Physical and optical properties of aerosol particles depend on the relative humidity of their carrier gas. To achieve comparability of measurements from different aerosol monitoring sites, networks usually require that the aerosol is dried to a relative humidity below 50% r.H.. Commercially available aerosol dryers are often not suitable for remote monitoring sites. Diffusion dryers need to be regenerated frequently, Nafion dryers are not designed for high aerosol flow rates. We have developed automatic regenerating adsorption aerosol dryers for a design flow rate of 1 m³/h (figure 1).

Particle transmission efficiency has been measured during a 3 weeks experiment. The lower 50% transmission efficiency was found to be below 3 nm at this flow rate. Operated at the design flow rate, the aerosol transmission efficiency exceeds 92% in the size range from 10 nm to 800 nm. Measured transmission efficiencies (dots) are in good agreement with theoretical calculations line (figure 2.).

So far seven dryers have been deployed worldwide. The most challenging site for such a dryer is located in the rainforest of the Amazonas river basin about 50 km off the city of Manaus. Monthly average temperatures at this site range from 24 to 33 deg. C with a daily average humidity of up to 90% r.H.. From February 2008 through August 2008 we measured an average ambient temperature of 30.3 +/- 2.3 deg. C with a relative humidity of 78.5 +/- 3.9%. During the experiment average relative humidity of the dried aerosol was 27.1 +/- 7.5 % r.H.

We demonstrated that the new automatic regenerating aerosol dryer performs well under adverse environmental conditions. Relative humidity of the aerosol at the most challenging site never exceeded design values. Operational parameters of the system need, however, to be set according to site requirements. Routine maintenance of the system did require little effort which makes these dryers suitable to be operated at remote continuous monitoring sites.