Overshooting convection during TRO-pico: mesoscale modelling of two cases hydrating the lower stratosphere

Emmanuel Rivière (1), Virginie Marécal (2), Sergey Khaykin (3), Nadir Amarouche (4), Mélanie Ghysels (1,5), Irène Mappe-Fogaing (1), Abhinna Behera (1), Gerhard Held (6), and Hermes França (6)

(1) Université de Reims Champagne-Ardenne, Groupe de Spectrometrie Moléculaire et Atmosphérique (GSMA), Reims, France (emmanuel.riviere@univ-reims.fr), (2) CNRM/GAME, Meteo-France/CNRS, Toulouse, France, (3) LATMOS/IPSL, Guyancourt, France , (4) Division Technique de L'INSU, Meudon, France, (5) Now at National Institute of Standards and Technology, Chemical Sciences Division, Gaithersburg, MD, USA, (6) IPMET/UNESP, Bauru, SP, Brazil.

One of the main aims of the TRO-pico project (2010-2015) was to study the variability of overshooting convection at the local scale to try to deduce a typical impact on the TTL water at the global scale. In this study, we've identified local maximum in the water vapour profiles gathered by the balloon-borne hygrometers Pico-SDLA and Flash above Bauru, Brazil (22.3 S) during the TRO-pico campaign. We tried to link them to overshooting cells in the surrounding of Bauru with a trajectory analysis. In this study we select a couple of cases of overshooting convection both sampled by the Bauru S-Band radar and by one of the balloon-borne instruments of the TRO-pico campaign in 2012 and 2013. The selected cases are the case of March 13, 2012 (hereafter M12), sounded by both hygrometers Pico-SDLA and FLASH, and the case of January 26, 2013 (hereafter J13), sounded by Pico-SDLA. For the M12 case, local water vapour enhancements at two different altitudes due to two different cells were reported, with local enhancement of about 0.65 ppmv. For the J26 case, the water enhancement was about 1 ppmv. The corresponding mesoscale simulations with the Brazilian Regional Atmospheric Modelling System (BRAMS) using 3 nested grids with horizontal resolution down to 800 m were carried out. Simulation results are compared to Bauru's radar echo tops and and water vapour in situ measurements. As for the M12 simulation, the model is doing a rather good job in reproducing several overshooting cells, both in severity and timing. Associated stratospheric water budget are computed for each cases.