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Reactive gases in the chemistry climate model ECHAM6-HAMMOZ

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Abstract: The recently developed global chemistry climate model ECHAM6-HAMMOZ contains comprehensive and detailed schemes for tropospheric aerosol (HAM) and reactive gases chemistry (MOZ). The Jülich Atmospheric (chemical) Mechanism (JAM002) consists of more than 300 species and 650 reactions, including relatively detailed degradation pathways for various volatile organic compounds in the troposphere and stratosphere. State-of-the-art parameterisations for chemical and physical processes are included. Here we present evaluation results from a multi-year simulation of the present-day atmospheric composition.

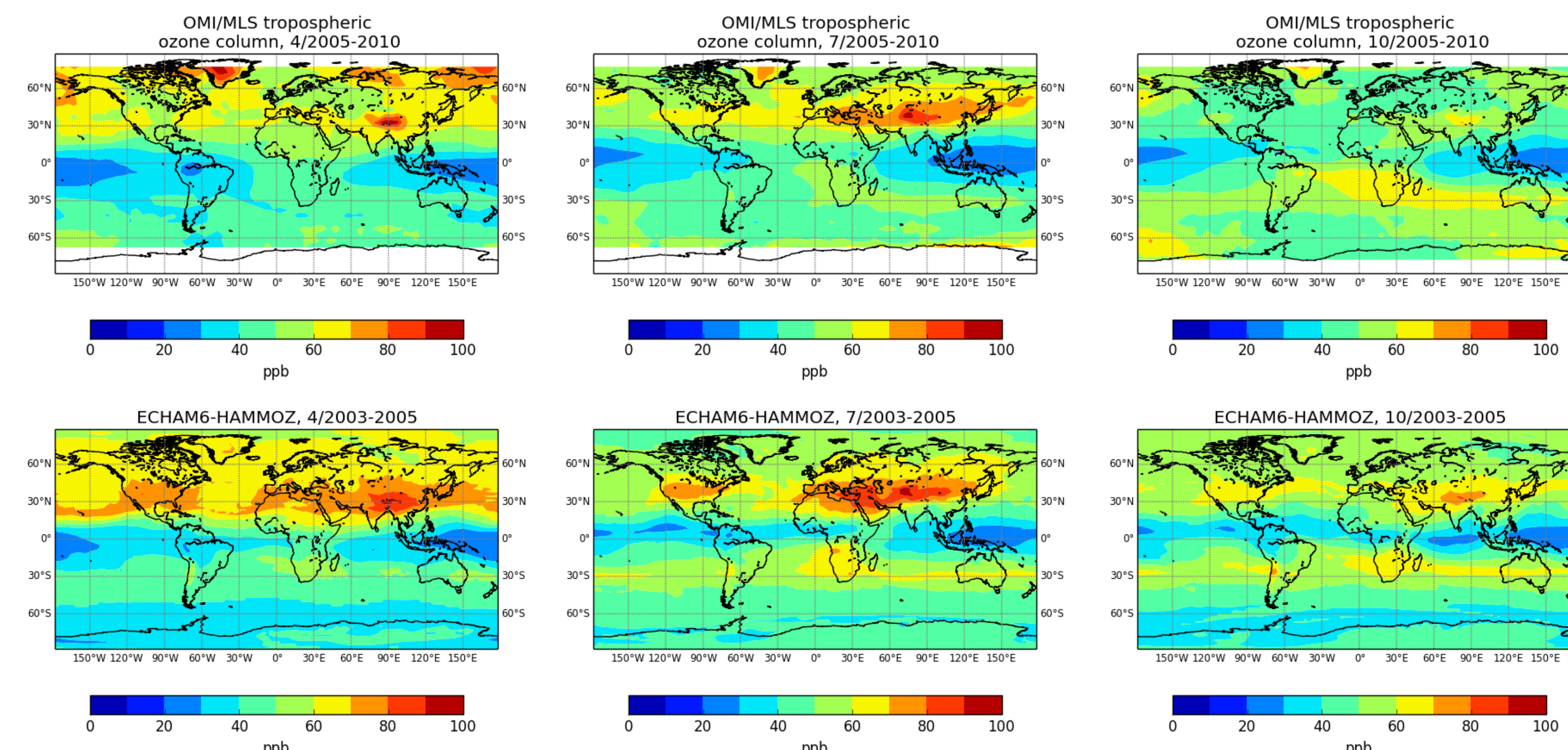


Figure 1: Three-year average monthly tropospheric ozone columns from OMI/MLS (top) and ECHAM6-HAMMOZ (bottom) for April, July, and October. OMI/MLS data courtesy of J. Ziemke and O. Cooper.

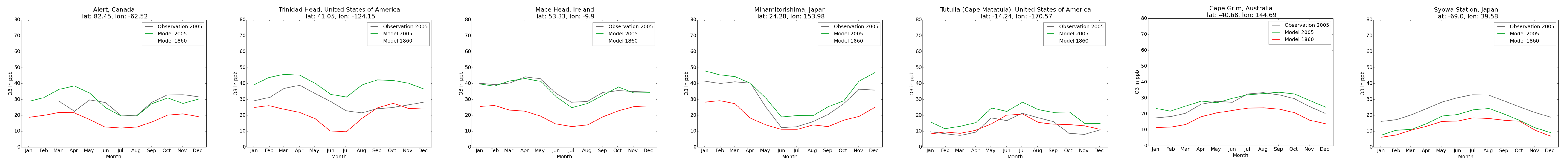


Figure 2: Monthly mean ozone seasonal cycles at selected surface sites around the world. Observations from the GAW network are compared to the present-day simulation (year 2005) and to a sensitivity experiment under preindustrial conditions.

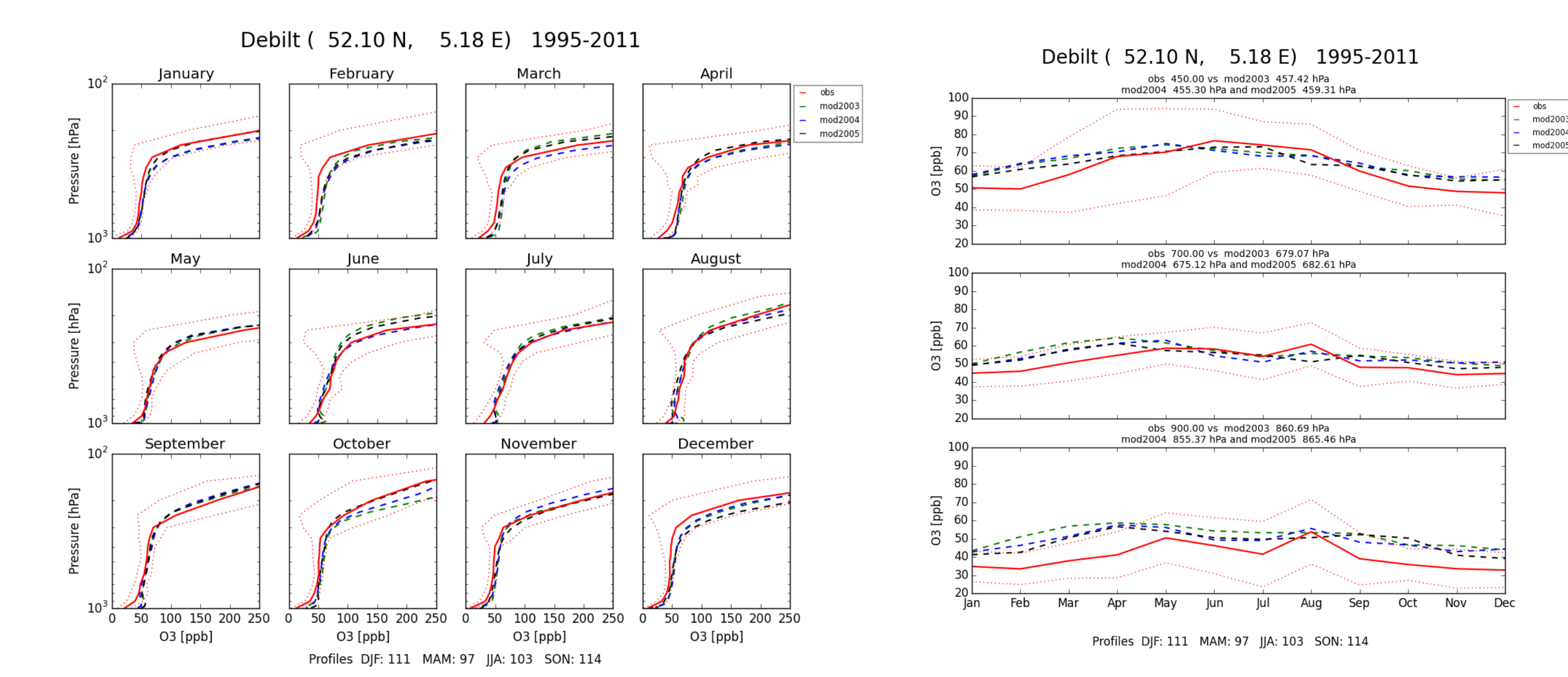


Figure 3: Comparison of monthly mean ozone vertical profiles from various model years with an ozone sonde climatology (Timles et al., 2014). Left: vertical profiles, right: time series at three selected model levels.

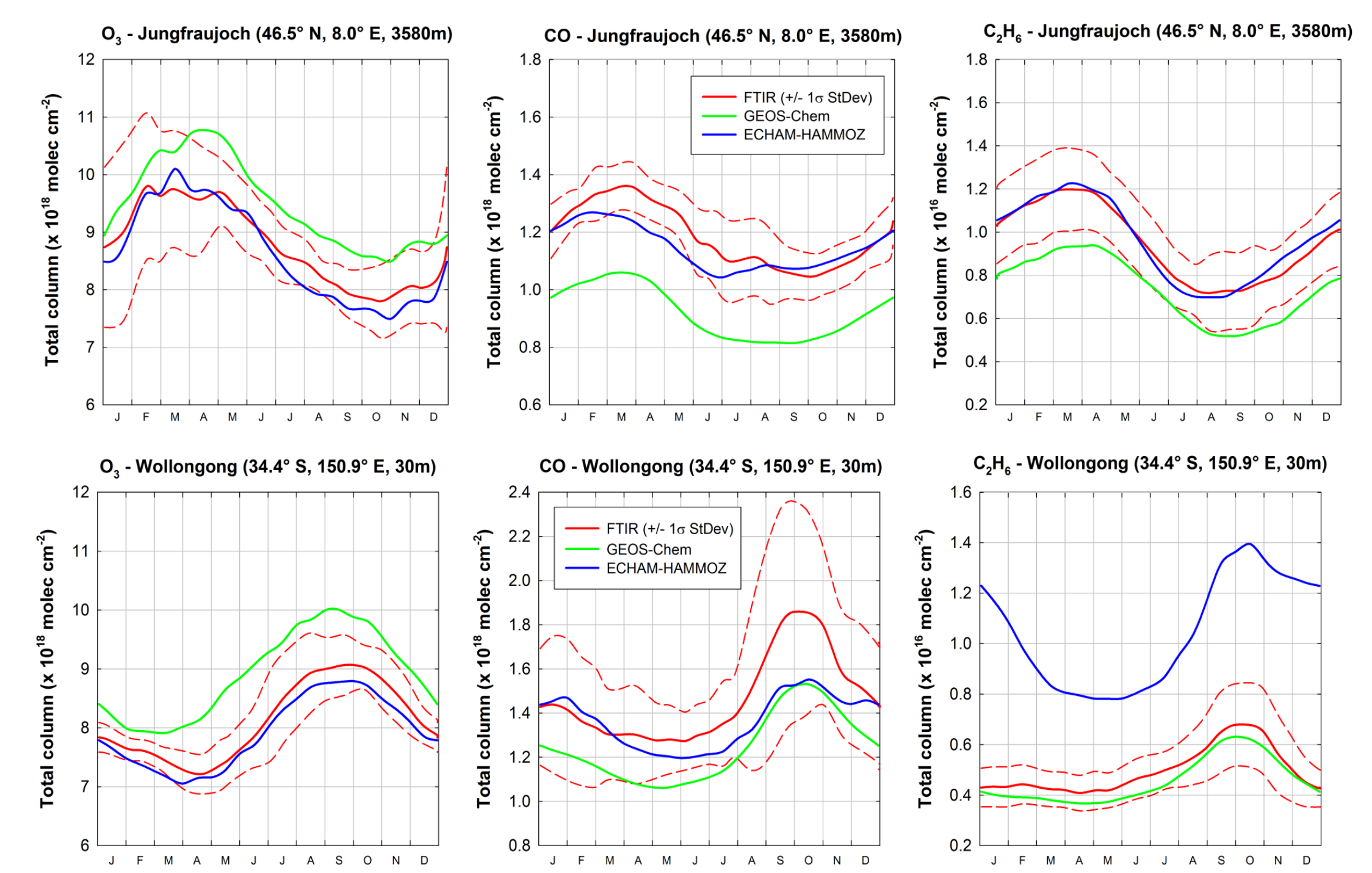


Figure 4: Seasonal cycles (over the period mid-2003 – 2007) of ozone, CO and ethane at NDACC-affiliated (top) Jungfraujoch and (bottom) Wollongong stations. FTIR vertical sensitivity and resolution have been accounted for by applying the averaging kernels to the model profiles. The FTIR retrievals were performed at University of Liège and University of Wollongong. We thank the NDACC station PI's for providing access to the FTIR data.

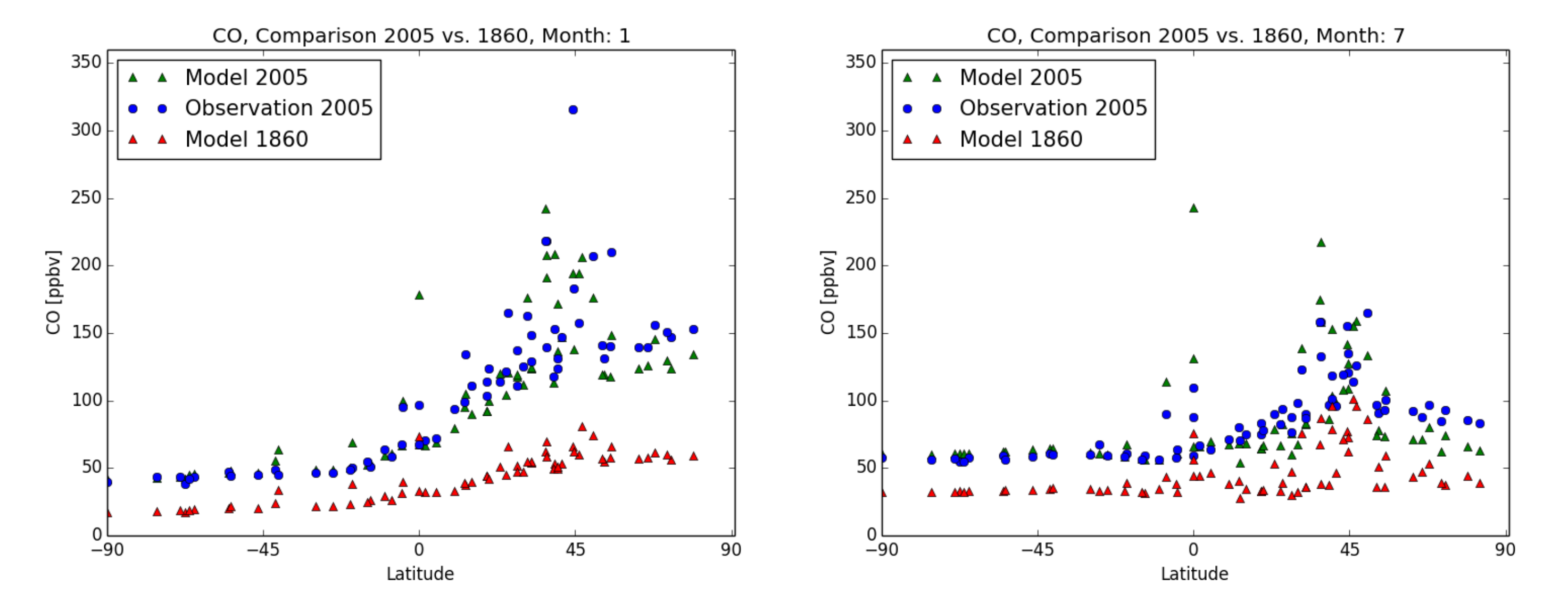


Figure 5: Latitudinal plot of monthly mean surface CO mixing ratios for January (left) and July (right). For comparison, a preindustrial simulation is also shown (in red).

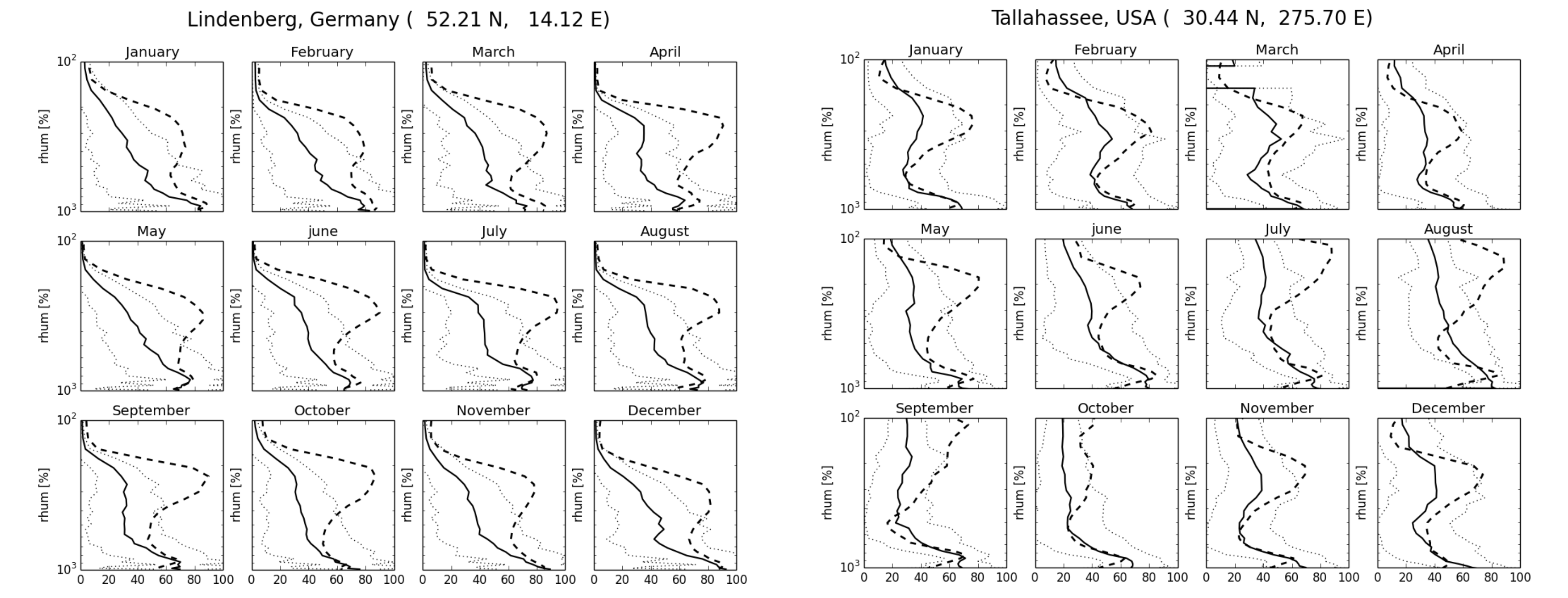


Figure 6: Monthly mean vertical profiles of relative humidity (year 2005) in comparison with radiosonde data (UWisc).