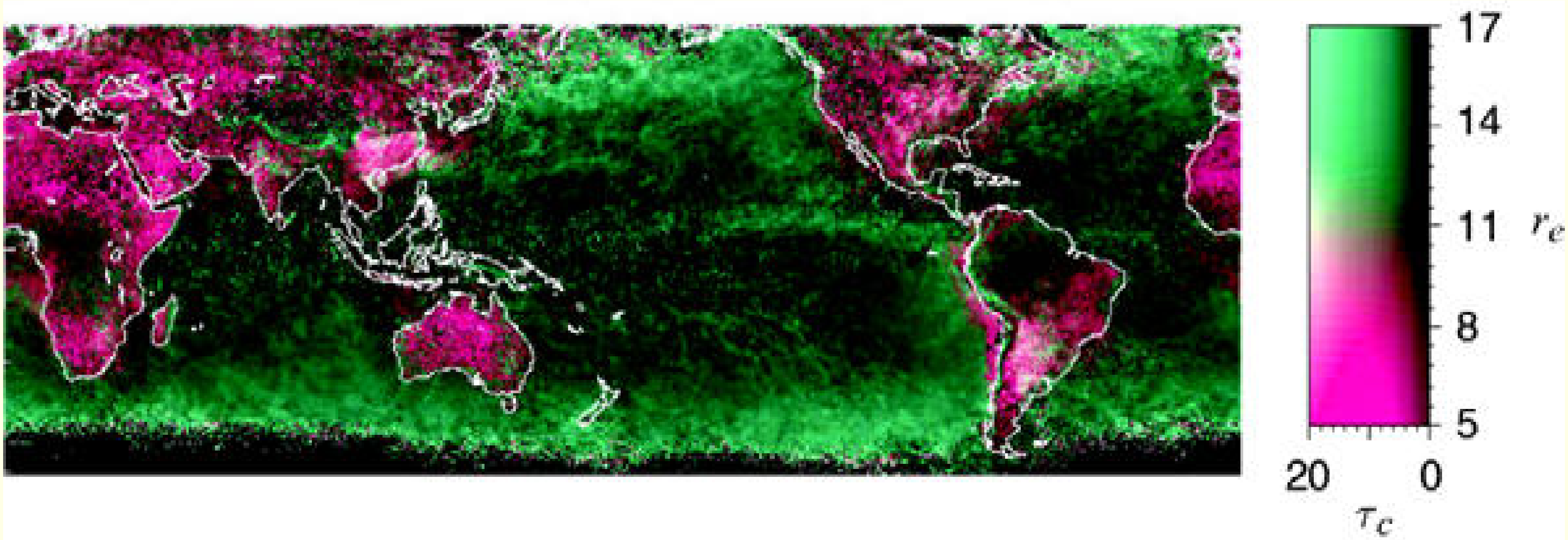
Shown next are retrievals from satellite measurements of cloud optical thickness (τ_c) and cloud droplet effective radius (r_e) for low-level water clouds over the globe.

It can be seen that the r_e values are generally smaller over the land than over the oceans.



Retrievals from a satellite of cloud optical thickness (τ_c) and cloud particle effective radius (r_e in μm) for low-level water clouds.

Ship Tracks in Clouds

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Ships emit large numbers of particles which increase the number concentration and decrease the average size of the cloud droplets.

The greater concentrations of droplets cause more sunlight to be reflected back to space, so they appear as white lines.

Ship tracks in marine stratus clouds over the Atlantic Ocean as viewed from the NASA Aqua satellite on January 27, 2003.

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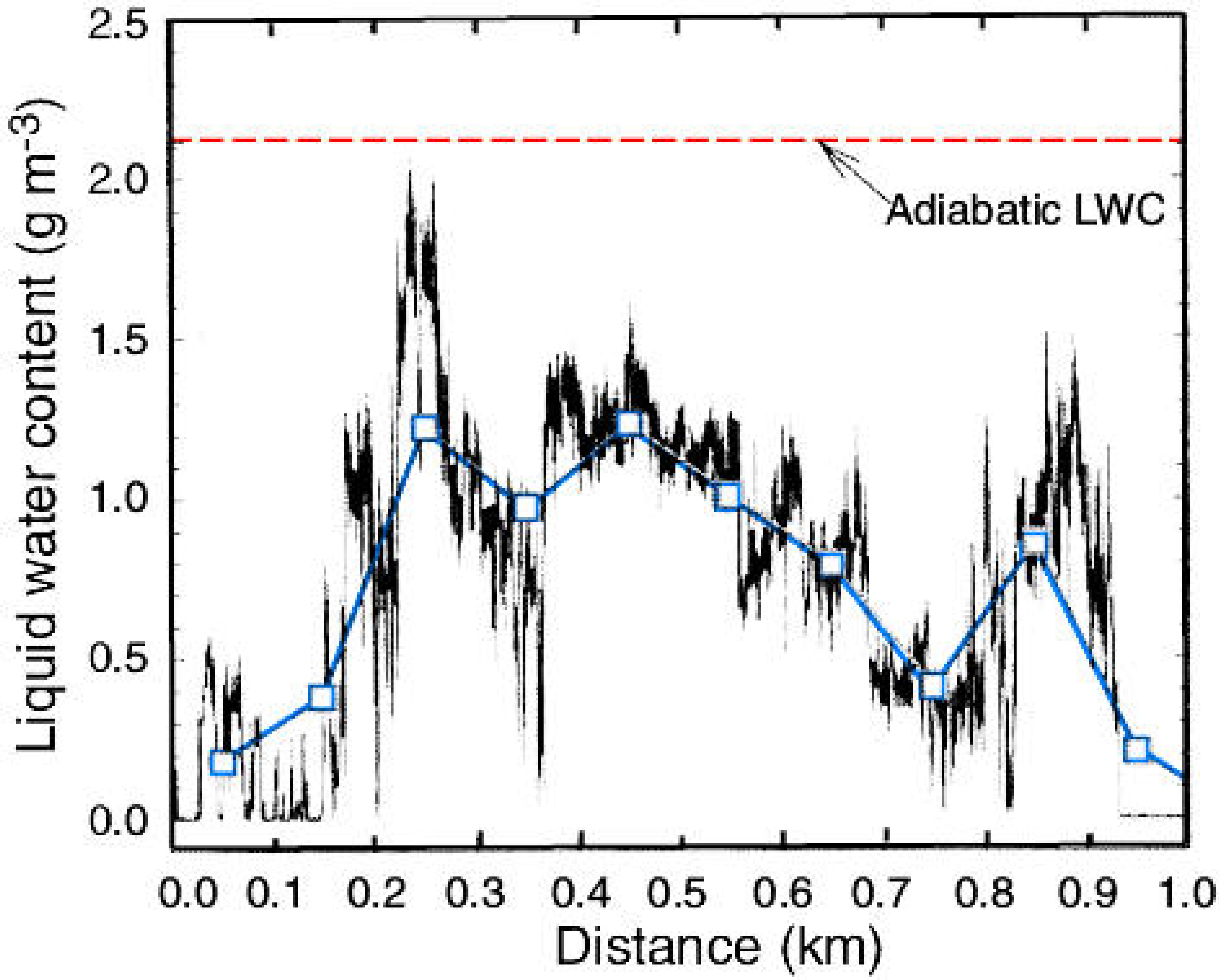
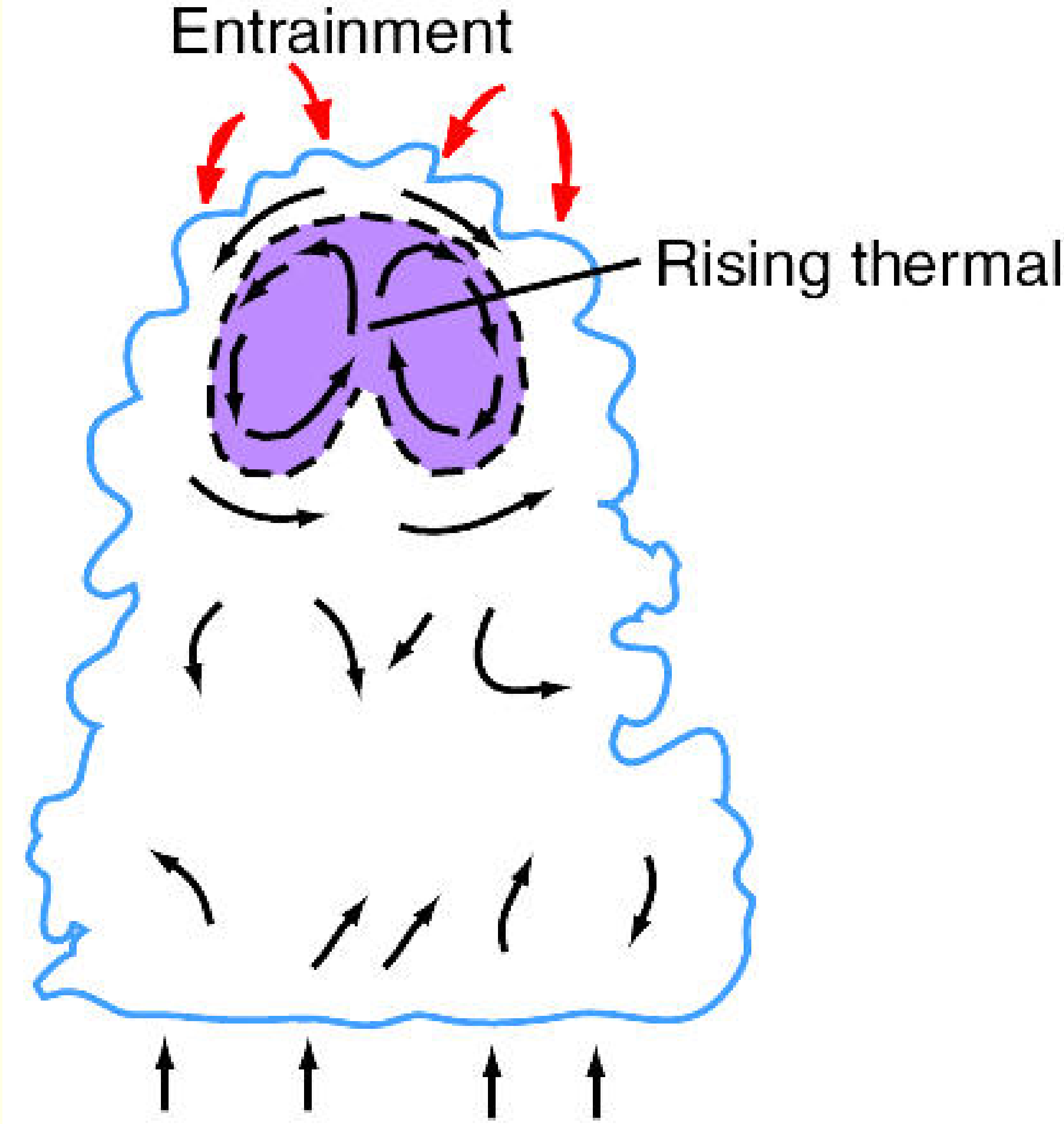
Shown in the following figure are measurements of LWC in cumulus clouds.

The measured LWC are well below the adiabatic LWC, because unsaturated ambient air is entrained into cumulus clouds. Consequently, some of the cloud water evaporates to saturate the entrained parcels of air, thereby reducing the cloud LWC.



High resolution liquid water content (LWC) measurements (black line) derived from a horizontal pass through a small cumulus cloud.



Schematic of entrainment of ambient air into a small cumulus cloud. The thermal (shaded violet region) has ascended from cloud base.

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This process is responsible in part for the "Swiss cheese" distribution of LWC in cumulus clouds.

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These motions are responsible in part for the cellular appearance of stratocumulus clouds, as shown next.

Stratocumulus clouds over the Bristol Channel.

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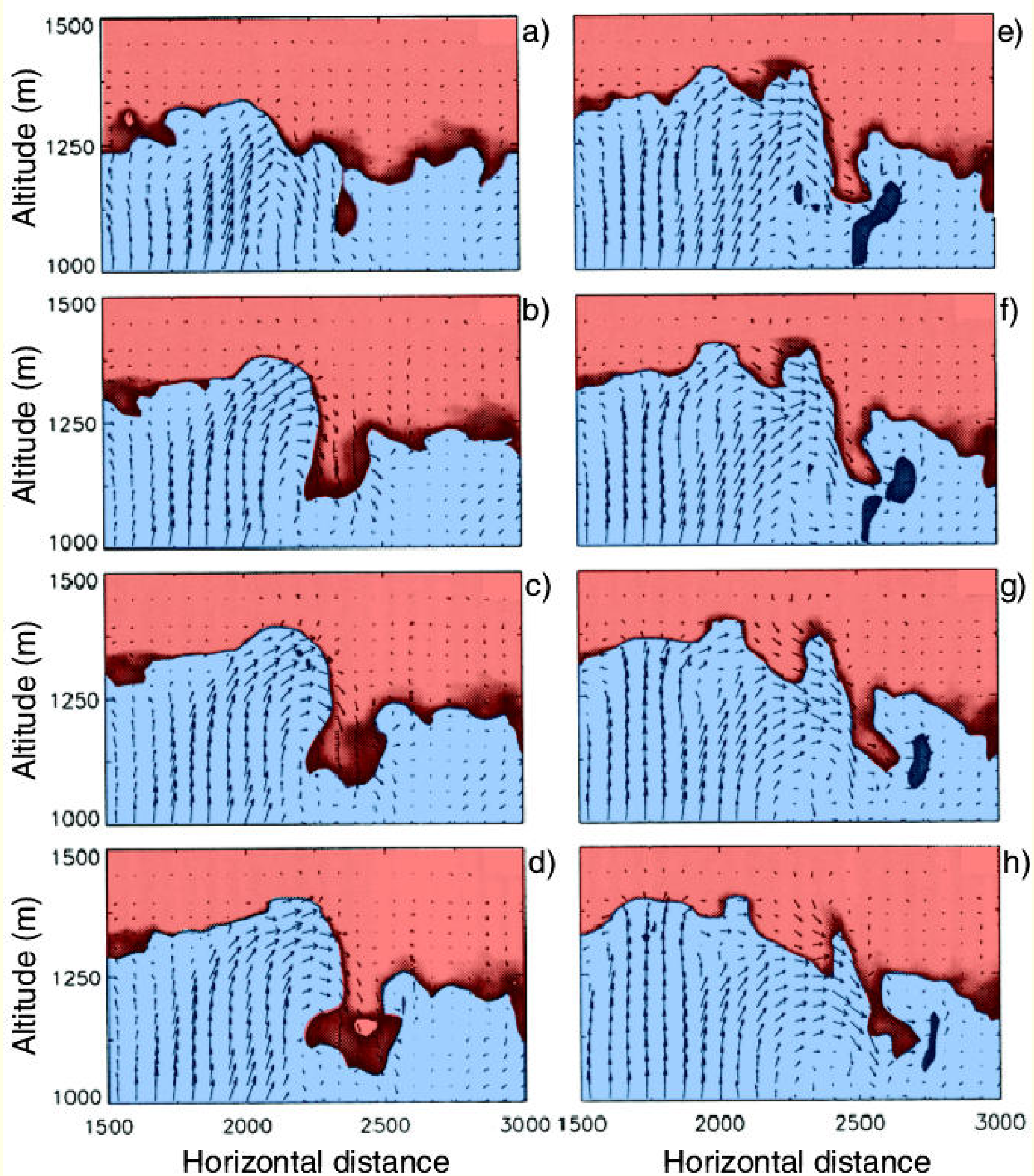
As in the case of cumulus clouds, following such engulfment, cooling of entrained air parcels by the evaporation of cloud water will tend to drive the parcel downward.

Under extreme conditions, such down-drafts might lead to the breakup of a stratocumulus cloud layer.



Model simulations showing the entrainment of air from the free troposphere (orange) into the boundary layer (blue) over a period of 6 min.