There are four basic parameters that are usually examined in measurements of clouds.

1. Size distributions (either, number, surface area, or volume). These look very similar to aerosol size distributions except the modes in the distributions are found at much larger sizes. The mode in the number distribution is typically between 10 and 25 \( \mu m \) diameter. The volume distribution is typically bimodal if the cloud is precipitating, with the second mode at somewhere between 100 and 1000 \( \mu m \) diameter. The precipitation mode has the largest sizes near cloud base, and the cloud mode (the small mode) has the largest sizes typically near cloud top.

**Figure 1:** Number (left) and LWC (right) size distributions in clean stratocumulus and stratocumulus polluted by ships.
2. The number concentration of droplets $N(z)$ is usually nearly constant with increasing height.

3. The liquid water content $LWC(z)$ usually increases linearly with height, starting near zero at cloud base.

4. The volume mean particle size $r_v$ also increase with height, but starts at about $4 \, \mu m$ near cloud base, and increases less than linearly with height to somewhere between $5$ and $15 \, \mu m$ diameter.

**Horizontal structure**

The horizontal structure of clouds can be relatively homogenous, as in the case of stratus or fogs, or highly variable in stratocumulus or cumulus clouds. The degree of inhomogeneity appears to be linked to how turbulent the cloud is, and how it is precipitating. Observations show that the number concentration and liquid water content are much more highly variable horizontally than the droplet size.

**Continental versus maritime clouds**

It is generally observed that continental clouds have smaller and more numerous droplets than maritime clouds. The degree to which this is the case appears to be closely linked to the concentrations of aerosols in the environment.
Figure 5.12 Measurements of the droplet concentration ($N_d$), total liquid water content ($LWC_{\text{tot}}$), temperature ($T$, solid line) and dewpoint ($T_d$, dashed line), and equivalent potential temperature ($\theta_e$) in the marine boundary layer in the vicinity of the Fremo Scorpius (June 8), Brazil Vitoria (June 11), Moku Pahu, (June 12), Tai He, Star Livorno (June 29), and NYK Sunrise (June 30) ship tracks. Measurements of $N_d$ are from the PMS FSSP-100 probe, measurements of $LWC_{\text{tot}}$ are from the PMS FSSP-100 and the PMS 2D-C probes, measurements of $T$ and $T_d$ are from the Rosemount temperature sensor and the chilled-mirror dewpoint sensor, respectively, and $\theta_e$ is derived from the temperature, pressure and dewpoint. The dashed line in the $LWC_{\text{tot}}$ profile is the adiabatic liquid water content profile of the cloud layer.