The retrieval problem of microwave cloud tomography is highly ill-posed when only a few passive sensors are used. Cloud tomography is a technique for imaging cloud structure from multi-angular emission measurements. Retrievals are very sensitive to small measurement and/or numerical errors.

Combining tomography and radar data improves the retrieval of cloud liquid water distribution. The dual-frequency data provide an initial guess of liquid water distribution (Hogan et al., 2005).

Summary

Retrieving cloud liquid water distributions with cloud tomography is ill-posed. Regularization methods can improve the retrievals, but still not enough when only a few sensors are available.

Cloud radar complements to passive sensors, and can be used to further constrain the tomographic retrievals. Adding radar data into cloud tomography greatly improves the retrieval accuracy.

Combining radar and cloud tomography offers the potential for retrieving cloud droplet number concentration and effective radius, in addition to cloud liquid water content.

Other cloud properties are also possible with the combined data

Some assumptions used in Frisch et al. (1995) can be relaxed or even eliminated, thus allow for the retrieval of more cloud properties.