GPS tomography and radar reflectivity reconstruction fast algorithm.

M. Reverdy (1), J. Van Baelen (1), A. Walpersdorf (2), B. Boudevillain (3)

(1) Laboratoire de Météorologie Physique, Aubière, France
(M.Reverdy@opgc.univ-bpclermont.fr / Phone: +33 0473407677), (2) Laboratoire de
Géophysique Interne et Tectonophysique, Grenoble, France, (3) Laboratoire d'étude des
Transferts en Hydrologie et Environnement, Grenoble, France.

As part of the OHM-CV (Observatoire Hydrométéorologique Méditerranéen Cévennes-Vivarais), a project dedicated to the study of heavy precipitation occurrences and hydro-meteorology in Southern France, an extensive GPS project has collected data during the autumn period of 2002, located in the south of France. In particular, a dense GPS network (16 stations over a 25 km by 25 km area) was deployed in the Cévennes-Vivarais region. In order to retrieve the 3-D water vapor distribution, we have developed a GPS tomography software which has been tested and validated with sensitivity tests.

This software allows us to perform inversions every 15 minutes to produce water vapor density maps. The spatial and temporal variability of water vapor are parameters which are varying a lot, but this time step is short enough to see the formation and the disappearance of water vapor bubbles. Actually, we can look into the details at some interesting highly variable structures.

Furthermore, the GPS network was deployed in this area because of a French Météo France Radar located in proximity. This radar, near Bollène operated in a 3-D volume scan mode. The resulting data give us the reflectivity over the same area that GPS network for comparison and further correlations.

Unfortunately those data were damaged due to numerous problems including orography and initial radar processing. Those problems are mainly the consequences of the

nearby mountains and of the distance between the radar and the position of our GPS network (∼70km). In order to retrieve the lack of information, we have developed a fast reconstruction algorithm based on reflectivity interpolation. Furthermore, we have studied the effect of the reconstruction on different damaged reflectivity map by proceeding as follow. We have selected non-damaged reflectivity map and have inserted some blank data. Then, we run our algorithm and look in details at the result after the different interpolations (horizontal, vertical and diagonals). Even if we still have some artifacts due to the interpolation, this method gives us an interesting tool to perform high quality reconstruction.

Thus with both GPS and radar results, we expect to better understand the wet convergence, the precursor stages of heavy precipitations and the water vapor distribution in some cloud system.