Biomass burning in the southern hemisphere UTLS: GLORIA trace gas observations during SouthTRAC 2019 to evaluate the CAMS model

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We present trace gas measurements obtained by the airborne imaging limb sounder GLORIA (Gimballed Limb Observer for Radiance Imaging of the Atmosphere) that has been operated onboard the German HALO (High Altitude and Long Range) research aircraft above the South Atlantic during the SouthTRAC campaign between September and November 2019. We show retrieval results as two-dimensional trace-gas distributions derived from GLORIA observations in the UTLS (Upper Troposphere Lower Stratosphere) region above South America and the Atlantic Ocean. Targeted gases are, amongst others, O₃, HNO₃, PAN, C₂H₆, and HCOOH. Using trajectories from the HYSPLIT model, measured pollution trace gas plumes are linked to possible regions of origin. Emission sources are connected to large scale biomass burning events in central Africa, South America and Australia. In our contribution, we compare these GLORIA measurements with results of the CAMS (Copernicus Atmosphere Monitoring Service) reanalysis model. We show that there are very delicate structures of pollutant trace gas distributions in the South Atlantic UTLS, and that CAMS generally is able to reproduce measured distributions of pollutants. Quantitatively, PAN volume mixing ratios are captured quite well by the model, which however underestimates the concentrations of C₂H₆ and in particular of HCOOH. Furthermore, biomass burning emissions from the beginning of the intensive Australian fires in November 2019, which are measured by GLORIA in thin filaments are not reproduced by the model.