Airborne Lidar Observations in the Inflow Region of a Warm Conveyor Belt

Andreas Schäfler (1), Florian Harnisch (1), Andreas Dörnbrack (1), Heini Wernli (2), Christoph Kiemle (1), Stephan Pfahl (2)

(1) Institut für Physik der Atmosphäre, Deutsches Zentrum für Luft und Raumfahrt (DLR), Oberpfaffenhofen, Germany
(2) Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland

Warm Conveyor Belts (WCBs) are air streams that are highly relevant for the dynamics in the mid-latitudes as they strongly influence the PV structure. It is known that incorrectly represented WCBs can lead to forecast busts. However, there is little information how the moisture in the boundary layer affects the diabatic processes occurring during the ascent and subsequently the dynamics of the associated cyclone. Lidar data in cloud free regions are representing an excellent possibility to observe the moisture structure in the WCB inflow. Therefore a large set of airborne lidar missions with water vapour (and wind) observations over the northern Atlantic, Pacific and Europe was analyzed to search for the occurrence of WCBs.

This talk presents a case study of a TPARC aircraft mission on September 19, 2008 east of Japan which offers observations in the inflow region of a WCB. This enabled a detailed investigation of the humidity structure as revealed by lidar remote sensing profiles. Detailed diagnostics has been performed to investigate air mass histories. A comparison of the observed profiles with ECMWF analyses revealed that the humidity in the inflow region was largely overestimated. By assimilating the data with the ECMWF’s IFS 4DVAR system the analysis was corrected. A forecast improvement of the dynamical structure of the low and the PV structure at mid- and low-levels was observed.