The CRISTA-NF (Cryogenic Infrared Spectrometers and Telescopes for the Atmosphere) instrument operated on the high-flying Russian aircraft Geophysica during the RECONCILE field-campaign to measure limb-emissions of trace gases in the mid-infrared region to retrieve trace gas concentrations in the surroundings of the polar vortex. One main scientific objective was the exploration of mixing between vortex and mid-latitude air. In March 2010, two flights were performed in the vicinity of the vortex edge. CLaMS simulations (Chemical Lagrangian Model of the Stratosphere) of the situation indicate signs of ozone depletion, de- and renitrification and former Chlorine activation.

CRISTA-NF measurements of these flights are evaluated using JURASSIC2 (Juelich Rapid Spectral Simulation Code 2). The results provide a horizontal along-track resolution of 25km. The tracer CFC-11 is retrieved with a vertical resolution of only 350m, providing probably for the first time such a highly resolved 2-D curtain of CFC-11 concentrations. ClONO$_2$, HNO$_3$, and other trace gases complement the picture at a decreased resolution.

The origins of examined airmasses are determined by introduction of artificial tracers into CLaMS simulations. The air originates from the vortex core, edge, and mid-latitudes. The retrieval results exhibit finer structures than were originally visible in the CLaMS simulations. Increasing their resolution to 50km horizontally and 400m vertically reduces the deviations, but the remaining discrepancies indicate that the mixing parameterization may require small adjustments. These results can thereby give new insights into the composition and variability of the UTLS, which is via radiative forcing a major driver of surface climate change.