Regional Effects of Absorbing Aerosols and Biomass Burning

Project lead: Dr. Fabian Senf (TROPOS)

Absorbing aerosol plays an important role in Earth's climate system. Absorbing aerosol such as black carbon or dust absorbs incoming solar radiation. This additional absorption leads to modifications of the atmospheric stability in the boundary layer and free troposphere and thus to perturbations in the temperature structure of the atmosphere influencing cloud formation and maintenance. Aerosol also reduces the downwelling solar radiation at the surface which has been referred as surface dimming. Together the changes in atmospheric stability and reduction in surface fluxes could act to significantly modify the fraction of clouds and consequently in the Earth's energy balance. The proposed project investigates the impact of absorbing aerosol and biomass burning smoke on regional weather and climate using realistic high-resolution simulations. Resources at DKRZ are requested to run the ICON model in a limited-domain setup to study different types of regional effects, incl. e.g. semi-direct responses of realistic cloud fields to aerosol-induced changes in atmospheric heating and surface fluxes as well as emission pathways of biomass burning smoke its interaction with the cloudy atmosphere. The outlined research contributes to the scientific understanding of aerosol effects and different interaction pathways in a changing climate.